UNIT 9: SCIENCE COMMUNICATORS

UNIT STRUCTURE

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9.1 LEARNING OBJECTIVES

After going through this unit, you will be able to understand

- various segments of science communication
- who are the science communicators along with their qualities and responsibilities
- various training avenues in India pertaining to this field.

9.2 INTRODUCTION

Communicating science to the public means making complex ideas and concepts simpler without modifying scientific facts. It is considered as a great tool of development communication as it has the potential for societal transformation by enabling interfaces among scientist, public, policy makers, and industry and thus paves the way for public engagement in nation development. Dr. A P J Abdul Kalam once said, 'powerful communication is an asset to transform societies'. During the inaugural session of Eleventh International Conference on Public Science Communicators at New Delhi

(2010), Dr Kalam said that 'the role of science communication is no longer limited to communication band-width, but the imagination band-width of scientists'. He proposed three important tasks for the people engaged in science communication. These are:

(a) to make all citizens, particularly those in remote and rural areas to feel enthusiastic towards science;

(b) to make all the citizens to know about the advances of science and their role in the society for economic and health development; and

(c) to make scientific achievements accessible for the people while being sensitive to sustainability of our planet and our responsibilities towards it.

Sarah Palmer and Renata Schibechi (2014), proposed four types of science communication:

- *Professional science communication:* associated with the professional practice of science (example: scientist).
- *Deficit science communication*: related to the knowledge exchange between scientists to "the public".
- *Consultative science communication*: It is a two-way communication where knowledge is exchanged from scientists to the non-scientific publics, and reverse, i.e. from the non-scientific publics to the scientists.
- *Deliberative science communication*: It is more democratic in nature. Like in *Consultative science communication* knowledge is exchanged between scientists and public in a two way process but in a more deliberative way. Here scientific knowledge and local knowledge are mutually respected.

Looking at other aspects of science communication, we find, science communication promotes use of appropriate skills, media, activities and dialogue to produce *personal responses* of public to science. According to Burns et al (2003), these 'personal responses' may be divided into five categories, viz. *awareness, enjoyment, interest*, *opinion sharing and*

understanding of science (its content, processes, as well as social factors). As science communication today encourage not only communication but also 'engagement' of public, therefore, a science communicator has to play a decisive part in the process.



CHECK YOUR PROGRESS

Q.1: What are the different types of science communication as given by Sarah Palmer and Renata Schibechi?

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Q.2: Who was APJ Abdul Kalam?

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9.3 WHO IS A SCIENCE COMMUNICATOR?

A science communicator is a person who has interest in science and possesses skills in communication. Science practitioners, mediators, and other members of the general public (women, youth, children etc.) can work as science communicator with an intended action of communicating scientific knowledge or practices to non-scientists in an explicit and organised way.

Primary objective of a science communicator is to increase scientific temperament by targeting behaviour change of public. To achieve the objectives, a science communicator has to

i. Build trust both at scientists and public level

ii. Inspire interdisciplinary approaches from different branches of science

iii. Encourage the use of science stories for successful science communication

iv. Try to make the science personal

v. Promoting science communication and people's participation

vi. Boosting regional language in or mother tongue as language of communication for clear understanding of the content

Understand the stage or level of audience understanding. Are they in *pre-knowledge stage* of knowing a subject? Do they stand at *knowledge stage* or in *acceptance stage*? Can the audience *advocate* about the topic? -The science communicator should ask before designing his strategy or message.

9.3.1 Scientists as communicator

There is a prevailing nuance that scientists usually decline to respond to communication like skipping public hearing, ignoring discussions with policy makers and avoiding press. This, referred to as 'ostrich behaviour' of science communication, stands as a big challenge in public engagement. As such, the concept of 'scientist as communicator' has been growing worldwide. Alan Townsend, an ecologist and biogeochemist feels the it is not *what* a scientist says, but *how* one says it. Today, much attention has been paid to motivate scientist community that the results of scientific research needs to be communicated for policy change and development of society at large.

(b) Women as science communicator

Women are the centre point of a family. A child learns everything from his/her mother. Therefore, it is essential to encourage mothers to be engaged in the process of science communication. Simple things like basic hygiene, sanitation, and respect for nature can be learnt at home, if a woman plays the role of a science communicator. Tales she tells to a child can make science as a component of the narrative. *Chipko movement* is a successful example of how women can become a change agent. Moreover, if women can be trained as a science communicator,

probability of cultural barriers in the process of science communication gets reduced, as mother is the first teacher of a man.

(c) Youth – the change agent

Youth are enthusiastic, open for accepting change and implementing change. They are the next generation, inspiring audience in a society. For example, Greta Thunberg – a Swedish environmental activist has recently become the new face of the 'youth as a change agent' internationally for her voice on climate crisis.

(d) Children- the future hope

It is a universal truth that today's children are tomorrow's citizen. Children can be attracted easily with creative activities in science and hence will be involved in the organisational framework of science communication. School curriculum, science museums, fairs and festivals, planetariums, zoo may provide opportunities for children engagement. Face-to-face interaction with scientists or experts can germinate scientific temperament among children. For children, content of science should be fun for developing their imagination and engagement.

Aryabhatta Science Centre, an initiative of the Science and Technology Division of Assam Science Technology and Environment Council (ASTEC), Government of Assam is an example of how hands in science practise can be promoted for inculcating scientific temperament among children in Assam. Established in 2008, ASTEC had set up 219 numbers of Aryabhatta Science Centres in 219 development blocks of Assam. Objectives of Aryabhatta Science Centres are: (a) to build scientific attitude among the school students, (b) to make science education exciting through experimentations and other hands-on-activities and (c) to promote basic science as a career option.

9.3.2 Qualities of a science communicator

There exists a great verity of approach, content designing, and communication philosophy that different organizations and communicators adopt as skills and to promote public engagement. It is an established fact that the science communication and public engagement demands best practice and better qualities from a mediator, called science communicator.

Considering the need of a common guideline, AAAS prepared a preliminary framework that outlines foundational science communication skills. This 'Foundational Skills for Science Communication-A Preliminary Framework' (2017), includes different skills and their component parts which a science communicator should possess for better connection and sharing of knowledge. These include:

(a) *Identifying and aligning engagement goals*: Science communicator should be capable of identifying the goals of the communication process. Accordingly, objectives should be made and strategy for communication should be prepared.

(b) *Adapting to communication landscape and audience*: The science communicator should be aware of the historical context of an issue, sensitivity of audience choice, values and core beliefs, need of expertise on the subject along with logistical challenges.

(c) *Messaging:* Message prioritization (i.e. identifying the core messages to communicate for audience), arrangement of supporting evidences for the message, understanding audience dimension and audience categorisation are some key issues that a science communicator needs to focus on. It is interesting to inform you that The AAAS Communicating Science program focuses their messaging instruction on the "3Ms" structure i.e, messages should be in miniature format (short and simple), memorable, and meaningful (particularly to the audience).

(d) *Language*: Language here has two folded meanings- i) the language of science and ii) language that is spoken by the audience. When considering the language of science, a communicator should use analogies, metaphors, descriptive examples, or other tools in support of the content. Inclusions of words, phrases, connotations from the speaking language of target audience make the message acceptable and understandable for the audience.

(e) *Narrative*: A common quality of all the good communicators of the world is that they are fine story tellers. Therefore, a science communicator should prefer to tell stories and includes tools like personal stories/anecdotes/analogies/metaphors/visual imagery etc. to connect with audiences.

(f) *Non-verbal communication:* A good quality of a science communicator is the knowledge of non-verbal communication in case of face-to-face communication. The communicator's posture, gestures, expression, vocal dynamics etc. play a crucial role in striking an emotional chord with the audience.

(g) *Writing /presentation style*: Writing or presentation style is the heart of all communication. Therefore, a good science communicator always knows the appropriate style of presentation for different audience and for different media (print, electronic, folk or new media). Use of active voice, present tense and clear, non-biased sentences are the golden keys for communication.

(h) *Creating Space for Dialogue; Listening, Empathy, and Audience Engagement*: Demonstration of openness and warmth by a science communicator opens the door for public engagement in science communication. Listening to what the audience has to say, respecting their culture and knowing the context of the matter are considered as good qualities of a science communicator.

In addition to these qualities, some other conventional norms for a good science communicator are:

(i) *Love for research*: Science is easy to understand but tough to explain. As such, science communicator should have openness for doing research on a subject, planning and preparing strategies for meaningful communication.

(ii) *Plan for unexpected*: A good science communicator always prepares for any unexpected hurdles that might break the free and even flow of communication. Such hurdles may be political, legal, cultural, environmental, economic or logistic in nature.

(iii) *Evaluation*: Evaluation or scrutiny of a communication process builds the foundation stone for the next project. As such, a science communicator should practice SWOT analysis (Strength, Weakness, Opportunity, and Time) during evaluation process.

(iv) Reverence for the 7 Cs of communication i.e., credibility, context, content, clarity, continuity and consistency, channels for audience suitability, capability of audience understanding are basic qualities of a science communicator that are required to persuade the minds of audience and provide space for public engagement.

9.3.3 Methods and forms of science communication

Sam Illingworth, in the paper entitled *Delivering effective science communication: advice from a professional science communicator* elaborately discusses about various methods and forms that can be adopted by a science communicator for effective communication of science. These methods and form are:

(i) Traditional journalism (newspaper, radio)

(ii) Live or face-to-face events (e.g., public lectures, panel debates,science festivals) and

(iii) Online interactions (e.g., blogs, websites, videos, podcasts, social media interaction etc.)

Among all these methods, face-to-face events are considered as the most powerful way for establishing effective science communication. Face-to-face events can be divided into various categories like:

(a) Panel Discussions: This includes discussions or debates on a topic by several experts from the subject

(b) Science Festivals: Science festivals present science in a purely entertaining way by simplifying the contents. Such festivals, according to experts are useful to engage public.

(a) Science Busking: Science Street performances, where science is used to draw in a crowd and explain a topic to them (like street plays or magic shows) falls into this category. Science busking depends upon the skill of the performer.

(b) Book Clubs: Small reading groups for interested parties can be created to discuss scientific accuracy (or not) of a chosen book. Such initiatives can be promoted at school level (detailed and in-depth discussions on a topic of science), thus promoting young minds for embracing science as a profession.

(c) Citizen Science: These are activities that involve the public in scientific research.

(d) Workshops: Workshops are effective ways of establishing science communication as a topic can be addressed in several ways by experts. In workshop, public engagements become higher.

(e) Folk media: Being an informal media and close to people's heart, use of folk media for propagation of message is crucial in developing countries in particular.

(f) Citizen Juries: Citizen Juries can play a significant role in sensitive issues like environmental assessment. It involves the policy makes, experts and public coming together on a topic, using scientific research and public opinion to achieve the most

effective set of recommendations for an issue like dam construction, conservation of eco sensitive zones, chemical or nuclear power plant establishment etc.

Science communicator can also use other platforms like museums, different events, science fiction and advertising, cinema (both documentary and fiction films) to reach each and every individual of a society.



CHECK YOUR PROGRESS

Q.3: Who is a science communicator?

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Q.4: What are the prime objectives of a science communicator?

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9.4 TRAINING OF SCIENCE COMMUNICATORS

Training programmes for communicating science in India have received preferred space in the recent years. Many institutes working in the field of science are offering training programmes individually or in a collaborative effort. For example, *The National Council for Science Museums* (NCSM) offers a two-year regular M. Tech degree programme in science communication in collaboration with BITS, Pilani. This four-semester, professional degree course aims to train science graduates as science communicators. 'History and Philosophy of Science to the art of Mass Communication with a focus on science dissemination and the application of the most modern technologies in science communication' is the basis of the course.

Vigyan Prasar (VP), an autonomous organization under the Department of Science and Technology (DST), Government of India also provides science communication workshops, training programmes, that serve India's science popularization agenda. Vigyan Prasar has three fold objectives to fulfill this aim. These are : (i)- to create and foster a well-informed citizenry by highlighting dimensions of science and technology, (ii)- by promoting teaching and learning including education and other community centered interventions across the country and (iii) engagement of various stake holders and community.

CSIR-NISCAIR focuses on higher education and research. They introduced academic courses and research programmes leading to M.Sc. in Science & Technology Communication and research (PhD).

Indian Science Communication Society (a voluntary and non-governmental organisation established in 1994 by a group of self-motivated professionals, science writers and scientists driven by the visionary zeal and passion to popularise science and scientific temper among the Indian masses) offers One Year "Training Course In Science Journalism" (Through Online Education).

Of late, Post Graduate and Graduate courses on Science Communication are becoming an integral part in various academic courses (for example: Devi Ahilya University, Indore; Lucknow University; Anna University, Chennai; Makhanlal Chaturvedi National University of Journalism and Communication (MCNUJC), Bhopal, Madurai Kamaraj University (MKU), Madurai, Gauhati University, Guwahati and Tezpur University, Tezpur. National Council for S&T Communication (NCSTC), Department of Science and Technology, Government of India has supported many universities for offering science journalism or Science Communication as a paper/semester course as part of the syllabi of journalism and mass communication of such institutes).

Apart from these courses, different government and nongovernmental organisations and agencies conduct workshops and training courses from time to time.



9.5 LET US SUM UP

- Communicating science to the public means making complex ideas and concepts simpler without modifying scientific facts. It is considered as a great tool of development communication as it has the potential for societal transformation by enabling interfaces among scientist, public, policy makers, industry and thus pave the way for public engagement in nation development. Different types of science communications like *professional science communication, deficit science communication, Consultative science communication*, *deliberative science communication* have opened up avenues for working in this field.
- It is an established fact that the science communication and public engagement demands best practice and better qualities from a mediator, called science communicator. A science communicator is a person who has interest in science and possesses skills for communication. Science practitioners, mediators, and other members of the general public (women, youth, children etc.) can work as science communicator with an intended action of communicating scientific knowledge or practices to non-scientists in an explicit and organised way.
- There exists a great variety of approaches that different organizations and communicators adopt as skills and to promote public engagement.
- For effective science communication, training is a prerequisite for a communicator. Such programmes for communicating science in India have received preferred space in the recent years. Many institutes working in the field of science are offering training programmes individually or in a collaborative effort. Post Graduate and Graduate courses on Science Communication is becoming an integral part in various academic courses in Indian Universities. Apart from these courses, different government and non-governmental organizations and agencies conduct workshops and training courses from time to time.



9.6 FURTHER READING

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4. National Council for Science & Technology Communication NCSTC | Department of science & technology. (2021, September 23). Department Of Science & Technology**.** https://dst.gov.in/scientific-programmes/st-and-socio-economic-development/national-council-science-technology-communication-ncstc
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Websites:

CSIR-NISCAIR. https://www.niscair.res.in/

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Vigyan Prasar Science. https://vigyanprasar.gov.in/

Assam Science Society. https://assamsciencesociety.in/



9.7 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q. No. 1: Different types of science communication are : Professional science communication, Deficit science communication, Consultative science communication and Deliberative science communication

Ans. to Q. No. 2: APJ Abdul Kalam was the former President of India. He is also considered as one of the finest science communicators of all times.

Ans. to Q. No. 3: A science communicator is a person who has interest in science and possesses skills in communication. Science practitioners, mediators, and other members of the general public (women, youth, children etc.) can work as science communicator with an intended action of communicating scientific knowledge or practices to non-scientists in an explicit and organised way.

Ans. to Q. No. 4: The prime objectives of a science communicator is to increase scientific temperament by targeting behaviour change of public.



9.8 MODEL QUESTIONS

A. Short Questions (Answer each question in about 150 words)

Q. 1: Write about the various tasks for the people engaged in science communication.

Q. 2: Write short notes on-

(a) Women as science communicator

(b) Youth - the agent of change

(c) Scientist as science communicator

(d) Child as science communicator

B. Long Questions (Answer each question in about 300-500 words)

Q. 1: Highlight on the qualities of a science communicator.

Q. 2: Discuss about the various methods and forms of science communication

Q. 3: Briefly mention about the scenario on training of science communicators in India.

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UNIT 10: PUBLIC UNDERSTANDING OF SCIENCE

UNIT STRUCTURE

10.1 Learning Objectives

10.2 Introduction

10.3 Concept of Public

10.4 Necessity of Public Understanding of Science and Technology

10.5 Science and Culture

10.6 Role of Communication

10.7 Let Us Sum Up

10.8 Further Reading

10.9 Answers to Check Your Progress

10.9 Model Questions

10.1 LEARNING OBJECTIVES

After going through this unit, you will be able to -

- learn about public understanding of science
- understand the concept of public
- explore the need for public understanding of science and technology
- emphasize the role of communication

10.2 INTRODUCTION

Public Understanding of Science (PUS) is an evolving discourse. From the knowledge of 'science' (thereby scientific literacy) to public engagement (PUS) – this discourse has now moved to 'science in and of society', thus, attributing the change of 'attitude' of the public towards science and technology. In the past, information regarding scientific advancement was disseminated to the public as a part of public lectures, discussions and demonstrations by scientists, nature observers and professionals. After the nineteenth century, the specialisation and professionalization of different

branches of science have led to the widening gap between the public and practitioners of science. New ideas and findings were published mostly in academic journals written technically and reviewed by experts. As a result, a sharp distinction between science and society became visible.

From the twentieth century, scientific bodies revisited the issue and science popularisation and movements were initiated by scientists in various countries. After World War II, 'science literacy' and 'science communication' gradually became a part of the government policies in many countries. Today, public communication of science as a part of the policy, education and scientific discussion have become a routine affair. It is now an object of research across the globe to reduce the gap between experts and the general public and to inspire public engagement in the field of science and technology.

The expression, public understanding of science has two-fold meaning: (a) public attitudes and behaviour and (b) understanding of science. Though public communication of science was steadily growing, it emerged as a new area of interest after the widely acclaimed report of the Royal Society of London in 1985 under the chairmanship of Dr. W. F. Bodmer. In the report, study areas such as mathematics, technology, engineering and medicine, systematic investigation of the natural world and the practical application of knowledge derived from such investigation was included as a part of 'science'. 'Understanding' refers to comprehension of the nature of scientific activity and enquiry, and not just knowledge of some of the facts and 'public' meant non-scientific public.

Martin Bauer in his article *The Evolution of the Public Understanding of Science - Discourse and Comparative Evidence* stated that PUS had a *rationalist* and a *realist* agenda. For the *rationalist*, attitudes arise from information processing with a rational core. It is assumed that if people had all the information, and were able to understand probabilities, they would be more supportive of science. It is a battle of minds of the public with more information and the correct statistical reasoning (i.e., risk perception).

For the *realist*, 'attitudes' are emotional relations with the world. Realists understand emotions with the logic of advertising. Thus, the battle

for the public mind becomes a battle for hearts. Based on survey evidence, Bauer shows that the public understanding of science might be significantly different in an industrial developing context and a knowledge intensive developed context.

In India, the dissemination of scientific ideas was initiated in the ninetieth century, when several science books were translated from English to regional languages. Newspapers [like *Arunudoi* (1846) in Assam] introduced dedicated pages for providing news and information on issues related to science. After independence, the Government of India initiated concepts like scientific temperament, broad scientific outlook, scientific belief system etc. to facilitate public understanding of science. Efforts of Kerala Sastra Sahitya Parishad (1962), Assam Science Society (1953) and other organisations in different parts of the country like in West Bengal, Maharashtra, Karnataka, Tamil Nadu led to people's movement for communicating science in India. Gauhar Raza and Surjit Singh in their article *25 Years of Public Understanding of Science in India: Analysis Based on Cultural Distance* elaborately describes the genesis of public understanding of science in India. The investigations into people's understanding of science in the country have been pioneered by researchers working at the Council of Scientific and Industrial Research (CSIR), Science Academies, National Council for Science & Technology Communication (NCSTC), Department of Science and Technology (DST), New Delhi etc.

10.3 CONCEPT OF PUBLIC

The public is an indispensable part of the communication process. They are the 'receiver' or 'decoder' in media studies, for whom messages are transmitted through a channel or medium. The public in science communication is heterogeneous and is geographically dispersed. Understanding of public is significant as contents are specifically designed according to the need of the specific public (generally referred to as the primary target audience). Today, action research has turned into a major branch of science communication research for effective, public-oriented content generation and media influence.

The public in science communication is diverse, differentiated, and plural, hence the use of 'the public' is often in practice. For a long time, the public remained as a broad spectrum of non-scientists in scientific communication. While some define public in science as non-expert or layman (patients and their families, community groups, citizens), or citizen, the American Association for Advancement of the Science (AAAS) considers public as members of the society who already understand basic scientific facts and concepts, yet they may disagree or uncomfortable with the presumed implications. The public consists of people who participate in opinion sharing and hence the public engagement has become a significant part of the public understanding of science movement since the 1980s. There are many ways of classifying the public.

(a) **Demographics and Psychometrics**

The public can be categorized according to their demographic profiles. The demographic profile defines groups based on characteristics like:

(i) Age: Children, young, adults and old
(ii) Gender: Male, female and others
(iii) Education: from illiteracy to the higher level of degree obtained
(iv) Income level: Below poverty line, lower middle class, middle class etc. and
(v) Occupation: Categorization as per occupation. It includes the unemployed category as well.

(b) **Type of media consumed**

(i) Reader: When the audience read a newspaper or written communication
(ii) Listener: People listening to audio (example: radio listener)
(iii) Viewer/ spectator: Public for visual presentation
(iv) Netizen: This is a new form of individuals or groups who are confined to digital world.

(c) **Geographical location**

(i) International: When the target audience is dispersed without geographical boundaries

(ii) National: When the message is limited to the citizen of a nation

(iii) Regional: When information is confined to a region

(iv) Local: When approaches are targeted for a locality.

(d) **Public as a Societal Group**

(i) Individual (Information targeted to influence at the *individual* level)

(ii) Community (Information targeted to influence at communication level)

(iii) Organization (Information prepared for groups like academic institutions, research organizations or special focus groups)

(iv) Policymakers (They sit at the top of the hierarchy in a society bound by law. Message should be strategically designed to influence policymakers.)

(e) **Public as defined by the Report of the Royal Society of London**

Royal Society of London's report on Public Understanding of Science in 1985 classified 'public' into five overlapping categories. These are:

(i) private individuals for their satisfaction and wellbeing

(ii) individual citizens for participation in civic responsibilities as members of a democratic society

(iii) people employed in skilled and semiskilled occupations, the large majority of which now have some scientific content

(iv) people employed in the middle ranks of management and in professional and trade union associations; and

(v) people responsible for major decision-making in our society, particularly those in industry and government.

(f) **Public as 'Overlapping Groups'**

According to Bruce Lewenstein (1998), 'audience are overlapping group of people in the society with their own 'need, interest, attitudes and levels of knowledge'. According to Burns et al (2003), the public in science communication may involve- science practitioners, mediators, and other members of the general public, either peer-to-

peer or between groups. Lewenstein classified 'audience' into the following categories:

(i) Scientists: in industry, the academic community and government.

(ii) Mediators: communicators (including science communicators, journalists and other members of the media), educators, and opinion-makers.

(iii) Decision-makers: policymakers in government, and scientific and learned institutions.

(iv) General public: the above three groups above, plus other sectors and interest groups. For example, school children and charity workers.

(v) Attentive public: the part of the general community already interested in (and reasonably well-informed about) science and scientific activities

(vi) Interested public: is composed of people who are interested in but not necessarily well informed about science and technology.

(g) **Public as per engagement**

Traditionally, the public tends to remain passive in the adoption of innovative ideas due to a sense of uncertainty, risk, distrust and a usual fear for science. This *ivory tower syndrome* place audience as a *passive audience.* The model which deals with the understanding of such a non-interactive, passive audience and the gap between the knowledge of science and the public is called the *deficit model* of science communication. With more interactions from the scientific communities, organisations and government, today, public participation has been increased for contemporary scientific development. Such enthusiastic public who are open to scientific engagements is referred to as an *active audience*. Audiences who take a critical stand for scientific development are considered critical audiences. From passive to being critical and active, the public has a significant role in the advancement of society and contribute to establishing a knowledge-based scientifically literate audience.

(h) **Public as 'Market'**

With the growth of science and technology, a market has evolved (for example: in the field related to health, technology, aeronautical, space, gadget etc.) and the term 'consumer' is preferred rather than public in recent years. Consumer profile, service, product, consumer interest are other common terminologies associated with this growing market for science and technology. From the 1950s onward, funding research on what impacts or influence public perception have received greater attention. Apart from these, Social and behaviour change is exponentially growing as a topic of research.



CHECK YOUR PROGRESS

Q.1: What is meant by two-fold meaning of 'public understanding of science'

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Q.2: What is Bodmer report?

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Q.3: Why deficit model of public understanding is significant?

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10.4 NECESSITY OF PUBLIC UNDERSTANDING OF SCIENCE AND TECHNOLOGY

The necessity of public understanding of science has been well argued by the report of the Royal Society of London. Some of the significant points of the report are:

(i) Better public understanding of science can be a major element in promoting national prosperity, in raising the quality of public and private decision-making and in enriching the lives of the individual.

(ii) There would be a considerable competitive advantage if those who hold positions of responsibility had at least some understanding of what science and technology can and cannot achieve, and were better able to call for and evaluate advice on scientific and technological issues.

(iii) A better understanding of science by the government and the higher levels of the Civil Service should also lead to better policies for science. The government needs to appreciate, for example, the interconnections between basic, strategic and applied research, the relative timescales and uncertainties of these three phases, special factors such as increasing instrumental sophistication that affect the cost of research, and the dynamics of the system for financing research in the higher education sector.

(iv) In a democracy, public opinion is a major influence in the decision-making process. It is therefore important that individual citizens, as well as the decision-makers, recognize and understand the scientific aspects of public issues

(v) An understanding of science is also important for the individual in his or her private life. Personal decisions, for example about diet, smoking, vaccination, screening programmes or safety in the home and at work, should all be helped by some understanding of the underlying science.

(vi) Greater familiarity with nature and the findings of science will also help the individual to resist pseudo-scientific information. An uninformed public is very vulnerable to misleading ideas.

(vii) Science and technology influence the individual's daily life in an enormous variety of ways in our gadget-filled, technology-based society. Ignorance of elementary science cuts off the individual from understanding many of the tools and services used every day.

(viii) Understanding the nature of risks and uncertainty is an important part of the scientific understanding needed both for many public policy issues and for everyday decisions in our personal lives.

Decisions on nuclear power stations or medical screening programmes or seat belts or motorway speed limits all involve a balancing of risks, taking into account a variety of social, political, economic and scientific factors.

(ix) Without some understanding of science, an individual is cut off from much of the richness of contemporary human thought. Indeed, whatever the benefits of public understanding of science may be, the intrinsic contribution of science to our culture argues that imparting such understanding is a duty the scientist owes to the public.

According to AAAS, public engagement with science describes intentional, meaningful interactions that provide opportunities for mutual learning between scientists and members of the public. Mutual learning refers not just to the acquisition of knowledge, but also increased familiarity with a breadth of perspectives, frames, and worldviews. The webpage of the Society declares that goals for public engagement with science in addition to mutual learning include civic engagement skills and empowerment, increased awareness of the cultural relevance of science, and recognition of the importance of multiple perspectives and domains of knowledge to scientific endeavours. The complex relationship that exists between science and society can be constructive, tension-filled, or everything in between. Public engagement can provide a constructive platform for public views to be combined with scientific expertise in decision-making contexts.

10.5 SCIENCE AND CULTURE

Scepticisms about scientific developments and acceptance of the same are associated with the cultural origin of the public. It is a fact that culture shapes attitude and public behaviour. Cultivation of scientific temperament, therefore, demands higher levels of literacy, correct information and constant public engagement at the grassroots level. In a pluralistic society like India, culture is a prime factor that determines the acceptance of innovative scientific ideas. In developing countries, it is pertinent to understand how society talks about science. It is hard to avoid traditional beliefs (which may be irrational and unscientific sometimes) that

are entwined with the culture for centuries. For example, eclipse (solar or lunar) is associated with many unscientific traditional beliefs. Common people in Assam used to throw overnight cooked food, considering it to have ill effects on the body. People avoid travelling and taking food during the hours of eclipses. Constant efforts from various scientific organisations such as academic, Government and Non-Governmental organisations have been able to encourage young children to consider such events as mere celestial happening; yet, a considerable number of the public still have reservations to accept this scientific fact. Likewise, believing miracles, astrology and other non-scientific issues minimise the degree of public engagement.

Scientific culture is a distinct and coherent object that can be infused into the general culture and in the mind of the public through extensive communication. It is interesting to note that scientific culture or culture of science is used to refer to science in the general culture of a country. British scientist C. P. Snow, in his influential book *The Two Cultures* (1959) argues that great cultural divide which separates two intellectual groups 'science' and 'the arts' into two opposite poles leads to two cultures in a society. Snow suggested that practitioners from the areas should work coherently to build a bridge for the benefit of public understanding of science.



CHECK YOUR PROGRESS

Q.4: What do you mean by 'mutual learning' in public understanding of science'?

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Q.5: Define 'two cultures'. Who coined it?

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10.6 ROLE OF COMMUNICATION

Communication has a significant role to play in the public understanding of science. The aim of communication, therefore, is to bridge the gap and to act as a facilitator among different stakeholders of the society including policymakers, scientists and 'the public'. Various models exist to describe the role of communication in the popularisation of science. Three models are discussed below to understand the pivotal role of communication in public understanding of science.

(a) **The Steller Model**

Proposed by Michel Claessens, this model explains how scientists depend on journalists to simplify complex ideas so that the public understands science. Scientists are often busy with their research and findings. The process of scientific research is a complex one. The public does not need to know all the complex steps and information of scientific research. Communication makes these ideas simple and palatable for the audience. The association of the story of an apple falling on the great scientist Newton while sitting legibly in a park and thereby the discovery of the theory of Gravitation is such a charming example of how communication plays a significant role in simplifying complex theories for public understanding.

(b) **Contextual Model of Science Communication**

It is a well known fact that the audience perceives information depending on various contexts like psychological, geographical, economical, social and political. Contextual model establishes the fact that communication in science is essential to disseminate information in accordance with the contexts of subject and audience. For example, in health care systems, the relationship between practitioners, policymakers and the public depends on the context of the individual or public at the mass level. Here, we may refer to the phase II Lockdown process in India as an example. The

government of India abstained from a nationwide lockdown during the second wave of the Covid-19 pandemic and allowed state governments to decide whether they will impose lockdown or not depending on the context of the cases reported. Likewise, in the case of individual health issues, the views of practitioners, caretakers and the public are always taken care of. This model also clarifies how communication in public understanding is essential in risk perception and risk communication (e.g., risk associated with nuclear research, chemical explosion, environmental issues etc.)

(c) **Public Participation Model**

Efforts of communication in public understanding of science are to encourage interaction and more engagement among the public in scientific issues. The public engagement approach promotes interactive opportunities for dialogue and exchange. Through engagement, the public participates in discussions. Apart from this, various outreach programmes, science fairs and festivals, public policy activities, museum projects, science communication ventures – such as radio, TV, books, film, social media etc. can enhance public participation. This participation, according to Edna F. Einsiedel, can happen according to three purposes: for policymaking, for public dialogue (an inclusive category that incorporates education, entertainment, persuasion in various dialogic forms) and for knowledge production. The public participation model demonstrates the democratic power that communication can offer to the public in the understanding of science, valuing nation-building and upholding decisions at individual or wider social level. This model also manifests the commitment policymakers need to have, the obligation of scientific communities towards public engagement as well as the responsibility of the public towards science.



CHECK YOUR PROGRESS

Q.6: What is the role of communication in public understanding of science?

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Q.7: What are the three steps of public participation in science according to Edna F. Einsiedel?

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10.7 LET US SUM UP

- Public Understanding of Science (PUS) is an evolving discourse. From the knowledge of science (thereby scientific literacy) to public engagement (PUS) - this discourse has now moved to science-in and of society, thus, attributing the change of attitude of the public towards science and technology.
- After World War II, science literacy and science communication gradually became a part of the government policies in many countries.
- The expression, 'public understanding of science' has two-fold meanings (a) public attitudes and behaviour and (b) understanding of science.
- Public communication of science has emerged as a new area of concern after the widely acclaimed report of the Royal Society of London in 1985 under the chairmanship of Dr. W.F. Bodmer.
- In India, the dissemination of scientific ideas was generated discretely from the ninetieth century, when several science books were translated from English to regional languages.
- 'Public' in science communication is diverse, differentiated, and plural, hence the use of 'the public' is often in practice.

- There are many ways of classifying the public (e.g., depending on demographics and psychometrics, type of media consumed, geographical location etc.)
- Better public understanding of science is required in promoting national prosperity, raising the quality of public and private decision-making and enriching the lives of the individual
- Scepticisms for acceptance of scientific developments are associated with the cultural origin of the public.
- Communication has a significant role in the public understanding of science. There exists a gap between science and the public. The aim of communication, therefore, is to bridge the gap and to act as a facilitator among different stakeholders of the society including policymakers, scientists and 'the public'.



10.8 FURTHER READING

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8. Raza, G & Singh, S. (2016). 25 Years of Public Understanding of Science in India: Analysis based on cultural distance, *Journal of Scientific Temper*, Vol 4(3&4), July-Sep & Oct-Dec, pp. 81-101



10.9 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q. No. 1: The two folded meanings of 'public understanding of science' are: (a) public attitudes and behaviour and (b) understanding of science.

Ans. to Q. No. 2: Royal Society of London published a report on Public Understanding of Science in 1985 under the chairmanship of Dr. W. F. Bodmer. This report which established new concern for the discourse is called the Bodmer report.

Ans. to Q. No. 3: The deficit model is significant because it deals with the understanding of non-interactive, passive audience, and the gap between the knowledge of science and public in science communication.

Ans. to Q. No. 4: Although the traditional meaning of mutual learning refers to the acquisition of knowledge (between scientists and the public), it goes beyond in public understanding of science which aims to increase familiarity with a breadth of perspectives, frames, and worldviews.

Ans. to Q. No. 5: A great cultural divide exists in society which separates intellectual groups into two opposite poles called 'science' and 'the arts'. This is referred to as the 'two cultures. It was coined by British scientist C. P. Snow in his influential book The Two Cultures (1959).

Ans. to Q. No. 6: Communication has a significant role in public understanding of science. As we know there exists a gap between science and the public. The aim of communication, therefore, is to

bridge the gap and to act as a facilitator among different stakeholders of the society including policymakers, scientists and 'the public'. At large, communication can offer to the public -understanding of science, valuing nation-building and upholding decisions at individual or wider social level.

Ans. to Q. No. 7: The three steps of public participation in science according to Edna F. Einsiedel are: policymaking, public dialogue (an inclusive category that incorporates education, entertainment, persuasion in various dialogic forms) and knowledge production.



10.11 MODEL QUESTIONS

A. Short Questions (Answer each question in about 150 words)

Q. 1: What is the rationalist and realist agenda in public understanding of science?

Q. 2: Write a note on (a) 'public as market' or (b) 'public as engagement'

Q. 3: Discuss the need for a Public Participation model in public understanding of science

Q. 4: What is the significance of the contextual model in public understanding of science?

B. Long Questions (Answer each question in about 300-500 words)

Q. 1: Briefly mention the necessity of public understanding of science.

Q. 2: What are the various categories of 'public' in public understanding of science? Classify the public as suggested by Bruce Lewenstein or Royal Society of London.

Q. 3: Define 'public'. Do you think that culture has a role in the public understanding of science? Discuss with suitable examples.

Q. 4: What do you mean by 'public engagement'? Mention some steps to enhance public engagements.

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UNIT 11: SCIENCE COMMUNICATION FORMATS

UNIT STRUCTURE

11.1 Learning Objectives

11.2 Introduction

11.3 Science News

11.4 Report and Reportage

14.4.1 Report

14.4.2 Reportage

11.5 Features and Articles

11.5.1 Features

11.5.2 Articles

11.6 Sources of Scientific Information: Primary, Secondary and Tertiary

11.7 Weaknesses of Various Formats

11.8 Let Us Sum Up

11.9 Further Reading

11.10 Answers to Check Your Progress

11.11 Model Questions

11.1 LEARNING OBJECTIVES

After going through this unit, you will be able to

- understand various science communication formats
- learn the strengths and weaknesses of various formats
- conceptualize different sources of scientific information

11.2 INTRODUCTION

There exist several formats for science communication. As science communication is a part of the journalistic genre, therefore, all the types of formats are equally useful for science journalism as well. In this Unit, we shall focus on science news, report, and reportage, features, and articles.

11.3 SCIENCE NEWS

News is the germinal essence of all information systems. Anything new (which is happening but never happened before), is termed as news. News connotates to highly volatile and dynamic literature. News can be classified into different types, such as political, cultural, sports, crime, science, etc.

Science news disseminates information related to all the branches of science including- physical, biological, astronomical, technological science, health, nature, etc. However, there is no general consensus on how to define science news. National Science Writers' Association of America defines that scientific news includes those newspapers and journals which dwell upon or treat the subjects that are practiced by the scientists. This branch of journalism is broadly defined as science journalism. The scientific revolution in the 17th century led scientists to write on scientific achievements thereby establishing a relationship between science and society. Today, most scientific news is concentrated primarily on disciplines like genetics, climate change, nanotechnology, space science, cancer research, and vaccines.

United Nations Educational, Scientific and Cultural Organization (UNESCO) promotes science journalism by disseminating scientific knowledge through media and ensuring knowledge creation, acquisition and sharing through ICT along with developing strategies in the field of the sciences, in consultation with the media and facilitating journalists' networks on science journalism and sustainable development issues.

Indian Science Writers' Association (ISWA) in its code of conduct for members declares that a science journalist should be observant of the highest standards of journalism. Further, it states, the treatment of scientific controversies should include different viewpoints. Claims must be verified before printing; and premature publicity, misrepresentation and misinterpretation of a scientific finding must be avoided. Journalists normally do not wish to reveal to their sources of information, however, a science journalist, for the sake of accuracy, may show his copy to the source just to

ensure that it is technically sound and that it carries the important point(s) that the source wishes to make.

Science journalism focuses on increasing public understanding and appreciation of science and thus contributing towards popularized scientific information. This essence can be well understood with a statement of prominent science writer, William Laurence of the *New York Times* who once stated that “True descendants of Prometheus, science writers take the fire from the scientific Olympus, the laboratories and the universities, and bring it down to the people”.

We have discussed the elements of science news in Unit 4. Here, we shall discuss a model of science news writing (Table 11.1) put forward by Secko and co-workers (2013). According to this model, before writing a story, a science journalist should be well versed on why the story is being written (purpose), what is the focal point for discussion (focus), how the story will be presented (style), what information and which voices will be included in the story for relevance, objectivity and clarity (sourcing), for whom the story is written for (audience) and how science should be portrayed in the story (science). The perspectives on how science is portrayed (is the scientific content presenting science as a ‘monster’ or a ‘friend’? is it dealing with the science which is beneficial to the society or is centred around politics related to science? or is it a scientific advertisement?) determines the quality of the science news. If we link these criteria to public engagement, it becomes an effective way to achieve scientific literacy in society.

Table 11.1 Science news /story writing criteria

1.	*Purpose*	*Why* the story is being written
2.	*Focus*	*What* is the focal point of the story
3.	*Style*	*How* the story is written
4.	*Sourcing*	*What* information and *Which* voices are included in the story
5.	*Audience*	*Who* the story is written for and what role (if any) audiences play in the story
6.	*Science*	*How* science should be portrayed in the story



CHECK YOUR PROGRESS

Q.1: Mention about the writing criteria of science news.

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Q.2: Who said, "True descendants of Prometheus, science writers take the fire from the scientific Olympus, the laboratories and the universities, and bring it down to the people".

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11.4 REPORT AND REPORTAGE

11.4.1 Report

A report has a wider meaning than news. Depending on the use of the word as a *verb* or *noun*, a report has different meanings. According to Oxford learners' dictionaries, while used as a *verb,* a report

(i) gives people information about something that you have heard, seen, done, etc. (Example: findings of something, reporting somebody or on something etc.).

(ii) presents a written or spoken account of an event in a newspaper, on television, etc.

(iii) can be used to show that something has been started, and you do not know if it is true or not (e.g., as per Government *report*, daily cases of COVID 19 patient has exceeded more than 3 lakhs)

(iv) tells a person in authority about a crime, an accident, an illness, etc. or about something bad that somebody has done (e.g., report to somebody: Have you reported the incident to the police?)

(v) tells somebody that you have arrived, for example for work or for a meeting with somebody (report for something example *You should report for duty at 9.30 a.m.)*

On the other hand, when it is used as a *noun*, a report is

(i) a written or spoken account of an event, especially one that is published or broadcast

(ii) spoken or written description of something containing information that somebody needs to have (a police report, a progress report).

(iii) an official document written by a group of people who have examined a particular situation or problem (example: a*ccording to the report, we are facing an obesity crisis)*

(iv) a story or piece of information that may or may not be true (example: There are unconfirmed *reports* of a shooting in the capital)

For our purpose, we can summarize that a report, in general, is a document, presented in a written form, in an organised format for a specific audience with a clear purpose. Proximity, timeliness, prominence, consequence and human interest are some of the basic characteristics of a science report like other areas of journalism.

A person who prepares a report for the media house is called a reporter. The field of reporters varies from stringer, full-fledged reporter to a correspondent. The reporter may be associated with media houses (print, electronic and web) or news agencies.

11.4.2 Reportage

Reportage is a journalistic genre that combines both news and analysis of detailed information of a subject. While news gives first-hand knowledge of an event, reportage goes deeper into it. Broadly, there are two basic types of reportage: informational and

analytical. Informational reportage centre around detailed information. On the other hand, analytical reportage analyses data from various perspectives related to the subject.

Presentation of reportage depends on the type of media (newspaper, radio, television, web) you are working for. The objective of reportage is to inform and make the public aware about a recent development in detail. As such, reporters are given time (sometimes a week or longer) to cover a story, unlike a few hours for news (so that that they can be engaged with various sources, evaluate and analyse different points of view associated with a story).

In earlier times, reportage was a part of a drama, where a messenger brought detailed information of a happening (especially war) to the characters. It was and is a process of storytelling without drama in the narratives.

Reportage has proximity with the feature but unlike feature, reportage revolves around news and is considered as a part of soft journalism. Reportage deals with scientific events, exhibitions, workshops/seminars/conclave etc. For example, the magazine, Outlook India provides space for reportage separately. In a reportage, titled *Eastern Coast On High Alert As India Braces For Cyclone Yaas*, on May 24, 2021, the Outlook Web Bureau talks about (i) evacuation detail, (ii) information related to the characteristics of cyclone (example: velocity, depression and longevity of the cyclone, area affected or possible to be affected) with input from India Meteorological Department (iii) response of central and state government towards the disaster, and (iv) relating the story to a different cyclone (cyclone *Tauktae*) that happened a few days before cyclone *Yaas* and affected the states of Gujarat, Goa, Maharashtra, Karnataka and Kerala. (v) and the source of the reportage which is PTI. A snapshot of the reportage is shown in Figure 11.1.



Figure 11.1 A snapshot of the reportage published in Outlook (Source: https://www.outlookindia.com/website/story/india-news-eastern-cost-on-high-alert-as-india-braces-for-cyclone-yaas/383475)

If you compare this reportage with news, you may not find such extensive writing. Moreover, as we have discussed just now, the reportage revolved around a special happening and detail information/ analysis on the news, in contrast, to providing basic information to the public. Likewise, several blogs on the internet written by prominent science communicators, provide reportage on current issues in an interesting way.



CHECK YOUR PROGRESS

Q.3: Who is a reporter?

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Q.4: What are the different types of reportage?

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11.5 FEATURES AND ARTICLES

Features and articles are a common occurrence in newspapers, magazines and the web. These are examples of tertiary scientific writing. Leading scientific journals focuses on good features and articles to highlight scientific development around the world. It is true that such scientific writings are difficult sometimes, but is powerful and rewarding. Simplicity, clarity, accuracy, credibility, readability is the *mantra* of influential features and articles. By influential, it is meant to be informative, stimulating, enlightening and persuasive. Features and articles combine both creativity and media elements to fascinate the reader.

11.5.1 Features

Feature is an essential part of scientific writing. There is a dedicated space for Science Feature in almost all the journals, magazines and newspapers. Many journals/magazines select the best feature stories for a year and compile them for readers. Many associations also promote journalistic science features by providing fellowships or prizes. E.g., Wellcome Trust Science Writing Prize, in association with the Guardian and the Observer in Britain. A summary of the differences between a news and a feature is given below.

Characters	News	Feature
Content	Recent or never happened before	Any issues on Science and technology or human-interest story
Time	News is time-bound	Feature writers get more time for elaborate description
Style of writing	• News is always written in an inverted pyramid style. • Information is the priority for journalists • Generally, one photograph is preferred	• The feature is open to writing in narrative style, with a beginning, middle and end. • It is written in an attractive way • There may be more than one photograph in a single feature. Moreover, in photo feature, it is the photograph that speaks the story
Word limit	News has word limitations due to the constraints of space in media houses. Therefore, it is written concisely.	Feature writer can enjoy more freedom in writing than a news reporter
Mode of writing	News is devoid of opinion	Feature reflects analysis and opinion from a writer
Angle of presentation	• News is considered objective and therefore expected to reflect unitary angles. • News is, therefore, 'as it happens'	• Pluralistic angle is a characteristic of feature writing. The feature is written subjectively. • Feature, on the other hand, is, 'focus and discussions'

11.5.2 Articles

A scientific article refers to a piece of writing on a specific recent issue and is a part of newspaper, magazines or other publications along with other formats like news, feature, letters to the editor and editorials. The article is immediately related to a news item. It is elaborate and based on data.

An article demands deep research on the relevant subject. Quotation or interview can be added inside the body of an article for strong support of the writer's viewpoint. The objective of the article is to introduce the reader to a recent happening and its impact or relevance to society or human life. Articles are sometimes assisted with photographs, diagrams, tables and graphical representations to give strong shreds of evidence for arguments. Articles always reflect well built, deliberate opinion of a writer.

The article differs from features in the timing, style of writing and subject orientations. While the subject of an article is timely, the feature may not be. The article aims to provide readers with an immediate overview of a happening. On the other hand, features are aimed to attract the leisure hours of the audience.

Common guidelines for writing features and articles are:

(i) Choose a topic of current interest

(ii) Do research. Find out relevant supporting documents for establishing your opinion.

(iii) Schedule and take interviews of experts, if necessary

(iv) Visualize the outline of your write up

(v) Understand your audience. The style of writing always differs depending upon the target audience

(vi) Writing in an active voice is preferable but it depends on the policy of the media organization you are writing for. Some newspapers and magazines prefer passive voice in presenting the idea

(vii) Insert quotations and references. You may also add case studies, historical observations, and statistics if required.

(viii) Try to avoid jargon. Try to avoid the adjectives and adverbs too

(ix) Your conclusion should reflect your opinion. It may be *open-ended* (leaving a question to the audience to rethink and rediscover) or *close-ended* (reflecting only the author's opinion).

(x) Writing a good headline is significant to hook the audience. It is both an art and a skilled craft. The *introduction* is equally important to hold an audience for your write-up

(xi) Edit and revise before you send it for publication

(xii) Be creative

(xiii) Do hard work to improve yourself in every writing

11.6 SOURCES OF SCIENTIFIC INFORMATION: PRIMARY, SECONDARY AND TERTIARY

Scientific information can be classified into three broad categories depending on the style of writing. Some scientific writings are based on original research and full of technical words, some are written based on such original research for giving a generalized idea on a subject and the third category is the popular write-ups targeted primarily to the general audience. Let us understand these categories in detail.

(a) Primary Scientific Information: These types of information (preferably called 'paper') are the result of original research conducted by an individual or by a group of individuals. These are mostly published in scholarly journals (Figure 11.2). Examples include original research articles, case reports/case series, and technical notes. Primary scientific information is considered as one of the vital sources for science reporters. Such information always follows a definite structure in writing like having -a title, abstract, keywords, introduction, methodology, results, discussion, acknowledgements and references. Such information is published after a rigorous review process by experts thereby reducing the degree of falsification of data.



Figure 11.2 *Genomics* is a scientific journal: an example of a primary scientific information.

(b) Secondary Scientific Articles: Reviews, books (examples: monographs, textbooks, handbooks etc.) and other sources which rely on primary sources of information are categorised as the secondary type of articles. The objectives of such articles are to summarize information from primary sources. Such articles are useful for generating an overview of a topic. **E.g., The book *Gravitation* on Albert Einstein's theory of relativity, authored by Charles W Misner, Kip S Thorne and John Archibald Wheeler is considered as a seminal textbook on Gravitation.**

(c) Tertiary or Popular Scientific Literature: These types of articles are written in a more simplified and popular language in contrast to scientific styles with a focus on the general audience. You can find examples of tertiary or popular scientific literature in science magazines, editorials, newsletters, articles in newspapers, letters to the editor, and on the internet (examples: webpages and blogs). Popular scientific articles are consumer-friendly and contains more entertainment in the content. The craft of popular article writing includes an analytical format with an introduction at the beginning, a detailed explanation in the middle or body and a conclusion at the end supported by data or figures related to the story. The conclusion part of the article reflects the author's opinion in general.

11.7 WEAKNESSES OF VARIOUS FORMATS

Various formats, discussed here are examples of communication from a person (sender) to an audience (receiver). As such different types

of barriers (e.g., physical, psychological, cultural, linguistic, etc.) stands as a weakness in disseminating information. Most significantly, *perception* of individual and organisation influences on framing a message at a higher level in comparison to other factors. As such, perception is a common weakness in almost all forms of communication. Some other weaknesses of the formats includes:

(a) **Time**: In the case of news, as time is short, hence, the news is written in a hurry, devoid of a detailed description, opinion and emotion. In other formats, as the detailed description is *prima facie*, it takes a longer time for the total presentation. Another disadvantage is that detailed descriptions of a subject may sometimes mislead people due to overburdening of data and individual opinion in articles, features, reports and reportage.

(b) **The skill of the presenter/writer**: This is another important strength as well as weakness of communication. If the writer is not skilled in the format, he or she is choosing to write or present or if the reporter is not well versed, the result will not be interesting and attractive for the audience.

(c) **Translation**: In science communication, translation becomes a big weakness for a new writer. Scientific terminologies, sometimes are misleading if translated by the face value of the term, without understanding the original meaning. For example, the term *satellite DNA* from molecular biology, cannot be translated as *Upogrohiyo DNA* in Assamese because of the meaning of the word satellite. In such circumstances, interest in the subject, discussion with experts, a good dictionary can help the reporter in presenting the matter correctly.

(d) **Lack of sufficient space**: In India, science write-ups are not given sufficient space in media organizations. A very few media houses provide regular space for science. Indian Science Writers' Association revealed that only 3% of total newspaper space is

provided for science in India. 'Science editor' or 'science reporter' is yet to be conceived as a full-fledged journalistic profession in third world countries. Therefore, it appears as a weakness of scientific writing due to which an article or a feature may not get adequate space for justifying and arguing the rhetoric.



CHECK YOUR PROGRESS

Q.5: What is the mantra for influential feature/ article?

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Q.6: What evidences are provided in an article to give strong argument?

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Q.7: Newspaper article is an example of ……. type of scientific writing.

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11.8 LET US SUM UP

- Science news disseminates information related to all the branches of science including- physical, biological, astronomical, technological science, health, nature etc.

- Considering the growing need, United Nations Educational, Scientific and Cultural Organization (UNESCO) promotes science journalism
- Indian Science Writers' Association (ISWA) in its code of conduct for members declares that a science journalist should be observant of the highest standards of journalism.
- Science journalism focuses on increasing public understanding and appreciation of science and thus contributing towards popularized scientific information.
- If we link criteria of science writing (purpose, focus, style, sourcing, audience understanding and science) to public engagement, it becomes an effective way to achieve scientific literacy in society.
- The report is another format of science writing. It has a wider meaning than news.
- We can summarize that a report, in general, is a document, presented in a written form, in an organized format for a specific audience with a clear purpose and journalistic elements
- Reportage is a journalistic genre that combines both news and analysis of detailed information of a subject. It has a proximity with the feature but unlike feature, reportage revolves around news and is considered as a part of the soft news
- Objectives of reportage are to inform and make people aware about a recent development in detail
- Features and articles are a common occurrence in newspapers, magazines and the web. Leading scientific journals focuses on good features and articles to highlight scientific development around the world.
- Scientific information can be classified into three broad categories depending on the style of writing i.e., primary, secondary and tertiary



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4. Dawkins, R (2008). *(Ed) The Oxford Book of Modern Science Writing*, Ed. Oxford University Press
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11.10 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q. No. 1: Criteria for science news writing are: purpose, focus, style, sourcing, audience understanding and science

Ans. to Q. No. 2: William Laurence

Ans. to Q. No. 3: A person who prepares a report for a media house is known as a reporter

Ans. to Q. No. 4: Broadly, there are two basic types of reportage: informational and analytical

Ans. to Q. No. 5: Simplicity, clarity, accuracy, credibility, readability remain as the mantra of influential features and articles

Ans. to Q. No. 6: Photographs, diagrams, tables and graphical representations are provided to give strong evidence for arguments in an article

Ans. to Q. No. 7: Newspaper article is an example of the tertiary type of scientific writing



11.11 MODEL QUESTIONS

A. Short Questions (Answer each question in about 150 words)

Q. 1: Define a report.

Q. 2: What are the objectives of reportage?

Q. 3: How is feature different from reportage?

Q. 4: What are the characteristics of article writing?

B. Long Questions (Answer each question in about 300-500 words)

Q. 1: State the basic differences between feature and news.

Q. 2: What are the steps of writing science features or an article for beginners? Discuss.

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UNIT 12: WRITING AND REPORTING ON SCIENCE

UNIT STRUCTURE

12.1 Learning objectives

12.2 Introduction

12.3 Writing Science News

12.4 Writing of Feature and Articles on Science

12.5 Let Us Sum Up

12.6 Further Reading

12.7 Answers to Check Your Progress

12.8 Model Questions

12.1 LEARNING OBJECTIVES

After going through this unit you will be able to

- describe the process of writing Science Communication.
- discuss the writing of Features and Articles on Science

12.2 INTRODUCTION

After introducing Science Communication in the previous units we are going to discuss in this unit the method of writing in science communication. There are various ways of presenting science communication and a detailed account of the methods of writing science news and reports is given in this unit. Writing of science news and writing of features and articles have been discussed here to offer a comprehensive description of the essentials about science reporting.

12.3 WRITING SCIENCE NEWS

Science and technology is increasingly shaping and revolutionizing our everyday lives. Nowadays, we just cannot possibly think of our lives without the contributions of science and technology. So in that case the common public need to know what scientists are doing and their inventions

and other technological advancements. Science is often hard to comprehend. Science news is difficult to digest for common people. Most people think that the difficulties of science arise out of necessity and out of the extreme complexity of scientific concepts, data and analysis. Complexity of thought need not lead to impenetrability of expression. As a result, science writing as a different genre has evolved. To know how to write the science news, you must refresh your knowledge on news writing, which we have discussed in the first year of BMC.

Science news writing is a skill that every science communicator or journalist is required to develop and hone it with experience. There are certain techniques or parameters upon which news writing is based. And every news organization follows these basic techniques despite the fact they may all have individual styles of news presentation. The very first step towards learning this technique is to learn the structure of a science news story or news report.

Structure of a Science News Story

In the most basic sense, a science news report has the following elements:

Headline: You all must have been familiar with the term 'headline'. It is that part of a news story which first catches the eye of the reader. As you can see in the examples, it is the title of the news story and it is the most visible element. It is always written in a font few sizes bigger than the rest of the news story. The headline identifies the reader's area of interest and introduces and summarizes the story. It is usually after reading the headline that the reader decides whether or not to read the rest of the story. Sometimes headlines try to create curiosity through interesting use of language and prompt the reader to read the full story. There are different types of headlines based on nature and significance of the story. As you know science is not much interesting for the readers. So, to attract a reader to read a science news story the headline should be attractive.

Byline/ Creditline: The byline on a newspaper or magazine article gives the name, and often the position, of the writer of the article.You must have

seen in the newspapers that below the headline, on the left hand side, a name of a person is written and some time the source is also written. This is called the byline or the credit line and it identifies the source of the story. If the person's name is written, then it is called the byline. If there is no mention of the person's name, but simply that it is from a staff reporter, then it is called the credit line. It could also be 'by our correspondent' or 'our bureau' or 'by our special correspondent' etc as applicable.

Dateline: Below the credit line or byline, just before the actual news story begins, you would have seen the date of the story along with the name of a place. This is the dateline. The date mentioned is the date on which the event has taken place and on which the reporter has filed the story and the place mentioned is the place from where the reporter has filed the story.

Lead or Intro: Just where the dateline ends, starts the main part of the report. The first paragraph of the news story is called the lead. It is usually written in bold or in a font larger than that used in the rest part of the story. However, this varies from publication to publication. The lead usually tells the story in a nutshell and gives the important information, particularly the most important of the 5W's and H.

Body: It gives the elaborate details of the event including all the 5W's and H and the related explanations of the event. The body is the part where the actual story is narrated. The body describes what the story is all about. Usually the lead provides just the gist of the actual event, the body gives a description in order of importance of information and finally the story is drawn to an end with a concluding paragraph, probably threading the important parts of the story or giving a general conclusion.

Of all these **elements**, the most powerful element is **the lead**. Because it is the **lead or intro** that leads one individual into the news story. So, let us now discuss the qualities of good introduction:

- The 'intro' is the most important part of any news story. It should be direct and attention-grabbing. It should contain the most important aspects of the story. The details are covered later. It should be short

and arouse the interest of the reader or listener. Normally it should be one sentence of not more than 20 words for print media, and fewer for radio and television.

- The intro should be based on the most newsworthy aspect of the story, the essence of the story, the sharpest angle of the story. Hence the intro should be kept short (ideally around 40 words), uncluttered and relevant to the main story. The intro should make the reader want to read the rest of the story. To write an intro, you must first decide what makes the story a news. There may be several things which are newsworthy in the story. But, you have to identify and decide which is the most important or the sharpest angle of the story- it is at this point that your professional skills will face the test. If you pass the test, we can say you have written a good intro.

  In this way, your readers or listeners will be provided with the most important information straight away. Even if they stop reading or listening after the first one or two sentences, they will still have an idea of what the story is about.

- Another point to note is that you should not try to give too much detail in the intro. The six main questions which journalists try to answer are– Who? What? Where? When? Why? And How? And these will all need to be answered in your news story, but all of them need not to be answered in the intro.

The Inverted Pyramid style

News stories are constructed in the **Inverted Pyramid style** in order of importance. This is a formula used by all media organization. Inverted Pyramid style is mostly applicable to hard news stories and most hard news stories follow this structure religiously. However, on rare occasions feature stories and other soft stories can be written in this style as well. In this style the most important points of a story are told in the beginning, that is, in the lead itself, followed by the body in which the rest of the relevant information are presented in descending order of interest or order of importance. Of

course in this style there is no conclusion. The most important or interesting facts are arranged in the lead or immediately after the lead and the least important points are narrated in the end.

A science news story is expected to follow the principle of "5 W's and H". And according to the Inverted Pyramid structure, the lead or intro contains the most important of the 5 Ws. The less important Ws and the H is answered in the body. In the process of writing the news care has to be taken that once the intro captures the essence, rest of the questions are to be addressed in the following parts of the story. If these questions are not addressed adequately the reader/viewer/listener will not get his or her curiosity fully satisfied:

Generally, this standard technique is followed while writing the news. If the news is to be classified in the form of straight and interpretative reporting then, it can be said that the first four Ws- Who, What, When and Where- reflect the hard facts of the story (straight news or the hard news) and while answering the- Why and How -an element of interpretation is introduced. In this context it is important to mention that contrary to the "hard news" the concept of "soft news" pertains more to the background information and it attempts to capture not only the event but also the process that goes behind the happening of an event.

The concept of "soft news" is also associated with the emergence of infotainment when all news, at times, are treated as "soft" to the extent of entertaining. In nutshells, we can say that hard news is "event- centric" while the soft news is "process centric"; hard news is 'hard event' and soft news can be a feature capturing human angle of the event. Another differentiation can also be that hard news is spot news or breaking news, because the news organizations break out the news as soon as it happens, without delaying.

How to Write the Copy

Now that we have learnt about the structure of a news story, let us now deal with actual news writing, which is, in journalistic terms, called 'writing the copy' or 'copy writing'. If we understand the basic principles for

writing each of the elements that make a news story, we will be able to write the entire news story easily and with confidence. So, let us deal with them one by one.

Principles of News Writing: In this section we are giving the principles of News writing in general which also apply to the writing of science news.

- **Headline:**

  The headline has to be written keeping in mind that it not only introduces and summarizes the news story, but also serves the purpose of attracting the reader's attention. As such, it has to be crisp and precise, must clearly give an appropriate perception of the story, and should also convey the maximum meaning by using the least number of words. Here are a few basic rules for writing good headlines:

  1. Build the headline around a strong verb
  2. Avoid articles and helping verbs like a, an, the, is , are, were etc.
  3. Never use the feel of the past. Use present tense and future tense Use active voice. It helps cut out extra words and also helps give the feel of the present.
  4. Do not over abbreviate. Although headlines permit limited space, do not , in any case, use arbitrary or rare abbreviations.
  5. Mention the subject in the headline wherever it is known. If the name is known, then use the name, otherwise use another title that identifies the subject.
  6. When certain parts of direct speech are significant enough to be used in the headline, then it is put in quotes. Unlike the use of double quotes in the main body of the news story, in the headline, only single quotes are used.
  7. The 'period' or 'full stop' is not used at the end of the headline.
  8. The headline should always try to summarize the story and highlight the most important/striking element in it.

9. While attempting to write attractive/smart headlines, clarity of information should not be compromised.

- **Byline/ Credit Line**:

Different newspapers follow different rules for writing the byline or credit line depending on their own **style book**. Credit lines within the same newspaper may also vary. Some of the common styles are – 'by a staff reporter', 'from a staff reporter', 'from a correspondent', 'by our special correspondent', 'by our reporter', 'from our correspondent', 'by Manosh Das', 'from Bikram Mitra' etc. Some newspapers omit the words 'by', 'from' etc. They simply write 'our correspondent', 'Manosh Das', 'Bikram Mitra' etc.

Usually, it is placed on the left hand side of the report, below the headline. In some cases it is kept left aligned, while sometimes it may be aligned centre above the first paragraph.

- **Dateline:**

In almost all cases, the dateline has two parts — the place and the date. The place comes first, and then comes the date. For example, 'Guwahati, April 7'. However, some newspapers now-a-days have started omitting the dateline also, or only mentioning the place in the dateline. This is done mainly in case of feature news or other soft news stories where the time element may not be very significant. It is also done when there are multiple editions of the same paper where the news item may be carried on a different date.

- **Lead**:

Usually the lead should possibly be containing all the elements- the five Ws and an H. However, in some cases when it is impossible to club all the elements in the lead then the rest of the elements should be carried in the next paragraph. But the reporter must try to include as many elements as possible in the first paragraph itself. If the incident is big in terms of effect and importance then it becomes difficult to incorporate all the elements in the lead itself, as it may end up cluttering of the lead. In such a situation, the body should deal with the rest of the elements, mostly the 'why' and 'how' elements.

However, when it comes to detailing the event in the body of the news story then the inverted pyramid style is followed invariably, where the more important points are told in the beginning, followed by the lesser important details.

Therefore, in a way, the lead summarizes the story in three to four sentences. Ideally, the lead should not contain more than 30 to 40 words, within which the summary of the event should be given. And within those 30 to 40 words the lead should attempt to contain all the five Ws and an H as much as possible. Otherwise normally the 'how' element is carried forward to the following paragraphs in the body as it deals with detailing of the story.

- **Body:**

  As stated earlier, the body is the middle part of a story and it deals with the detailing of events. After having summarized the story in the lead, still many relevant points are left to be elaborated regarding the story which the readers might be interested to know. And this is done in the body part.

Similar to the lead, the body is designed using the inverted pyramid style. That is, playing down the facts in chronological order of importance and relevance. The most necessary aspects are highlighted in the beginning of the body followed by the lesser essential facts, in a descending order.

However, since the body deals with the description of the event, most of the readers get wary of reading the whole detail and skip to other news item, having skimmed through the lead. But a clever writer would know how to retain the interest of the readers until the last line of the story. For that the writing should be interesting and beautifully treated so that the readers find it hard to leave it half way through. Also the reporter should always attempt to say more with fewer words due to space restriction in newspapers.

One has to remember that one basic feature that differentiates news from other write ups is its language. Here are a few very basic guidelines to be followed in case of the language of news.

1. Always use very simple language and short sentences.
2. Avoid the use of complicated words, metaphors, figures of speech, adjectives and ***clichés***. Explain technical jargons of science and technology.
3. Write in active voice wherever possible. It makes sentences shorter and direct.
4. Spell numerals up to 9 and beyond that write in numerals.
5. Identification that follows a name, viz., age, address, job description or any other information is to be set off by paired commas. Honorific titles like Mr., Mrs., Dr. etc are not to be used.
6. While reproducing speech directly, place it within double quotes unlike in the headline where it is placed in single quotes. Sometimes you can write full sentences in direct speech or also write just significant words or phrases in direct speech.
7. The time element in a news story is very important. News stories about events that have already taken place are written in the past tense. As such they use active verbs like *elected, injured, killed, damaged, awarded* etc. or passive verbs *like was elected, was injured, was killed, was damaged, was awarded* etc.
8. Present tense is often used in order to emphasize timeliness. E.g.

   Refusing to lie down, Bird Flu, that bounced back in parts of West Bengal for the second time in a month, broke out in Jalpaiguri district prompting the authorities today to order mass culling.
9. In stories where the actual time of an event is not known or is not important, the present perfect form of the verb is used. *For example, has been named, has said, has announced* etc.
10. For news stories that speak about events that will take place in the future are expressed by the use of the auxiliary verb will – *will come, will speak, will arrive etc.*



Clichés: a phrase or an idea that has been used so often that it is no longer effective or interesting. Eg: 'last but not the least'



CHECK YOUR PROGRESS

Q.1: What are the main parts of a science news story?

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Q.2: What is the significance of the

a. Headline

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b. Credit line

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c. Dateline

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d. Lead

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Q.3: Explain the following:

a. Inverted Pyramid Style

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b. Pyramid Style

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Q.4: Which style of writing is used for science news writing?

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Q.5: Which part of the news story contains the maximum and the most important information?

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Q.6: Mention five important points to be followed while writing headline.

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Q.7: Mention five important points to be followed while writing a news story.

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ACTIVITY – 12.1

1. Develop a news story from the points given below. The news story should be complete with all the different elements and following all the principles of news writing.

- 4.30 pm, Dec 6
- Head-on collision between truck and over speeding motor cyclist
- Motor cyclist dead on the spot
- Truck lost control and stopped after hitting a tree. Front part of truck damaged.
- Truck driver badly injured but alive, taken to hospital.

12.4 WRITING OF FEATURE AND ARTICLES ON SCIENCE

Already we have discussed the writing of science news. The writing structure of the features, articles are different from that of a news story. News stories are written mostly in the inverted pyramid formal structure and style. On the other hand, Features follow the structures of essays and discussion. News stories do not present the reporter's distinct point of view but a feature does. In a feature, the author presents his / her point of view. Unlike news stories, features are generally longer and are not constrained by a hand news-peg although they still need some element of timeliness. While hard news attempts to tell what is happening, features have more room to develop why and how something is occurring and provide more perspective.

In this section we will discuss on the writing for science & technology. In the unit 5 of the course 'Writing for the Media' of BMC third year, we have incorporated a section on science writing. A portion of that section has been given here for the better understanding of science writing.

Science writing encompasses a wide variety of niches that can include writing for newspapers, mass market magazines, trade publications, university press offices, broadcast media, and newsletters, among many other venues.

Science writing needs special technical skills. The main difference between science writing and writing in other academic fields is the relative importance placed on certain stylistics elements .So in this unit we will look into what is scientific writing and how to write a scientific write-up.

The basic purpose of scientific writing is not the mere presentation of information and thought, but rather its actual communication. It does not matter how pleased an author might be to convert all the right data into sentences and paragraphs ; it matters only whether a large majority of the reading audience accurately perceive what the author had in mind .

There are several different kinds of writing that fall under the umbrella of scientific writing.

- Peer – reviewed journal articles (presenting primary research)
- Grant proposals (You can't do science without funding)
- Literature review articles (summarizing and synthesizing research that has already been carried out)
- Popular Science articles (communicating scientific discoveries to a non –scientific audience)

The main purpose of scientific writing is to present data or ideas with a level of detail that allows a reader to evaluate the validity of the results and conclusions based only on the facts.

- **Some dos and don'ts in Scientific Writing :**

  1) **Precision –** You need to be precise in scientific writing. There is no scope for ambiguities as it creates confusion in the minds of the reader.

  2) **Clarity –**You need to present your writing clearly .Language should be easy to follow**.**

  3) **Objectivity –**Subjectivity needs to be avoided. Any claims that you want to make should be based on facts, not by intuition or emotion.

- **Certain points that need to be kept in mind while writing a science write up:**

  1) **Word choice –** Often several words may convey similar meaning, but usually only one word is most appropriate and that needs to be put in the given situation. For example :

     "Population density is positively co-related with SARS transmission rate."

     "Population density is positively related to SARS transmission rate**."**

     So you can see that in some contexts, "correlated" and "related" have similar meanings. But in scientific writing correlated conveys a precise meaning because it states the statistical relationship between the two variables. So, simply

pointing out that two variables are related is not enough. Our readers want to know about more precise relationship between the two. Therefore, it is important to choose the appropriate word**.**

2) **Phrasing choice**: The above mentioned idea is applicable here also in case of choosing the right phrase. For example, the phrase “writing of an investigative nature” could also be used in sciences. Also it might refer to a police investigation. So in that case a more specific phraseology needs to be used by avoiding ambiguous phraseology. Here it is noticed that repetition is to some extent preferable.

3) **Figurative Language:** Figurative language must be avoided because it is imprecise. For example “experimental subjects were assaulted with a wall of sound” does not convey the precise meaning of “ experimental subjects were presented with 20 second pulses of nonspecific mating cells”. Exclude similes and metaphors in scientific writing. You just cannot leave anything to imagination.

4) **Level of detail**: You should avoid irrelevant information but do include as much information as required. Whatever information you want to put must be followed by your reader easily without being distracted by irrelevant facts and descriptions.

5) **Quantify:** Whenever possible, use quantitative rather than qualitative descriptions. For instance, a phrase like “development rate in the 30C temperature treatment was ten percent faster than development rate in the 20C temperature treatment “ is more precise than the phrase “development rate was fastest in the higher temperature treatment . “

6) **Language use:** Complex ideas and concepts must be conveyed in a lucid manner. You need to distill complicated ideas into simple explanations. Use familiar terms rather than

technical or obscure terms. Some expressions are given below with their simple alternatives:

COMPLEX	**SIMPLE**
Efficacious	**Effective**
Utilize	**use**
Elucidate	**explain**
Proximal	**close**

There are some situations where the use of a technical or obscure term is justified. For example , in a paper comparing two different viral strains , the author might use the word “enveloped “ rather than the phrase “surrounded by a membrane “.

7) **Sentence Structure:** Science writing must always be precise. It should be written in simple sentences rather than complex sentences. Precision requires a fine level of detail. Careful description of objects, forces, organisms, methodology etc can easily lead to framing of complex sentences without pause which may cause difficulty for learners. So usually simple sentence is preferred.

For example :The osmoregulatory organ , which is located at the base of the third dorsal spine on the outer margin of the terminal papillae and functions by expelling excess sodium ions , activates only under hypertonic conditions . This sentence is too long and complex .Learner has to wait a long-time to get the main idea. So instead of that sentence a more simple sentence can be used which reads: “Located on the outer margin of the terminal papillae at the base of the third dorsal spine , the osmoregulatory organ expels excess sodium ions under hypertonic conditions . “So you can see that a simpler sentence is easy to comprehend. Hence sentence structure needs adequate care in scientific writing .

8) **Verbosity**: Avoid verbosity and use concise writing .Most of the scientific writing is space limited. Grant proposals, journal articles, and abstracts all have word limits .So you need to

concisely write your scientific writing. Common phrases like *"the fact that,"* and *"it is interesting that "* are cumbersome and unnecessary in scientific writing.

9) **Use of Passive Voice**: Generally in science write up passive voice is used to enhance objectivity .But this again depends upon the reviewer who would instruct you whether to use passive voice or active voice. Just follow a few guidelines given below while using active voice :

- Avoid starting sentences with "I" OR "WE" because this pulls you out of the focus from the scientific topic at hand
- Avoid using "I" OR "WE" when you are making a conjecture ,whether it is substantiated or not .Everything that you want to say should follow from logic , not from personal bias or subjectivity. Never use any emotive words in conjunction with "I" OR "WE". For example "I believe", or "we believe ".
- Never use "we" in a way that includes the reader.

10) **Use of illustration**: Tables, boxes, figures and diagrams referred to here as illustrations which should always be used where they will save words or make your argument clearer.

SOME GUIDELINES TO BE FOLLOWED WHILE WRITING A SCIENTIFIC WRITING:

There are *three* fundamental aspects to good science writing - ***planning the structure*** , ***thinking about your reader*** , and ***choosing your words***. Always remember the following points when you write a science write up.

Padding: words that are used to make a piece of writing longer but they do not contain any interesting information.



Padding: words that are used to make a piece of writing longer but they do not contain any interesting information.

- Be concise. Clear thinking and careful planning lead to economy of expression and avoidance of repetition and ***padding***.
- Use simple words. Good style doesn't require you to be pompous or flamboyant.

- Write short sentences. Avoid long sentences as it becomes difficult for the reader to comprehend.
- Take care of your grammar.
- Beware of fashion. Words and phrases can become fashionable and over used, and their meaning often becomes uncertain.
- Use your own words as far as possible so to make it more understandable to readers.
- Use words correctly. Always write with a good dictionary at hand (eg. Oxford Advanced Learner's Dictionary).
- Use words that your reader will understand. Always remember the knowledge of technical expressions (jargon) is often limited to a comparatively small group of people
- Spell correctly. Use a good dictionary.
- Take care with the use of 'I' as I have mentioned earlier.

So by now you must have graduated to the level of becoming a science reporter. Just remember that a science reporter need not necessarily be a specialist in science. What is essential is a background in science and a scientific temperament. A science reporter must update himself with the latest developments of science and be aware of the major scientific research. So your job is to write the highly technical scientific news for common reader in an understandable and readable way. So enjoy writing science write ups.



CHECK YOUR PROGRESS

Q.8: What are the basic points to remember in science writing?

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Q.9: What are the different kinds of science writing?

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12.5 LET US SUM UP

- Science and technology is increasingly shaping and revolutionizing our everyday lives
- The headline identifies the reader's area of interest and introduces and summarizes the story.
- The byline on a newspaper or magazine article gives the name, and often the position, of the writer of the article.
- The 'intro' is the most important part of any news story. It should be direct and attention-grabbing.
- News stories are constructed in the **Inverted Pyramid style** in order of importance. This is a formula used by all media organization.
- A science news story is expected to follow the principle of "5 W's and H".
- The concept of "soft news**"** is also associated with the emergence of infotainment when all news, at times, are treated as "soft" to the extent of entertaining.
- Different newspapers follow different rules for writing the byline or credit line depending on their own **style book**.
- A dateline has two parts- the place and the date.
- The body is the middle part of a story and it deals with the detailing of events.
- Science writing encompasses a wide variety of niches that can include writing for newspapers, mass market magazines, trade publications, university press offices, broadcast media, and newsletters, among many other venues.
- The basic purpose of scientific writing is not the mere presentation of information and thought, but rather its actual communication.



12.6 FURTHER READING

1. Bucchi, Massimiano & Brian Trench (2008), *Handbook of Public Communication of Science and Technology*, Routledge
2. Wilson, Handbook of Science Communication, Overseas Press



12.7 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q. No. 1: The main parts of a news story are – headline, dateline, credit line/ byline, lead, body and conclusion.

Ans. to Q. No. 2:

a. **Headline:** The significance of a headline is great. The headline identifies the reader's area of interest and introduces, precedes and summarizes a news story. Most people merely glance at the newspaper headlines and arrive at judgements based on this. The headline is that part of a news story which first catches the eye of the reader.

b. **Byline/ Credit line:** The byline or the credit line identifies the source of the story.

c. **Dateline:** The dateline indicates the date on which the event took place and on which the reporter had filed the story and the place from which the reporter had filed the story.

d. **Lead:** The lead serves as the intro to the news story. The lead usually tells the story in a nutshell and gives the important information, particularly the most important of the 5W's and H.

Ans. to Q. No. 3:

a. **Inverted Pyramid style**: It is the style of writing used for writing news stories. In this style the most important points of a story is told in the beginning that is in the lead itself, followed by the body in which the rest of the relevant information are presented in descending order of interest or order of importance.

b. **Pyramid Style**: It is the classic style for academic writing. It starts by laying the foundations. It starts with less significant details and builds up the story towards a climax leaving the most important information for the end. It is exactly the opposite of Inverted Pyramid Style.

Ans. to Q. No. 4: Inverted Pyramid Style

Ans. to Q. No. 5: The Lead

Ans. to Q. No. 6: 5 important points to be remembered while writing 'headline' are:

a. Build the headline around a strong verb

b. Drop articles and helping verbs like a, an, the, is are, were etc. wherever possible

c. Try to avoid the feel of the past. Use present tense and future tense

d. Use active voice. It helps cut out extra words and also helps give the feel of the present.

e. Do not over abbreviate. Although headlines permit limited space, do not in any case use arbitrary or rare abbreviations.

Ans. to Q. No. 7: 5 important points to be remembered while writing a news story are:

I. Always use very simple language and short sentences.

II. Avoid the use of complicated words, metaphors, figures of speech. Explain technical jargons.

III. Write in active voice wherever possible. It makes sentences shorter and direct.

IV. Spell numerals up to 9 and beyond that write in numerals.

V. The time element in a news story is very important. News stories about events that have already taken place are written in the past tense. As such they use active verbs like elected, injured, killed, damaged, awarded etc. or passive verbs like was elected, was injured, was killed, was damaged, was awarded etc.

Ans. to Q. No. 8: In science writing the following points should be kept in mind;

(i) **Precision –** You need to be precise in scientific writing. There is no scope for ambiguities as it creates confusion in the minds of the reader.

(ii) **Clarity –**You need to present your writing clearly .Language should be easy to follow**.**

(iii) **Objectivity –**Subjectivity needs to be avoided. Any claims that you want to make should be based on facts, not by intuition or emotion.

Ans. to Q. No. 9: There are several different kinds of writing under scientific writing, like;

- Peer – reviewed journal articles (presenting primary research)
- Grant proposals (You can't do science without funding)
- Literature review articles (summarizing and synthesizing research that has already been carried out)
- Popular Science articles (communicating scientific discoveries to a non –scientific audience)



12.8 MODEL QUESTIONS

A. Short Questions (Answer each question in about 150 words)

Q. 1: Can soft news be associated with the emergence of infotainment? Explain.

Q. 2: What are the different kinds of writing that fall under the umbrella of scientific writing?

Q. 3: What is the main purpose of scientific writing?

B. Long questions (Answer each question in about 300-500 words)

Q. 1: What are the important points that must be kept in mind while writing a science write-up?

Q. 2: What are the basic principes of news writing?

Q. 3: Describe the structure of science news story with the help of an example.

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UNIT 13: PREPARING BROADCAST MATERIAL ON SCIENCE

UNIT STRUCTURE

13.1 Learning objectives

13.2 Introduction

13.3 Various formats of Radio Programmes

13.3.1 News programmes on Science

13.3.2 Common science programme formats

13.4 Various formats of TV Programmes

13.5 Writing for Radio and TV on Science

13.6 Let Us Sum Up

13.7 Further Reading

13.8 Answers to Check Your Progress

13.9 Model Questions

13.1 LEARNING OBJECTIVES

After going through this unit, you will able to:

- describe the various formats of radio and television programmes in science
- know about the writing style that should be used on broadcast media for science.

13.2 INTRODUCTION

In this unit we are going to discuss the various formats of radio and television programmes. The writing style in broadcast media will be given a special focus in this unit which will also give you an insight into the format of writing for broadcast media. This will help you to know and understand what should be the style of writing for the media with special reference to science.

13.3 VARIOUS FORMATS OF RADIO PROGRAMME

13.3.1 News programmes on Science

In this section we will discuss News Programmes on Science which consists of the following:

News:

News provides new information on science and technology or on current scientific events that have happened recently and which are yet reach the general people.

There are two kinds of news- (a) Hard news and (b) Soft news. Hard news is the reporting of important events that have taken place. Soft news is the news of more informational nature and is not as important as hard news.

However news is not broadcast through commercial FMs and commuity radios except through the All India Radio. The News Services Division (NSD) of All India Radio disseminates news and comments to listeners in India and abroad. Radio news has always been in the forefront in informing and keeping the people abreast about the latest developments taking place in different parts of the country. AIR today puts more than 510 bulletins daily around 52 hours in 82 languages/dialects in the Home, Regional and External Services.

Out of these, 89 bulletins are broadcast daily from Delhi in the Home Service in English, Hindi and other Indian languages. The 44 Regional News Units (RNUs) put up 355 daily news bulletins in 67 languages. This includes news bulletins mounted exclusively on FM 'Gold' channel from 22 AIR Stations.

In addition to the daily news bulletins, the News Services Division also mounts everyday a number of news-based programmes on topical subjects from Delhi and some other Regional News Units.

Newsreel:

It is a style of news presentation in an extensive way where hard news is broadcast with the help of various news tools, such as eye-witness accounts, extracts of speeches by a leading dignitary reported in the news, sound effect relevant to the sources of the news, talks, commentaries etc. The daily newsreel of 15 or more minutes duration is a popular form of news broadcasting.

13.3.2 Common science programme formats

Like all other media, in order to draw the attention of the listeners, radio has also devised various appealing 'formats' which are further innovated by creative broadcasters to deliver the content to the best satisfaction of the listeners. These are discussed below:

- **Radio science report**

  An event of importance which is required to be reported in more detail is covered under this format. For example, a radio station can broadcast a report on the Indian Science Congress, Indian Science Communication Congress, National Children Science Congress or it may be any other report of important scientific events.

- **Documentary and Science Features**

  Documentary is a creative work of non-fiction. Developmental themes, invention or discovery, scientific awareness, events of archival value are normally presented in the format of documentary and features. While documentaries rely on factual records, science features rely on imaginary and emotional creativity with dramatics. It is a format of presentation of programme where all possible radio forms meet, such as voices, sounds, music etc. They combine in an attempt to inform, to move, to entertain or to inspire the listeners. The combination of all of these creates another format which is called **'**Docu-feature'

Science Magazine

There are some radio programmes usually of 30 minutes' duration which cannot be grouped elsewhere and which is a combination of various programme such as talks, interviews, on-the-spot reports, eye-witness accounts of scientific events, commentaries etc. Such programmes are called Science Magazines. This programme is usually intended for special audiences.

Science drama

It is a form of audio storytelling broadcast on the radio. With no visual component, science radio drama depends on dialogue, music and sound effects to help the listener imagine the story.

Interview

An interview is a formal/non-formal dialogue, where the interviewer tries to get some information/comment/reaction from the interviewee. Asking the right question in the right way is the crux of a good interview. It requires a lot of research and planning. Questions should be framed to achieve the purpose of the interview. Radio stations usually invite a scientist who discusses on his research and invention or any other issues of scientific relevance.

Science Talks

Talks were the earliest form of spoken-word broadcasting. Radio science talks are neither a lecture nor a public address. It is a straightforward composition - simple, precise friendly chat around a subject on science and technology. It has a clear beginning, a middle and an end. It introduces the scientific subject in an ear-catching way, explains it simply, develops its argument and then summarizes what it has said. A radio science talk avoids complex statistics. Figures are best rounded out to make it easily understood.

Science Discussion

This format is generally used when two or more persons have conflicting view points on an issue of science. The role of the moderator assumes more responsibilities to navigate the flow in such a manner to as avoid irrelevancy keeping in view the time limit.

Feedback/ Vox Pop/ Phone-in

This format is participatory in nature. Replies and/ or listeners' letters fall under this category of feedback. Many developmental activities like use of modern technology, new invention etc. create positive and negative reactions among the common people. Their instant reactions are recorded and aired and in most cases aired live.

'Phone-in' is yet another exciting format in which the listeners directly interact with a radio guest/ expert invited to talk on a matter of public interest. 'Doctor on line' programme of All India Radio, Guwahati is an example of science pone in programme.

There are other formats like variety Invited audience programme, News, Outdoor broadcast (O.B) programme, Special Audience Programme etc.



CHECK YOUR PROGRESS

Q.1: What is an Interview?

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Q.2: Where does science discussion take place?

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13.4 VARIOUS FORMATS OF TV PROGRAMMES

If we consider the different kinds of Television science programmes in today's context, then probably the best way to categorise would be to say that there are two broad categories of TV programmes – **news and non-news.** Under science news we have news bulletins and other news-based and current affairs based programmes, say for instance, news magazines, interviews, talks, panel discussions on current topics, news features etc. The non-news category is a much larger category which covers a whole

gamut of programmes – science fiction, non-fiction, comedy shows, interactive science programmes etc. Science fiction will mainly consist of drama – soaps and serials, telefilms, teleplays etc. With new age programming, the gap between fiction and non-fiction is fast blurring and many programmes are blends between fiction and non-fiction.

It is not possible to discuss at length each type of TV programme in detail in a single section. So, here we will discuss briefly only one type of programme, i.e., science news and news-based programmes.

Science News

News can be categorised in several types based on different criteria. If we take the location into account, we can say that news can be either **foreign news** or **home news**. Foreign news is on any scientific event that is happening abroad while home news involves something going on in the country from where the news is telecast. For example, a news of NASA is a foreign news and a news of ISRO is a home news.

If we consider the differences in participation of verbal and visual modes, then news can be categorised as **verbal news or read news, audiovisual news and combined news.** Verbal news is read by the news reader, no visuals are present apart from studio setting. Audiovisual news is read by Voice Over. Here dynamic elements of visual mode are in operation. Combined news is a combination of different elements like news reader plus still picture, or Voice Over and map, scheme, diagram covering the whole screen.

News can be categorised as **flash news, extended news, commented or personified news,** and **reportage news.** Flash news is very short, usually read by one voice. No commentary is present here. In extended news there is one institutional and one accessed voice. Institutional voice is usually that of the news reader or news reporter and accessed voice is that of a witness. Commented or personified news is the kind in which the reporter comments on the issue from the location and reportage news is the kind of news which is very dynamic. Investigative camera and reporter are present on location.

Science Report

The difference between science news and science report is that compared to news, the length of a science report is more extensive and also broader in coverage of a scientific issue or event. Usually, after the news reader's abstract of the main information, the reporter reports from the scene, then a third party is interviewed and the reporter provides further insight. The report is always audiovisual.

Science Feature

The third identified genre is feature. It is generally audio-visual and can be of four types: **critical, portrait, occasional, and reflective**. In its content, specific event, important personal matters or issues are analysed, assessed and generalised. Different from news or report, a feature reconstructs and interprets some known significant event.

Current Affairs Programme

A programme which contains an explanation and analysis of current events and ideas on a scientific issue, including the matters dealing with controversy or with policy is called a current affairs programme. It also includes investigative programmes with contemporary significance. A current affairs programme could be one of the following:

a) ***Science News magazine*** - These are programmes whose aim is to take it beyond where the news was left. Such programmes not only report but also analyze the events.

b) ***Debates*** - Debates are also used to discuss a current event. Generally, the major scientific events are debated by the scientists and science communicator.

c) ***Panel Discussion*** - If an issue is too complex for one person to handle, a panel may be convened so that a group of specialists on the subject matter can speak. Or, it is used when the audience needs to be introduced or exposed to various people or viewpoints at the session.

d) ***Television Interviews -*** Interviews fill a great many hours of every broadcast day. Some are brief, such as 10-second news broadcast actuality and are called sound bites. Others are longer and make up

the substance of hour-long talk programmes. Interviewing scientists on an issue, an airplane crash or similar event for news broadcast is only one aspect of news-gathering by reporters. Some interviews are essentially question and answer sessions, often with controversial guests. Many are single-subject interviews on topics such as health care, superstition etc.

13.5 WRITING FOR RADIO AND TV ON SCIENCE

Radio science writing is different from writing for other media. A science script is almost always essential for radio programmes. Radio has the unique technical character such as strict time limit etc. This calls for a different approach – a different style. Radio science writing is essentially writing for the ear. This is because the listener creates images when listening to a programme. Therefore, writing for radio needs to be as descriptive as possible.

Some rules for writing on science for radio are stated below :

a) Use words which are in everyday use, i.e. the language of talking and are readily understood by the majority of the people.

b) Short and tight sentences to be written

c) Avoid dependent clauses and clumsy inversion

d) Use descriptive style

e) Speech rhythms should be kept in mind when writing radio scripts.

f) Sentences must be easily understandable and should not be too long and winding.

g) Radio should display an element of ‘nowness’. Therefore write in present-continuous tense.

h) Put across the idea directly avoiding small details

i) One idea per sentence is the thumb rule.

j) Avoid figures to the decimal point. Round off figures for convenience.

k) Avoid the words, ’Above’, ’aforesaid’, ’following’, ’below’, etc.

l) Use simple words. Avoid technical and scientific jargon at all possible times.

Apart from these rules there are other suggestion as stated below :

It should be kept in mind that writing a science story for the electronic media is not the same as writing for print. Those who write for print enjoy some advantages which their broadcast counterparts don't have. For example, a reader can go back and re-read a technical sentence of a scientific invention. If a sentence isn't understood in a TV production, however, the meaning is lost — or worse, the listener or the viewer is distracted while figuring out what was said.

As discussed above, while writing for electronic media you must be very simple and always use active voice. Again, making sure that the most interesting and surprising elements to the forefront of the story, one should not give away everything right at the beginning. You should maintain the interest by spreading the pieces throughout the story. This mean that try you will not try to let the lead-into the story take away the interest from what follows.

After you write something on a typical story of science, set it aside for at least ten minutes and concentrate on something else. Then go back and review the story with a fresh perspective. At that point, it may be easier to catch and eliminate the unnecessary words and phrases.

One should always remember that in this age of entertainment, the viewers are not much interested on a dull topic of science or technology. So, you must present your story in a more attractive and interesting way. Read the story aloud and if necessary, rewrite the sentences that are too long and use tongue-twisting or awkward phrases, phrases that could be taken two ways, long titles etc.

Don't rely on the sound track to tell the story or explain the video. The basic idea should be obvious from the video. At the same time, the audio and video should complement and strengthen each other. Keep in mind the basic guideline of correlating (relating) audio and video because viewers are accustomed to having what they *see* on the screen relate to what they *hear* — generally in the form of dialogue or narration.



13.6 LET US SUM UP

- News provides new information on science and technology or on current scientific events that have happened recently and which are yet reach the general people.
- There are two kinds of news- (a) Hard news and (b) Soft news.
- Hard news is the reporting of important events that have taken place. Soft news is the news of more informational nature and is not as important as hard news.
- news is not broadcast through commercial FMs and commuity radios except through the All India Radio.
- The News Services Division (NSD) of All India Radio disseminates news and comments to listeners in India and abroad
- Newsreel is a style of news presentation in an extensive way where hard news is broadcast with the help of various news tools, such as eye-witness accounts, extracts of speeches by a leading dignitary reported in the news, sound effect relevant to the sources of the news, talks, commentaries etc.
- Documentary is a creative work of non-fiction
- An interview is a formal/non-formal dialogue, where the interviewer tries to get some information/comment/reaction from the interviewee.
- Science drama is a form of audio storytelling broadcast on the radio.
- If we consider the differences in participation of verbal and visual modes, then news can be categorised as verbal news or read news, audiovisual news and combined news.
- A programme which contains an explanation and analysis of current events and ideas on a scientific issue, including the matters dealing with controversy or with policy is called a current affairs programme. The difference between science news and science report is that compared to news, the length of a science report is more extensive and also broader in coverage of a scientific issue or event.



13.7 FURTHER READING

1. Bucchi, Massimiano & Brian Trench (2008), *Handbook of Public Communication of Science and Technology*, Routledge
2. Wilson, Handbook of Science Communication, Overseas Press



13.8 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q. No. 1: An interview is a formal/non-formal dialogue, where the interviewer tries to get some information/comment/reaction from the interviewee. Asking the right question in the right way is the crux of a good interview. It requires a lot of research and planning. Questions should be framed to achieve the purpose of the interview. Radio stations usually invite a scientist and discuss on his research and invention or any other issues of scientific relevance.

Ans. to Q. No. 2: This format is generally used when two or more persons have conflicting view points on an issue of science. The role of moderator assumes more responsibilities to navigate the flow in such a manner as to avoid irrelevancy keeping in view the time limit.



13.14 MODEL QUESTIONS

A. Very Short Questions

Q. 1: Can news be broadcast through community radio?

Q. 2: What do you mean by science Magazine?

Q. 3: What are Radio science taalks?

B. Short Questions (Answer each question in about 150 words)

Q. 1: What are the various television formats? Illustrate your answer with examples.

Q. 2: Write short note on:

a. Panel Discussion

b. Science Feature

Q. 3: What are the various formats of a radio science programme?

C. Long Questions (Answer each question in about 150 words)

Q. 1: State some rules for writing on science for radio broadcast.

Q. 2: What do you mean by current affairs programme? What are its diffeent types?

Q. 3: Of late, we have seen that the number of radio and television programmes on science has dipped compared to other non-news programmes. What reasons can be attributed to the poor coverage?

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UNIT 14: HEALTH AND ENVIRONMENTAL COMMUNICATION

UNIT STRUCTURE

14.1 Learning Objectives

14.2 Introduction

14.3 Meaning of Health Communication

14.3.1 Community Medicine

14.3.2 Communication for Health Initiatives of WHO

14.4 Health communication issues related to the field of medicine

14.5 Delivery of healthcare

14.6 Sources of news on health issues

14.6.1 Health Literacy

14.7 A brief history of Physician-Patient communication

14.8 Communication strategies of NRHM

14.9 Interpersonal dimensions of health communication

14.10 Environmental health

14.11 Environmental Communication

14.11.1 Meaning and Definition

14.11.2 Areas of Environmental Communication

14.11.3 Some important environmental issues

14.12 Let Us Sum Up

14.13 Further Reading

14.14 Answers to Check Your Progress

14.15 Model Questions

14.1 LEARNING OBJECTIVES

After going through this unit you will be able to ;

- understand the basics of health communication and its growing significance in the present-day world
- analyse various issues related to this field right from health advisories to sources of authentic news in this field

- assess the advantages and bottlenecks in executing health communication and healthcare delivery to the people at the grassroots level
- understand the different nuances of the patient-physician communication and its implications in well-being of the people
- get an idea about the communication strategies taken up by organizations and institutions for delivering health advisory to the target audience
- get a brief overview of the meaning of Environmental health and its importance for humankind.

14.2 INTRODUCTION

At the very outset, let us try to understand what is meant by the term Health.

The World Health Organization (WHO) defines Health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. This concept includes all the three major components of the system which combined together only make up for normal parameters to judge a healthy person. Further, it is not only adequate to enjoy only either physical or mental or social well-being. All the three aspects need to be present in tandem for a society to be termed as a healthy society. There is this common proverb - Health is wealth. Unless there is a close and positive coordination of all these three sides, we can't term that person or society as a healthy one.

14.3 MEANING OF HEALTH COMMUNICATION

Health communication is an area of study that examines how the use of different communication strategies can keep people informed about their health and influence their behaviour so that they can live healthier lives. It draws from many theories and disciplines, including social, cognitive and communication theories, marketing, and public relations. (School of Public Health and Tropical Medicine, Tulane University, USA)

Prior to explaining this term, it will be convenient to go through a definition of the term by a premier organization in this regard. The Society for Health Communication (SHC) defines it as the science and art of using communication to advance the health and well-being of people and populations. Further, it is a multidisciplinary field of study and practice that applies communication evidence, strategy, theory, and creativity to promote behaviours, policies, and practices that advance the health and well-being of people and populations. (SHC website, 2017).

Now, what is Communication for Health ? In other words, what is there to be communicated in this field and why is the express need to study communication for delivering healthcare and related messages or information?

This aspect can be considered in two very broad categories.

First of all, it is at a micro or individual level - communication between a patient or potential patient and a physician or any other health worker – be it a nurse, pharmacist or others concerned. We all know that a sympathetic and empathetic behaviour towards a patient by a health worker led by the physician is of utmost importance in giving solace to the patient. Such a behaviour goes a long way to inculcate a feel of confidence in the minds of the patients that the doctor is seriously trying to understand the problem and finding a solution. Further, not only diagnosis, there are other important aspects also. Such as how to take up medication, control of diet, precautions, details of care to be conducted by the immediate family or caretakers of the patient are also equally important for proper recovery of the patients etc. Hence, the communication aspect is so significant in this relationship. The trust between the patient and health worker has to be above any doubt so that the doctor can come to proper conclusion about the diagnosis. Here, in an ideal situation, there must not be any ‘noise’ or barrier in the communication. Otherwise, there shall not be effective diagnosis and medication.

It may be mentioned here that the Medical Council of India, the highest decision-making authority in the academic programmes of study of medical areas, has come up with the AETCOM guidelines (2018). This is an abbreviation of the terms – Attitude, Ethics and Communication. These

are actually included in the Graduate Medical Education Regulations (2017). Here, point no.2.3 entails the important role of a physician as a "Communicator with patients, families, colleagues and community".

The role is further explained in point 3.31 – 3.3.4 of the same document. Among various aspects, it includes –

- Demonstrating ability to communicate adequately, sensitively, effectively and respectfully with patients in a language that the latter understands and in a manner that will improve patient satisfaction and health care outcomes,
- Professional relationship with patients and families that are positive, understanding, humane, ethical, empathetic, and ability to communicate with patients in a manner respectful of patient's preferences, values, prior experience, beliefs, confidentiality and privacy.
- Demonstrate ability to communicate with patients, colleagues and families in a manner that encourages participation and shared decision-making. (MCI-AETCOM).

Secondly, at a macro level, health-related communication towards the society, community at a broader level for inculcating a certain point about prevention. This is because we all know that 'prevention is always better than cure' of any disease or ailment in any society across the world. Let us consider a scenario in this regard. Suppose a situation of communicable diseases is prevailing at a certain area. There, if some individuals and families take proper precaution and prevention about the disease they would be in a safer position. However, if even some of the people or families (which may not even be more than half of the population) don't observe the same precaution, there won't be any point for the families who are observing it. Hence, unless the entire society or community as a whole takes up precautionary measures, the disease would definitely spread without any resistance. Under such circumstances, what is to be done. The COVID19 pandemic situation has very effectively demonstrated how all members of the society cutting across any area, caste, creed etc. need to

take up preventive measures to stop further spread of the disease. Thus, quarantine, home attachment or isolation etc. systems were devised and the importance of these also needed to be disseminated to the people at large.

COVID19 is just a small example of so many other health-related problems in the society which need to be communicated to people constantly for preventing the situation from getting worse. Let's pick up a few usual examples —

- After Independence, in the 1960s till about the 1980s, in our country a health communication campaign had to be carried out aimed at the population about having preferably only one child for preventing an explosion in population
- Prescribing quinine pills for preventing malaria, use of iodized salt against goitre
- 'Do boond zindagi ke' – the much popular Pulse Polio Immunisation campaign etc.

Even in the present day times, newer challenges are confronting the society. Such as – the express need for advising people about the hazards of excessive exposure to electronic and digital gadgets, living a harmonious and balanced life for preventing the so-called lifestyle diseases, need for some amount of exercises on a daily basis (whether free hand or with instruments), reduce intake of tobacco products, liquor etc.

14.3.1 Community Medicine

This is an important concept in the field of health and medicine which is concerned with the prevention of disease, the determinants and natural history of disease in populations and the influence of the environment and of society on health and disease. The community medicine practitioner is devoted to preventing the occurrence of complaints in the population (Mackenzie, 1983). Medical colleges and universities do have separate departments for this aspect. It aims at devising various systems for treating diseases and health problems from a community-oriented perspective rather than treating

them as individual or single family-oriented problem. The objective is that a holistic approach can be taken up to address the issues in the short and long run. Further, Dr Edmond Fernandes, a veteran of this system in an article in The Times of India (Lifestyle, July 3, 2017) says that Community Medicine is understood by different names - Social Medicine, Preventive Medicine, Public Health, Community Health. The ultimate aim is to tackle the community's health and medicine issues as a whole. This is in contrast with to taking an individualistic view of many of the medical problems which need a broader treatment like COVID 19, Pulse Polio, Obesity etc.

So, this is also one area of health communication that would be important in the near and distant future also. If the entire community or society can be enlightened about preventive and precautionary measures then the individuals and families would automatically become enlightened. Thus, they would be empowered to face that particular health issue. This is the underlying idea behind introducing Community Medicine in the field of medical sciences. A lot of its success also depends on how successfully communication campaigns are carried out in this direction.



CHECK YOUR PROGRESS

Q.1: What is health communication ?

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Q.2: What are the guidelines for effective health communication ?

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Q.3: What is community medicine ?

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14.3.2 Communication for Health initiative of WHO

While discussing health communication in general, it would not be complete without taking into consideration, the initiatives of the World Health Organization (WHO) which has been spearheading a global movement in this field. It has come up with the concept of Communication for Health (C4H). This system is fully dedicated towards applying various parameters of communication for expanding awareness and inculcation of effective understanding in health and related areas to the masses at all levels of the society.

"Effective, integrated and coordinated communications are integral to achieve WHO's goal of building a healthier future and deliver on its mission to promote health, keep the world safe and serve the vulnerable. This Framework describes a strategic approach for effectively communicating WHO information, advice and guidance across a broad range of health issues: from chronic diseases to emerging and novel risks." (WHO website).

It also says that it communicates with a wide variety of decision-makers with some of them having backgrounds in medicine and public health and rely on WHO for technical information. However, as many key audiences are not technical experts, communicators must provide information that is easy to understand so that decision-makers comprehend health risks and take appropriate action. (WHO website).

The organization has established that for C4H to be effective and meaningful it has to follow the following six principles —

- **Accessible –** Whatever information is intended to be made available to the targeted audience must be in a media or platform that has to be accessible easily. Otherwise, there would be no meaning for even very highly-important or relevant information or message.
- **Relevant –** It has to be relevant to the particular issue of that specific time period. Because, if authorities or sources concerned talk about an issue that is not a current one, people would be at a loss about using it.

- **Actionable –** The messages need to be of such characteristic that the receiver can act proactive after realizing the importance of it for his or her own situation.
- **Timely –** This is highly important as diseases or health and medicine-related issues need to be tackled at a real-time manner. If messages or communication strategies are prepared and conducted much after any disease has actually occurred, there would be no point in doing the exercise at all.
- **Credible –** Credibility is of utmost importance in this aspect. Otherwise how would a person act on the information or messages received if there is doubt about their veracity or authenticity.
- **Understandable –** In science communication, it is said that something that has to be communicated needs to be understandable for the target audience's standard. Hence, however complicated some findings might be, it has to be prepared in a language that is easily understandable to the patients or communities targeted.

If all these six principles are followed properly, there is maximum possibility that the campaigns shall be successful to a big extent.

Guidelines form a major component of the health communication domain as these are important for guiding people towards a healthy lifestyle. These can range from simple to sophisticated ones. In this regard, there may be general guidelines with potential impacts of far-reaching effects. Or those on short-term necessity depending upon the sudden emergent situations also.

14.4 HEALTH COMMUNICATION ISSUES RELATED TO THE FIELD OF MEDICINE

There are several important issues in the field of medicine in health communication which needs a thorough study.

First of all – there is the issue of 'generic' versus 'branded' medicine available in the open market. .

According to a declaration of the US Food and Drugs Administration (FDA) - A generic drug is a medication created to be the same as an already marketed brand-name drug in dosage form, safety, strength, route of administration, quality, performance characteristics, and intended use. These similarities help to demonstrate bioequivalence, which means that **a generic medicine works in the same way and provides the same clinical benefit as the brand-name medicine.** In other words, you can take a generic medicine as an equal substitute for its brand-name counterpart.

An article by Ranit Mishori in The Washington Post (July 11, 2011) informs that generic drugs are cheaper than brand-name medicine as its manufacturers don't face the same costs like that of brand-name drugs. That's because the brand-name maker often invented the drug, a process that can cost hundreds of millions of dollars. This is the rationale behind drug patents. They give pharmaceutical companies a period of years when only they can make money on a product in which they have made a large investment. But in reality, most of the people may not know this fact and end up spending a lot of money unnecessarily on branded medicine. But, generic medicine would have been sufficient enough for their health problems.

Besides, any particular medicine requires several rigorous stages of testing following development of the drug in the laboratories. There are stages of animal and human trials which have to be successful for filing for patent and licence before selling it in the open market. It may require several years before a certain drug becomes ready to be put in the market. Besides, in every country there is a government agency in this regard to whom medicine companies have to apply for licence for launching a new medicine. This agency, after observing all the necessary paper works and results etc. would decide on whether to issue licence or not for that medicine.

However, at times, some of the companies may try to cut corners by making false claims to get the licence. And also they may launch the medicine

in a discreet manner even without applying for a licence. If detected, these might call for severe penal action as medicines involve the lives of so many thousands of people.

Again, it has also been seen that some medicine even after their launch in the market observing all necessary steps reflect major problems once people start using them. In that case also, if a petition is filed by any organization or individual there is provision for reviewing the licence it was granted and may lead to revoking of the same if necessary.

Besides, some of the medicines for a particular health condition may have major side effects while some others for the same disease may have far less of it. The health workers concerned including the physician, nurse, pharmacist etc. need to seriously observe these conditions and report immediately to the physician so that medicine can be altered. Hence, communication to the patients is so important.

In the world of medicine, some of the drugs over the decades have established themselves as highly prominent and popular brand names thereby prompting people to identify and use them on a usual basis. On the other hand, there may be many options available in the generic drugs category which would come much cheaper without any harmful side effects. But a nexus between pharmaceutical companies and physicians prescribing medicine may be possible. So, many a times patients are left with no choice but to buy those medicines asked by the doctors. Besides, from time to time news items are seen about some hospitals charging much more than the market price of the medicine supplied to patients undergoing treatment in those hospitals.

Further, the chain of health workers right from the physician to the nurses also need to be conversant with the communication principles prescribed for the physicians. This is because initially for health issues, the doctor diagnoses and prescribes a specific kind of treatment to the patient including medicine. From this point, these frontline health workers have to carry on the responsibility of administering proper treatment to the patients.



CHECK YOUR PROGRESS

Q.4: What is the role of WHO in health communication ?

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Q.5: What is Communication for Health initiative ?

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Q.6: Give examples of a few issues related to the field of medicine.

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14.5 DELIVERY OF HEALTHCARE

While the country has made a lot of progress in the field of health care at all levels, yet a few lacuna remain there which causes a lot of bottlenecks in implementing the plans and policies. In an article in Business World (August 21, 2020), Satyendra Johari opines that “the general health advisory may not solve the root cause of the illness and may invariably add up to an escalated cost owing to a prolonged treatment process.” The writer further says that a ‘very little or no focus at all is dedicated to preventive health care in the country which could have solved a lot of problems for the general public.

Also, it must be mentioned here that a number of health facilities including grassroots level health centres in every nook and corner of the country have grown manifold. However, for many different related factors, it has not been possible to equip all these centres with adequate facilities, manpower etc. This has been causing a deterrent for people to visit them when there is a need. Thus, they need to be addressed prior to or at least at the time of planning such facilities. Otherwise, health care is becoming very costly with all sophisticated facilities being provided mostly by the private

sector with a profit motive only. The National Health Mission (NHM) with its sub units National Rural Health Mission and National Urban Health Mission has been carrying out its responsibilities towards expanding health care facilities to the maximum possible population segment. However, more efforts on the government side are needed for catering to such a huge population across the length and breadth of the nation.

14.6 SOURCES OF NEWS ON HEALTH ISSUES

As this is a special and highly sophisticated area, there are very less sources of news on different health and related aspects for the common people. Of course, there are scientific journals like Lancet, The British medical Journal which are globally-renowned scholarly journals in different specific fields of the domain. However, for the common man's usage there are limited sources of health and related news which are sometimes disseminated by newspapers, websites, portals etc. Again, many a times the question of establishing authenticity of the information and claims in these sources need to be verified before consuming their messages. In Guwahati, an established private hospital came out with the idea of a general magazine on health-related issues in Assamese which proved to be effective and popular for quite a few years by now. Many TV and Radio channels also feature health-related programmes for peoples' benefit. At this point, mention must be made of a successful and effective TV programme on health issues named Kalyani. It was broadcast by Doordarshan for several years in its national channels in the decade of the 2000. The major regional centres of DDK broadcast this programme with local languages and inputs. It happened in a convenient manner for the understanding of the people of all categories of the society. For a particular episode, a specific health issue was selected and more than one expert physicians in that field would be invited to the studio for a brief introduction about the problem. There would be an anchor who would ask questions about the disease. Dedicated telephone lines would be open for allowing intending patients or somebody interested in knowing about it to call up the people in the studio. The physicians would offer instant

advise whenever possible or ask them to consult a doctor offline as the case may be. As the programme was in regional language of the states, it proved to be highly popular and many people could get preliminary advice on different diseases and lifestyle problems.

At this point, proper care also needs to be taken for avoiding the dangers of 'infodemic' causing problems to the people. This is a term that came into existence in the initial periods of COVID-19 pandemic. WHO describes it as - "too much information including false or misleading information in digital and physical environments during a disease outbreak. It causes confusion and risk-taking behaviours that can harm health. It also leads to mistrust in health authorities and undermines the public health response. An infodemic can intensify or lengthen outbreaks when people are unsure about what they need to do to protect their health and that of people around them. With growing digitization – an expansion of social media and internet use – information can spread more rapidly. This can help to more quickly fill information voids but can also amplify harmful messages." (WHO website).

This is why like in several other fields, fact-checking exercises should be undertaken to sift through false and misleading information which occur on many occasions.

Sources can be anything those led by the doctor himself or herself, health workers like nurses, pharmacy professionals, extension workers etc. There is this special group called 'Accredited Social Health Activists' (ASHA workers) which is a major component of the National Rural Health Mission and still continuing. A woman is selected from a particular village to act as an interface between the village folk and the public health system for better dissemination of health information and contact whenever needed by the villagers. These workers are provided necessary training from time-to-time for keeping in touch with latest developments in this field and thereby extend the benefits to the targeted audience. So far, it has been proving to be a highly-reliable and effective source of information for the rural population.

Besides, there are many advertisements, awareness camps, health camps, public relations exercises etc. carried out by government and non-governmental sectors at various points for making people aware of different schemes of the government.

14.6.1 Health literacy

This is an interesting concept in connection with our area of study. That is, the Centre for Disease Control and Prevention of the USA defines 'Personal health literacy as the degree to which individuals possess the ability to find, understand and use information and services to inform health-related decisions and actions for themselves and others. Besides, organizational health literacy means the degree to which organizations equitably enable individuals to find, understand, and use information and services to inform health-related decisions and actions for themselves and others.

Health literacy has also assumed a major importance because of the express need for knowing implications of different issues arising in the field of health and well-being in the society at present. Possessing this kind of literacy, any person can become aware as well as an active practitioner of positive health practices so that ill effects of a fast, modern life may not affect him or her to a big extent. In other words, it should be beneficial for facilitating a person to lead a balanced life in the present day world.



CHECK YOUR PROGRESS

Q.7: Discuss delivery of health care in the country.

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Q.8: How could you spot sources of news in this field ?

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Q.9: Describe Health literacy.

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14.7 A BRIEF HISTORY OF PHYSICIAN-PATIENT COMMUNICATION

Two scholars in this field – Kaba, R and Sooriakumaran P. (2007) in their research paper (2005) quotes Mead and Bower (2000) who advocated use of a democratic, equal doctor-patient relationship. It differed primarily from the paternalistic focus envisaged by Parsons in 1951. The article informs that the society advocated a shift in the doctor-patient relationship from the 'guidance-co-operation' model to 'mutual participation'. This relationship has undergone major changes over the centuries and decades till date with evolving dimensions and aspects. In short it needs to be said that unless there is a cordial, effective and meaningful relationship between the two sides, a good communication flow can't take place. This shall lead to a situation when the health problem of the patient may not be cured properly as there remained a gap in the communication. The Graduate Medical Guidelines (2018) of NMC also provide for a lot of significance on the physician-patient communication as this is a vital element for a proper diagnosis and cure of the health issues across all societies. Research studies have been conducted from time-to-time in this regard for allowing an adequate direction with a futuristic view for physicians as well as other health workers.

14.8 COMMUNICATION STRATEGIES OF NRHM

According to the Ministry of Health and Family Welfare (MHFW), Government of India, National Rural Health Mission (NRHM) was launched in April 2005, to provide accessible, affordable and quality health care to the rural population, especially the vulnerable groups. However, the

government by a decision in May, 2013 approved launching of National Urban Health Mission (NUHM) as a sub-mission of an over-arching National Health Mission (NHM), with National Rural Health Mission (NRHM) being the other sub-mission.

Hence, it would be wiser to discuss about the overall communication policies of the umbrella body – NHM as it would cover the publicity aspects of both the sub missions. This agency puts a lot of emphasis upon the communication aspect as it is a vitally-important link in the success of the programme in the short and also long run. Every district under this scheme has Media Executives looking after adequate implementation of publicity campaigns for creating awareness about the schemes, precautions etc. Also, a state-level Media Executive oversees a coordinated functioning of the district level activities. We have already mentioned about ASHA workers who are a major component of this scheme of NHM. The agency as a whole puts a lot of emphasis upon Social and Behaviour Change Communication for achieving its target of inculcating awareness on the various health schemes for the people.

14.9 INTERPERSONAL DIMENSIONS OF HEALTH COMMUNICATION

As the term itself reflects Interpersonal communication is between two persons in an ideal situation for so many purposes under the Earth. Similarly, in health communication parlance also, it is the communication between two primary parties – a doctor and a patient who needs to consult the former for any discomfort out of health factors. Here, empathy is of utmost importance between the two. More so, on the part of the physician as he or she would require to understand and realize what the patient wants to communicate. Based on better understanding of the patient's issues, the doctor shall be able to diagnose the disease properly and prescribe medication for recovery. Chichirez and Purcarea (2008) in their paper 'Doctor-patient communication: a historical overview' in the Journal of Medicine and Life says that it should be considered that medical system communication takes place in an environment that is complex, where

favourable and adverse factors coexist and continuously exchange places and importance. Both verbal and non-verbal communication modes are utilized to conduct Interpersonal communication. However, verbal – that is spoken language between the two engaging parties is most convenient and effective as there is the least possibility of misunderstanding or noises causing wrong interpretation of the dialogue process. Like it happens in other areas also, at the initial stages of the communication process, the patient and doctor or other health workers and facilitators need to establish a certain bond between them. This shall bring trust in a gradual manner. Such a process is expected to lead towards a relationship which would cause the patient to gain confidence on the service providers led by the doctor and nurses, pharmacists, physiotherapist (as and when necessary). We have mentioned earlier that unless there is a sense of trust between the two engaging sides, there won't be success in the patients getting cured or their recovery.

The possibility of the aspect of noise or barrier coming up in this communication is of a high scale. This is because like other areas of science communication, many a times the physician or doctor may find it rather difficult to make the patient understand various nitty gritty of abiding by the medication rules and practices or exercises. It may be because of the gap of education and experience between the two. Further, the patient may also find it difficult to understand what the doctor or nurse may have to say to him about medication. Besides, no person in the world would like to hear a negative news about his or her disease however serious or otherwise it might be. So, if a patient comes to the doctor with a disease which is in a 'terminal' stage, a lot depends on the latter about how to reveal such a difficult news to the person. Hence, these few along with so many different scenarios may arise in the relationship between a doctor and patient that training of proper communication skills is a 'must' for all personnel having a professional career in this profession.

At this point, this needs to be mentioned that along with guidelines for community treatment of some health aspects, individual persons also need to be communicated or guided properly about various bottlenecks which arise during the course of this interpersonal relationship.

14.10 ENVIRONMENTAL HEALTH

To understand the meaning of this term let us visit the WHO website which says that healthier environments could prevent almost one quarter of the global burden of diseases. The COVID-19 pandemic is a further reminder of the delicate relationship between people and our planet. Also, clean air, stable climate, adequate water, sanitation and hygiene, safe use of chemicals, protection from radiation, healthy and safe workplaces, sound agricultural practices, health-supportive cities and built environments, and a preserved nature are all prerequisites for good health.

Thus, it is obvious that a healthy environment is a basic precondition for a healthy living. This has prompted our Prime Minister Narendra Modi also to launch the much-ambitious 'Swachch Bharat' campaign in 2014 for a 'clean India' in the near future. This is a vast field with so many issues ranging from maintaining a green environment, adequate forest cover, minimizing the human-environment conflict in the face of modern day development etc. Let us mention about a few initiatives by some visionary personalities in this direction. It was Rachel Carson, a US scientist who is one of the pioneers in taking a lot of efforts in making people aware of the impending disaster expected to emerge from endangering Nature's way. She started with the use of pesticides and unnatural processes for growing more food and increase productivity in many areas at the cost of major damages to the environment. Her first book *Silent Spring* in 1962 paved the way for worldwide discussions in this regard.

Taking a cue from such developments, the UNO held its first ever Conference on Environment in 1972 which led to the adoption of the Stockholm Declaration and Action Plan. It was followed by a major global conference in 1992 in Rio De Janeiro of Brazil which followed up many of the issues. This was followed by the Climate Change Conference popularly known as COP that is held regularly in different countries for detailed discussions and possible actions to be taken up in this direction.

There have been several prominent personalities who have dedicated their lives for this cause and succeeded in creating awareness at

a high level among the population. Mention can be made of Chico Mendes of Brazilian rain forests, Sunderlal Bahuguan of Uttarakhand who spearheaded the Chipko Movement against rampant felling of trees, Medha Patkar fighting against big dams among others. And then there is Jadav Payeng of Assam (Jorhat) who singlehandedly set up and nurtured a full-grown forest on the outskirts of Jorhat town in a span of about three decades. This is an astonishing achievement as he had started from scratch as this area was a fully barren place on the bank of Brahmaputra river. Now he has been recognized globally for his success. Of course, we need to know about these warriors and their struggle to deliver the goods. Again, it was Greta Thunberg (Greta Tintin Eleonora Ernman Thunberg), a young girl-cum-Swedish environmental activist who worked to address the problem of climate change, founding (2018) a movement known as Fridays for Future (also called School Strike for Climate). {Encyclopaedia Britannica}.

Along with inculcation of awareness about many other areas under the bigger domain of science communication, specially Health Communication, Environmental Health also assumes a major position in the overall area. Climate change, minimization of damage against Nature, and also damage-control, reduction in carbon footprints etc. all these issues are being taken up and potential solutions are expected to be arrived at in the coming days.



CHECK YOUR PROGRESS

Q.10: What role does interpersonal communication play in health communication ?

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Q.11: What kind of media strategies are utilized by NHM for this purpose ?

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Q.12: What do you understand by the term Environmental Health ?

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14.11 ENVIRONMENTAL COMMUNICATION

Already we have discussed the issue of health communication. In the science communication discipline, environmental communication is an important area of discussion. You know that by now all the people in the world are taking environmental issues with due seriousness. Various meetings, conferences, etc are being organised nationally and internationally. The 2009 United Nations Climate Change Conference, commonly known as the Copenhagen Summit, was held at the Bella Center in Copenhagen, Denmark, between 7 December and 18 December. The conference included the 15th Conference of the Parties (COP 15) to the United Nations Framework Convention on Climate Change and the 5th Meeting of the Parties (COP/MOP 5) to the Kyoto Protocol. So, environmental communication has become an important part of the science communication discipline.

14.11.1 Meaning and Definition

Environmental communication, popularly known as EnvCom refers to the study and practice of how individuals, institutions, societies, and cultures craft, distribute, receive, understand, and use messages about the environment and human interactions with the environment. This includes a wide range of possible interactions, from interpersonal communication to virtual communities, participatory decision making, and environmental media coverage. Environmental communication as an academic field emerged from interdisciplinary work involving communication, environmental studies, environmental science, risk analysis and management, sociology, and political ecology.

The Development Assistance Committee's Working Party on Development Cooperation and Environment established an Interest Group on Environmental Communication in 1997 to work on the issues of environmental communication. According to this committee, Environmental Communication is the planned and strategic use of communication processes and media products to support effective policy making, public participation and project implementation geared towards environmental sustainability. Embedded in a well-defined communication strategy, EnvCom makes efficient use of methods, instruments and techniques which are well established in development communication, adult education, social marketing, agricultural extension, public relations, non-formal training and other fields. In his book *Environmental Communication and the Public Sphere*, Robert Cox provides a more formal definition that situates environmental communication as a form of symbolic action. In Cox's words, Environmental Communication is "the pragmatic and constitutive vehicle for our understanding of the environment as well as our relationships to the natural world; it is the symbolic medium that we use in constructing environmental problems and negotiating society's different responses to them." By word 'pragmatic' Cox means the instrumental function of educating, alerting, persuading, mobilizing, solving, etc. By the word 'constitutive' he means the creative function of helping to shape our perceptions of nature, environmental issues and ourselves.

While writing the meaning of the environmental communication for the Environmental Communication Network, Mark Meisner simply defines that environmental communication is communication about environmental affairs. As with other forms of communication, environmental communication is both an activity/phenomenon and a field of study that, not surprisingly, studies the activity/phenomenon.

He says that as an activity/phenomenon, environmental communication is all of the diverse forms of interpersonal, group, public, organizational, and mass communication that make up the

social discussion/debate about environmental issues and problems, and our relationship to non-human nature. Loosely speaking, we can refer to that discussion/debate about environmental issues and problems as "environmental discourse." And, we can refer to the even broader social discussion about Nature as the discourse of Nature. Environmental communication manifests as the discourse of Nature and its subset, the environmental discourse. As a field of study, environmental communication is a diverse synthesis of communication and environmental theory that examines the role, techniques, and influence of communication in environmental affairs.

Environmental communication is a type of symbolic action that serves two functions. These functions are pragmatic and constitutive. Environmental communication is pragmatic because it helps individuals and organizations to accomplish goals and literally do things through communication. Examples of this include educating, alerting, persuading and collaborating.

Environmental communication is constitutive because it helps to shape people's understandings of environmental issues, themselves, and Nature; it shapes the meanings we hold of these things. Examples of this include values, attitudes, and ideologies vis-à-vis Nature and environmental issues and problems.



Robert Cox: is Professor of Communication Studies and the Curriculum Ecology at the University of North Carolina at Chapel Hill. His principal research and teaching areas are environmental communication, rhetorical theory, and critical study of the discourse of social movements.

14.11.2 Areas of Environmental Communication

In the book *'Environmental Communication and the Public Sphere',* ***Robert Cox*** mentioned that the field of environmental communication is composed of seven major areas of study and practice. These are:

1. Environmental rhetoric and discourse
2. Media and environmental journalism
3. Public participation in environmental decision making
4. Social marketing and Advocacy campaigns
5. Environmental collaboration and conflict resolution

6. Risk communication
7. Representations of Nature in popular culture and green marketing

These seven are the main areas of study in the field of environmental communication as opined by Prof. Cox. Dietz and Stern state that as found in a study of the National Research Council, founded that "when done well, public participation improves the quality and legitimacy of a decision …. Can lead to better results in terms of environmental quality". Therefore, while popularising the environmental issues public participation helps in formulating good decisions.

Social marketing can be applied to promote merit goods, or to make a society avoid demerit goods and thus it promotes society's well being as a whole. For example, this may include asking people not to smoke in public areas, asking them to use seat belts, or prompting them to observe speed limits. Prof. Cox says that scholars have used a range of approaches in the study of public education and advocacy campaigns. It is a rapidly growing area of study. Public education and advocacy campaign attempt to change the public behaviour to achieve an environmental goal.

Another important area is environmental journalism. Environmental journalism is the collection, verification, production, distribution and exhibition of information regarding current events, trends, issues and people that are associated with the non-human world with which humans necessarily interact. To be an environmental journalist, one must have an understanding of scientific language and practice, knowledge of historical environmental events, the ability to keep abreast environmental policy decisions and the work of environmental organizations, a general understanding of current environmental concerns, and the ability to communicate that information to the public in such a way that it can be easily understood, despite its complexity. Environmental Journalism focuses on the ways

in which the news, advertising, commercial programmes and internet sites portray nature and environmental problems. It is also a study of the effect of the media on public attitude.

14.11.3 Some important environmental issues

Here is a list of environmental issues which relate to the anthropogenic effects on natural environment. Learners can study these issues and write on them in newspapers and magazines in a lucid manner inorder to enable the lay readers to understand these issues.

- **Anoxic waters** — Anoxic event • Hypoxia • Ocean deoxygenation • Dead zone
- **Carbon Credit**
- **Climate change** — Global warming • Global dimming • Fossil fuels • Sea level rise • Greenhouse gas • Ocean acidification • Shutdown of thermohaline circulation
- **Conservation** — Species extinction • Pollinator decline • Coral bleaching • Holocene extinction • Invasive species • Poaching • Endangered species
- **Energy** — Energy conservation • Renewable energy • Efficient energy use • Renewable energy commercialization
- **Environmental degradation** — Eutrophication • Habitat destruction • Invasive species
- **Environmental health** — Air quality • Asthma • Electromagnetic fields • Electromagnetic radiation and health • Indoor air quality • Lead poisoning • Sick Building Syndrome
- **Genetic engineering** — Genetic pollution • Genetically modified food controversies
- Global Warming
- **Intensive farming** — Overgrazing • Irrigation • Monoculture • Environmental effects of meat production • Slash and burn • Pesticide drift • Plasticulture

- **Land degradation** — Land pollution • Desertification
- **Soil** — Soil conservation • Soil erosion • Soil contamination • Soil salination
- **Land use** — Urban sprawl • Habitat fragmentation • Habitat destruction
- **Nanotechnology** — Nanotoxicology • Nanopollution
- **Nuclear issues** — Nuclear fallout • Nuclear meltdown • Nuclear power • Nuclear weapons • Nuclear and radiation accidents • Nuclear safety • High-level radioactive waste management.
- **Overpopulation** — Burial • Water crisis • Overpopulation in companion animals • Tragedy of the commons
- **Ozone depletion** — CFC
- **Pollution** — Light pollution • Noise pollution • Visual pollution • Nonpoint source pollution • Point source pollution
- **Water pollution** — Acid rain • Eutrophication • Marine pollution • Ocean dumping • Oil spills • Thermal pollution • Urban runoff • Water crisis • Marine debris • Ocean acidification • Ship pollution •Wastewater • Fish kill • Algal bloom • Mercury in fish
- **Air pollution** — Smog • Tropospheric ozone • Indoor air quality • Volatile organic compound • Particulate matter • Sulphur oxide
- **Reservoirs** — Environmental impacts of reservoirs
- **Resource depletion** — Exploitation of natural resources • Overdrafting
- **Consumerism** — Consumer capitalism • Planned obsolescence • Over-consumption
- **Fishing** — Blast fishing • Bottom trawling • Cyanide fishing • Ghost nets • Illegal, unreported and unregulated fishing • Overfishing • Shark finning • Whaling

- **Logging** — Clearcutting • Deforestation • Illegal logging
- **Mining** — Acid mine drainage • Mountaintop removal mining • Slurry impoundments
- **Toxins** — Chlorofluorocarbons • DDT • Endocrine disruptors • Dioxin • Toxic heavy metals • Herbicides • Pesticides • Toxic waste • PCB • Bioaccumulation • Biomagnifications
- **Waste** — E-waste • Litter • Waste disposal incidents • Marine debris • Medical waste • Landfill • Leachate • Recycling • Incineration • Great Pacific Garbage Patch



14.12 LET US SUM UP

- Health communication is a type of communication which is dedicated towards dissemination of health-related information to masses at all levels of the society
- It can happen at two broader levels - micro and macro - at individual or family level and at society or community level
- This is a complicated communication system as there are a lot of issues involved in it between health workers and patients
- Because of its significance the National Medical Graduates Guidelines 2018 of the National Medical Council (NMC) has listed communication as an essential skill to be taught and developed to medical graduates for a better communication with patients and others concerned alike
- Realizing the significance of a proper communication system, the World Health Organization (WHO) has devised quite a few modules and guidelines for an effective implementation of health communication.
- As a part of this initiative, a system called Communication for Health (C4H) has been developed which entails detailed advisories about carrying out communication for health purposes in all areas of the world whenever necessary



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- WHO has also devised a set of six-point principles for acquiring success in this direction which takes care of all possible scenarios involved with the process
- In case of medicine for various diseases, there are broadly two categories - generic medicine and those with a brand name
- Generic ones are usually less costly with all necessary ingredients intact whereas branded ones with same or similar components are costlier. Hence thee is a need for making people literate of this aspect so that they don't pay more for the same product with a different or less popular name.
- Delivery of healthcare to the targeted people has been a challenge in the country even now with many bottlenecks of different kinds causing difficulty in the process
- More streamlining of processes of delivery and feedback assessment are the need of the hour in this regard
- Sources of news for health and medicinal issues may be manifold. While the health workers led by the doctors, nurses etc. are important sources, other mass media and publicity modes about these are also equally important for reaching out to the public.
- Health literacy is an emerging field within the overall domain of health communication. It means basic awareness about health-related issues so that one can enjoy a balanced and healthy lifestyle amidst the growing situation of stress in almost all sectors of the society.
- A considerably-significant portion of health communication is centred around an interpersonal relationship, led by the one between the patient and the physician. Hence, the theoretical as well as practical aspects of interpersonal communication with absence of any possible noise or barrier is a primary necessity for a successful communication between these two parties. Hence, efforts must be kept on for always trying to improvise it to the maximum possible extent.
- This relationship also includes that one between other health workers apart from the doctor - nurses, pharmacists etc.

- There has been research studies going on at academic and scholarly circles for finding out ways and means for improving it to an ideal status.
- The National Health Mission (NHM) along with its two sub units have been utilizing various media and publicity tools for inculcating peoples' awareness about different health and related issues all over the society. Social and Behaviour Change Communication (SBCC) is particularly one of their efforts.
- Environmental Health is becoming more and more important over the decades because of its primary mandate of creating awareness among the people about keeping the environment in a healthy status. The goal is that a considerable portion of health-related problems can be mitigated even without going for medical advise at all.
- Several prominent personalities have initiated a dedicated crusade in their lives for developing awareness about this issue among human beings across the world.
- Environmental communication, popularly known as EnvCom refers to the study and practice of how individuals, institutions, societies, and cultures craft, distribute, receive, understand, and use messages about the environment and human interactions with the environment.
- Environmental communication serves two functions- pragmatic and constitutive.
- Environmental communication is pragmatic because it helps individuals and organizations to accomplish goals and literally do things through communication. Environmental communication is constitutive because it helps to shape people's understandings of environmental issues, themselves, and Nature; it shapes the meanings we hold of these things.
- Environmental journalism is the collection, verification, production, distribution and exhibition of information regarding current events, trends, issues and people that are associated with the non-human world with which humans necessarily interact.



14.13 FURTHER READING

1. Bucchi, Massimiano & Brian Trench (2008), *Handbook of Public Communication of Science and Technology,* Routledge
2. Nanda, J.N (2004), *Science and Technology in India's Transformation*, Concept Publishing Company, New Delhi

Important websites :

Website of World Health Organization

Website of Society for Health Communication

https://publichealth.tulane.edu/blog/health-communication-effective-strategies/

https://www.fda.gov/drugs/buying-using-medicine-safely/generic-drugs

https://www.washingtonpost.com/national/health-science/generic-drugs-can-be-cheaper-so-ask-your-doctor-about-them/2011/07/07/gIQAt2WL9H_story.html

https://www.businessworld.in/article/Challenges-faced-by-the-Indian-healthcare-system/21-08-2020-311268/

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https://www.who.int/westernpacific/activities/Communicating-for-health-impact

https://publichealth.tulane.edu/blog/health-communication-effective-strategies/

https://www.thehindu.com/sci-tech/why-health-communication-is-important/article4268023.ece

14.14 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q. No. 1: Health communication is the activity that is undertaken for disseminating and expanding all relevant and adequate messages about various issues in the field of health. The primary objective of this communication is to inculcate awareness about health and related problems among the people so that the latter can live a healthy life. This is becoming even more important as a sea of information of all kinds is in circulation. But, the relevant and required information needs to be disseminated properly to the people.

Ans. to Q. No. 2: These guidelines are more of a preventive nature as prevention is always better than the cure. For example, during COVID-19 pandemic, people had to wear masks, maintain social distance and use hand sanitisers in addition to other restrictions. Also, in times of summer rains, precautions were supposed to be taken seriously for avoiding water and air borne diseases like encephalitis, malaria etc. The major purpose of these guidelines are to prevent possible occurrence of any disease or health-related abnormality in a person.

Ans. to Q. No. 3: This is an interesting and important area of medical sciences where the entire community is targeted for treatment through different medical diagnosis so that the society as a whole may remain free from many health problems. For example, if the entire community in a village or a town area maintain proper civic hygiene, there is very less possibility of breaking out of any communicable disease. And, if the community as a whole maintain such standards it becomes far more easier to prevent many diseases. Hence, in many medical education institutions, there is a separate department for this aspect.

Ans. to Q. No. 4: As the name itself suggests, it is the global body of nations formed for unitedly taking care of major issues in the health and wellness sector across the world. It can be said that like UNO, this is a specialized agency in the domain of health. It monitors all kinds of health issues. Especially those with a worldwide implication and execute the same taking into confidence all member nations for an inclusive and expanded outreach to the maximum number of individuals and communities. It coordinates such activities among the member states for a better and healthy planet earth.

Ans. to Q. No. 5: This is one of the pioneering ideas with far-reaching potential impacts in this direction conceptualized by WHO. The primary objective is to utilize the advantages of the domain of communication for addressing all relevant aspects in connection with fighting health problems around the world. A major focus of it is - inculcating a sense of awareness for prevention of disease. It is based on the idea that communication leads to awareness and thereby empowerment on preventive measures about any disease and health issue.

Ans. to Q. No. 6: Issues related to the field of medicine may be like —

- Lack of awareness among people about the differences between generic and brand name medicine which leads to spending a lot of money without any justification.
- Need for awareness creation about the scale of side effects of a medicine used for any disease.
- Awareness about different names of a basic medicine manufactured by various companies.
- Awareness about not consuming medicine without a proper advice from a registered medical practitioner etc.

Ans. to Q. No. 7: Delivery of health care in the country is still not in an ideal condition. This is because of many factors. Such as, because of population explosion all health facilities set up by the government and also the private sector establishments are unable to keep pace

with the real time demand. Also, as there is a lack of basic infrastructure even now in many of the remote and rural areas, a good portion of health workers led by doctors, nurses etc. are reluctant to work in those areas. Thus, many such places have to live without adequate medical professionals and facilities. Also, there is a lack of interest in adopting modern thoughts and accepting scientific developments among people even today. This leads to problems like child marriage, unhealthy lifestyle, least regard to a balanced diet among others. The gaps in health care delivery are responsible in many ways for such a scenario.

Ans. to Q. No. 8: Any person, system, establishment from which there is a potential for a news on health-related issues is a source of news in this direction. It may be the awareness creation articles, features, advertisements in the media, academic research-based journals (not quite easy to understand for the common man), magazines, audio-visual programmes etc. for creation of such awareness are important sources. There is a need for establishing the authenticity of such news items prior to using them. This is because nowadays a whole lot of news items are found to be fake. The medical professionals right from the doctor to nurses, pharmacists and others are also sources of news on health issues.

Ans. to Q. No. 9: This is a simple concept which implies a comprehensive literacy about health issues by which we can lead a healthy life. In other words it is awareness about various measures for prevention of disease, knowledge about how to fight against an ailment, consulting doctor in the concerned field so that diagnosis can be speedy and a better recovery from such situation. This kind of literacy can be acquired by consulting doctors, medical professionals, popular literature about health issues. For example, a few years back, quite a few minor children lost their lives after consumption of litchis in its season. Later on, it was found that if this fruit was consumed in more numbers in an empty stomach in the early hours of the day it could lead to a very damaging situation which usually

proves fatal for such minor children if immediate medical care is not given. Similarly, avoiding too much of packet food, fast food, spicy ones, alcoholic and tobacco products are just a minuscule examples of health literacy in a simple way.

Ans. to Q. No. 10: Interpersonal communication can be considered as the mainstay of health communication. This is because person-to-person communication is the best form of communication for a successful exchange of information and messages between the doctor and patient and also nurses, pharmacists etc. There is a need for complete absence or a minimum of noise or barrier in this communication so that no confusion can arise in the situation. Otherwise it may lead to an unsuccessful communication effort thereby resulting in delayed or no recovery from the disease or ailments by the patient at all. Not only between the patient and doctor, the same is also important even for communication between doctor-nurse, pharmacists and other care givers so that no misunderstanding can take place in this relationship. Hence, interpersonal communication enjoys such a sacrosanct place in this regard.

Ans. to Q. No. 11: NHM on its part employs all feasible and effective media for taking its messages to the maximum possible number of people in the society. Media is a progressive and dynamic term which evolves with the passage of time. Hence, any organization with a mandate to reach out to the people need to keep a track of all new developments in this direction. Also adopt all of them for achieving the target of being able to address all members of the population. Social and Behaviour Change Communication (SBCC) is a major component of NHM's media practices as it tries to inculcate change of behaviour of the people towards a positive and healthy one rather than a less-progressive one. It has become necessary as majority of the people find it highly difficult to change their age-old temperament towards a modern and progressive one despite even possessing academic and other kinds of literacy.

Ans. to Q. No. 12: Environmental health is the good health of the environment which is like our mother and nurtures us with all its might. Quite a few pioneering individuals and institutions over the last several decades have dedicated their lives for creating awareness about this issue so that the global population can live in a healthy atmosphere. It is nowadays a common saying that there is only one planet Earth which needs to be nurtured properly for preventing its man-made decay far ahead than its natural one. That is, preventing as well as finding out solutions for fulfilling the requirements of the people which is increasing in a geometric proportion whereas resources are still in arithmetic proportion. Rachel Carson, Sunderlal Bahuguna, Medha Patkar, Jadav Payeng and this very young ambassador of environmental health Greta Thunberg have demonstrated to the world the need for taking this cause in a serious manner for keeping the world intact in this direction.



14.15 MODEL QUESTIONS

A. Short Questions (Answer each question in about 150 words)

Q. 1: What does community medicine deal with?

Q. 2: What do you mean by health literacy?

Q. 3: What are the different areas of environmental communication?

B. Long Questions (answer in around 300-500 words)

Q. 1: What do you understand by the term health Communication ? How is it related to science communication ?

Q. 2: What are the general guidelines for health communication ? How were these guidelines formed over the years ?

Q. 3: Discuss the important aspects in terms of the use of medicine in the field of health communication. How can these be turned towards an advantage ?

Q. 4: Briefly write about the issues and prospects in connection to delivery of health care in the society. How can communication be of some support in this regard ?

Q. 5: Why is the relationship and communication between patient and a doctor or a health worker is considered so important ? How can this be improved for future purposes ?

Q. 6: Write briefly about the history of the physician-patient communication till preset day. How can we make it a better one in future ?

Q. 7: Identify the sources of news and information for various health-related aspects and elaborate on their advantages and disadvantages, if any.

Q. 8: What is your understanding of the term 'environmental health' ? Discuss it in the light of today's global situation.

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UNIT 15: LAWS, ETHICS & AWARDS FOR SCIENCE COMMUNICATION

UNIT STRUCTURE

15.1 Learning objectives

15.2 Introduction

15.3 Media Laws & Ethics

15.4 Laws related to Science

15.5 Awards for Science Communication

15.6 Let Us Sum Up

15.7 Further Reading

15.8 Answers to Check Your Progress

15.9 MOdel Questions

15.1 LEARNING OBJECTIVES

After going through this unit you will be able to ;

- explain the laws and ethics of science communication
- elucidate the need and significance of health communication
- explain the concept of environmental communication

15.2 INTRODUCTION

In this unit we will concentrate on the laws and ethics of Science Communication. The need and role of ethics in science communication will also be given particular attention here. In science communication laws and ethics are of particular significance as the entire concept is a broad one and needs elaboration. The following sections of the unit deal with such vital issues as freedom of speech and expression, media freedom and defamation and above all, the Official Secrets act of 1923 and the Right to Information Act.

15.3 MEDIA LAWS & ETHICS

Media laws in India have a long history and are deeply rooted in the country's colonial experience under the British rule. The earliest regulatory

measures can be traced back to 1799 when Lord Wellesley promulgated the Press Regulations, which had the effect of imposing pre-censorship on an infant newspaper publishing industry. The onset of 1835 saw the promulgation of the Press Act, which undid most of the repressive features of the earlier legislations on the subject. After that the then govt. enacted some other rules and regulations for the press, such as Gagging Act of 1857, Press and Registration of Books Act of 1867, Vernacular Press Ac' of 1878, Newspapers (Incitement to Offences) Act of 1908 etc.

Finally, the most significant day in the history of Media Regulations, was the 26th of January 1950 – the day on which the Constitution was brought into force. The colonial experience of the Indians made them realise the crucial significance of the 'Freedom of Press'. Although, the Indian Constitution does not expressly mention the liberty of the press, it is evident that the liberty of the press is included in the freedom of speech and expression under Article 19(1) (a). Thus, press freedom came to be enshrined in our constitution and became a fundamental right gauranting personal freedom in matters of speech and expression. Media also came to enjoy a good deal of freedom while maintaining the required norms of ethics.

In the next section of this course, we will discuss some important laws related to science.

15.3.1 Freedom of Speech and Expression

The Freedom of Press and the Freedom of Expression can be regarded as the very basis of a democratic form of government. Freedom of speech and expression means the right to express one's own ideas and opinions freely by words of mouth, in writing and printing, in pictures or any other possible mode. It thus includes the expression of one's ideas through any communicable medium or visible representation, such as, gesture, signs and the like. It means to speak freely without censorship. The freedom of expression also includes publication and thus, the freedom of press is included in this category.

Freedom of speech and expression is the most basic of all freedoms granted to the citizens of India under Article 19(1)(a). The freedom of speech and that of the press lie at the foundation of a democratic society, for without free political discussions, no public education is possible, which is so important for the proper functioning of the government. It allows us to express our ideas and thoughts freely through any medium such as print, visual, and voice. One can use any communication medium of visual representation such as signs, pictures, or movies.

15.3.2 Effects of Media Freedom in Emergency

There is no provision in our Constitution for the suspension of the Fundamental Rights except during the Emergency period as mentioned under the provisions in Part XVIII. Two Provisions relevant in this context are Articles 358 and 359. Article 358 deals with National Emergency, which empowers the state to suspend the operation of Article 19 (Right to Freedom of Speech and Expression which includes Freedom of Media) during the operation of a Proclamation of Emergency made under Article 352. Any law or order made after the coming into operation of the Proclamation of Emergency, cannot be challenged on the ground of violation of any provision of Article 19. Even after the Emergency is over, the constitutionality of the acts done during Emergency cannot be challenged on the same ground. Therefore, the effect of Article 358 is enormous on the Media Freedom which is guaranteed by Article 19. As soon as the Proclamation ceases to operate, the legislative enactments passed and the executive actions taken during the course of emergency shall be inoperative and Article 19 which remains suspended during the Emergency is automatically revived and begins to operate. The suspension of Article 19 under Article 358 applies to the whole country and covers all the States.

15.3.3 Defamation

Defamation is an intentional false communication, either written or spoken, that causes injury to a person's reputation, which is considered his precious property. Defamation is an actionable wrong. The wrong of defamation consists in the publication of a false and defamatory statement in respect another person without lawful justification or excuse.

There are two kinds of defamation: Written and Verbal. The common law origins of defamation lie in the torts of 'slander' (harmful statement in a transitory form, especially speech) and 'libel' (harmful statement in a fixed medium, especially in writing but also a in picture, sign, or electronic broadcast), each of which gives a common law right of action. The fundamental distinction between libel and slander lies solely in the 'form' in which the defamatory matter is published. If the offending material is published in some fleeting form, as by spoken words or sounds, sign language, gestures and the like, then this is slander. If it is published in more durable form, for example, in written words, film, compact disc (CD), DVD, in virtual space like Internet and the like, then it is considered libel. In more simple language, verbal defamation is known as slander while written defamation is known as libel.

15.3.4 Official Secrets Act, 1923

The Official Secrets Act, 1923 (OSA) is a comprehensive document relating to official secrets and it defines a number of offences. The Act is aimed at maintaining the security of the State against leakage of secret information, sabotage and the like. It is India's anti-espionage legislation held over from British colonisation. It states clearly that any action which involves helping an enemy state against India is liable for punishment. It also states that one cannot approach, inspect, or even pass over a prohibited government site or area. According to this Act, helping the enemy state can be in

the form of communicating a sketch, plan, model of an official secret, or of official codes or passwords, to the enemy. The disclosure of any information that is likely to affect the sovereignty and integrity of India, the security of the State, or friendly relations with foreign States, is punishable by this act. The Act is important from the point of view of the Press since many of the acts prohibited by law may be committed by newspapers and journalists, as private individual, while performing their duties.

15.3.5 The Right to Information Act

In 2005, the Right to Information Act 2005 (Act No. 22/2005) was enacted by the Parliament of India giving the citizens of India access to records of the Central Government and State Governments. The Preamble of the RTI Act sets out that it has been passed "in order to promote transparency and accountability in the working of every public authority". It also states that the Act will "harmonise" "the conflicting interests" of "revelation of information" with "public interests including efficient operations of the Governments" and "the preservation of confidentiality of sensitive information".

Under the Act, all complying departments must appoint their Public Information Officer (PIO). Any citizen of India may submit a request to the PIO for information in any format, paper or electronic. It is the PIO's responsibility to ensure that the information is obtained from the appropriate department or section. If the request pertains to another public authority (in whole or part) it is the PIO's responsibility to transfer/forward the concerned portions of the request to a PIO of the other authority within 5 days.

15.3.6 Prasar Bharati Act, 1990

In India, it was felt in the late 1980s that media should be under the control of the public as distinct from the Government. It should be operated by a public statutory corporation or corporations, as the

case may be, whose constitution and composition must be such as to ensure its/their impartiality in political, economic and social matters and on all other public issues. Prasar Bharati (Broadcasting Corporation of India) Act, 1990 came into force from 15th of September, 1997.

The Act provides for the grant of autonomy to electronic media, namely, All India Radio and Doordarshan, which were earlier working as independent media units under the Ministry of Information & Broadcasting. The intention is that the Corporation shall function as a genuinely autonomous body with an innovative, dynamic and flexible approach and with a high degree of credibility. Further, the Corporation as an autonomous body shall function in a democratic manner enriching our democratic traditions and institutions, being responsible to the people and the Parliament of India and keeping in mind the different traditions, languages and cultures of the country and various sections of the society.

15.3.7 Copyright Act

In the previous unit we have got an idea on the Copy Right Act 1957. Here we will have a brief concept of the technical part of the Copy Right Act 1957. A work of literature (including software) drama, music or art is an intellectual property. It must be protected from illegal copying or reproducing. The Copy Right Act, 1957 accords the protection.

In case of copyright there is no need to register the owner in India. The basic permit for copyright is that the author will be the owner of the copyright which refers to the person who actually did the job or sometime to the original source. On the otherhand, if the author is an employee and the job/work was created in accordance with the term of employment then the employer will own the copy right. In the Copyright Act, there is a provision for joint owners. The copyright owner gets the monopoly right until 60 years from the beginning of the year in which the work is first published.

The copy Right Act 1957 was amended in 1994. This amendment aims to empower an individual author to exercise his or her 'moral rights' in connection with his/her own literary, dramatic, musical or artistic work and cinematograph films. This right is not transferable to anyone.

15.3.8 Some Other Important Laws

Following are some other important laws pertaining to media freedom:

- **The Press and Registration of Books Act, 1867** – This Act regulates printing presses and newspapers and makes registration with an appointed Authority compulsory for all printing presses.
- **The Press (Objectionable Matters) Act, 1951** – This enactment provides against the printing and publication of incitement to crime and other objectionable matters.
- **The Newspaper (Prices and Pages) Act, 1956** – This statute empowers the Central Government to regulate the price of newspapers in relation to the number of pages and size and also to regulate the allocation of space to be allowed for advertising matter.
- **Defence of India Act, 1962** – This Act came into force during the Emergency proclaimed in the context of indo-Chinese was in 1962. This Act aimed at restricting the Freedom of the Press to a large extent keeping in mind the unrest prevailing in India in view of the war against China. The Act empowered the Central Government to issue rules with regard to prohibition of publication or communication that is prejudicial to the civil defence/military operations, prevention of prejudicial reports and prohibition of printing or publishing any matter in any newspaper.
- **Delivery of Books and Newspapers (Public Libraries) Act, 1954** – According to this Act, the publishers of books and

newspapers are required to deliver, free of cost, a copy of every published book to the National Library at Calcutta and one copy each to three other public libraries specified by the Central Government.

- **The Working Journalists and other Newspaper Employees (Conditions of Service and Miscellaneous Provisions) Act, 1955** – It lays down the minimum standards of service conditions for newspaper employees and journalists.
- **Civil Defence Act, 1968** - It allows the Government to make rules for the prohibition of printing and publication of any book, newspaper or other document prejudicial to the Civil Defence.
- **Press Council Act, 1978** – Under this Act, the Press Council was reconstituted (after 1976) to maintain and improve the standards of newspapers and news agencies in India.
- **Cable Television Networks (Regulation) Act, 1995** basically regulates the operation of Cable Television in the territory of India and regulates the subscription rates and the total number of total subscribers receiving programmes transmitted in the basic tier. In pursuance of the **Cable Television Network (Regulation) (Amendment) Bill, 2002**, the Central Government may make it obligatory for every cable operator to transmit or retransmit programme of any pay channel through an addressable system as and when the Central Government so notifies. Such notification may also specify the number of free to air channels to be included in the package of channels forming the basic service tier.
- **The Cinematograph Act, 1952** – The Cinematograph Act of 1952 has been passed to make provisions for a certification of cinematographed films for exhibitions by means of Cinematograph. Under this Act, a Board of Film Censors (now renamed Central Board of Film Certification) with advisory panels at regional centres is empowered to examine every film and

sanction it whether for unrestricted exhibition or for exhibition restricted to adults. The Board is also empowered to refuse to sanction a film for public exhibition.



CHECK YOUR PROGRESS

Q.1: What is Defamation?

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15.4 LAWS RELATED TO SCIENCE

15.4.1 Indian Patent Act 1970

The Patent Act, 1970 was amended in the context of India's time bound international obligations under the Argent on Trade Related Aspects of Intellectual Property Right (TRAIPR) coupled with the necessity for integrating and harmonizing the Indian Patent Regime with international practices for providing a rationalized and user friendly system.

The earliest known patent on an invention was awarded in Florence in 1421 to *Filippo Brunelleschi* for a barge with hoisting gear capable of transporting marble. In Britain the first such patent was awarded in 1449 to a Flemish glassmaker for a method of making stained glass windows. During the sixteenth century the English monarchs discovered that the sale of monopoly privilege could be very lucrative and granted patents on an indefinite basis to all manners of trades and manufactures, regardless of their novelty. Even the trade in commodities such as leather, salt, iron, and paper was patented. The consequent high prices of these goods led to accusations that such perpetual monopolies were unjust. Responding to this criticism, numerous patents were revoked. For example, the monopoly on the production of playing cards granted to Edwin Darcy was rescinded.

A patent is an exclusive right granted for a product or a process that provides a new way of job/work or offers a new technical solution to a problem. In some countries, the patents are granted to offer the main criteria for patentability. In India patent law came into existence with the Patent Act 1970.

There are various types of patents-

(a) Standard Patent: Applying for provisional patent is known as 'hold the line'. The permission for a standard patent (after getting complete application) will bestow full patent rights on the appealer. The amendment of Patent Act 1970 proposes that the period of standard patent protection will be from 14 to 20 years (depending upon when it is applied)

(b) Innovation patent: Actually it is a lower form of patent than the standard patent. There is some limitation in this type of patent. The enterprise can apply for only a maximum of five 'claims', but in case of a standard patent an enterprise can make any number of claims. Here the patent is functionally embedded in the invention.



LET US KNOW

INDIAN PATENT SYSTEM

- The first legislation in India relating to patents was the Act VI of 1856. The objective of this legislation was to encourage inventions of new and useful manufactures and to induce inventors to disclose secret of their inventions. The Act was subsequently repealed by Act IX of 1857 since it had been enacted without the approval of the British Crown
- In 1872, the Act of 1859 was consolidated to provide protection relating to designs. It was renamed as "The Patterns and Designs Protection Act" under Act XIII of 1872.
- This Act remained in force for about 30 years without any change but in the year 1883, certain modifications in the patent law were

made in United Kingdom and it was considered that those modifications should also be incorporated in the Indian law.

- The Indian Patents and Designs Act, 1911, (Act II of 1911) replaced all the previous Acts. This Act brought patent administration under the management of Controller of Patents for the first time.
- After Independence, it was felt that the Indian Patents & Designs Act, 1911 was not fulfilling its objective. It was found desirable to enact comprehensive patent law owing to substantial changes in political and economic conditions in the country. Accordingly, the Government of India constituted a committee under the Chairmanship of Justice (Dr.) Bakshi Tek Chand, a retired Judge of Lahore High Court, in 1949 t o review the patent law in India in order to ensure that the patent system is conducive to the national interest. The committee submitted its interim report on 4th August, 1949 with recommendations for prevention of misuse or abuse of patent right in India and suggested amendments to sections 22, 23 & 23A of the Patents & Designs Act, 1911 on the lines of the United Kingdom Acts 1919 and 1949.
- Based on the above recommendation of the Committee, the 1911 Act was amended in 1950(Act XXXII of 1950) in relation to working of inventions and compulsory licence/revocation.
- In 1957, the Government of India appointed Justice N. Rajagopala Ayyangar Committee to examine the question of revision of the Patent Law and advise government accordingly. The report of the Committee, which comprised of two parts, was submitted in September, 1959. The committee recommended retention of the Patent System, despite its shortcomings. This report recommended major changes in the law which formed the basis of the introduction of the Patents Bill, 1965. This bill was introduced in the Lok Sabha on 21st

September, 1965, which however lapsed. In 1967, again an amended bill was introduced which was referred to a Joint Parliamentary Committee and on the final recommendation of the Committee, the Patents Act, 1970 was passed. This Act repealed and replaced the 1911 Act so far as the patents law was concerned. However, the 1911 Act continued to be applicable to designs. Most of the provisions of the 1970 Act were brought into force on 20 th April 1972 with publication of the Patent Rules, 1972.

- This Act remained in force for about 24 years without any change till December 1994. An ordinance effecting certain changes in the Act was issued on 31 st December 1994, which ceased to operate after six months. Subsequently, another ordinance was issued in 1999. This ordinance was subsequently replaced by t he Patents (Amendment) Act, 1999 that was brought into force retrospectively from 1 st January, 1995. The amended Act provided for filing of applications for product patents in the areas of drugs, pharmaceuticals and agro chemicals though such patents were not allowed. However, such applications were to be examined only after 31-12-2004. Meanwhile, the applicants could be allowed Exclusive Marketing Rights (EMR) to sell or distribute these products in India, subject to fulfilment of certain conditions.
- The second amendment to the 1970 Act was made through the Patents (Amendment) Act, 2002 (Act 38 0f 2002). This Act came into force on 20 th May 2003 with the introduction of the new Patent Rules, 2003 by replacing the earlier Patents Rules, 1972
- The third amendment to the Patents Act 1970 was introduced through the Patents (Amendment) Ordinance, 2004 w.e.f. 1 st January, 2005. This Ordinance was later replaced by the Patents (Amendment) Act 2005 (Act 15 Of 2005) on 4 th April, 2005 which was brought into force from 1-1-2005.

Patents Rules

- Under the provisions of section 159 of the Patents Act, 1970 the Central Government is empowered to make rules for implementing the Act and regulating patent administration. Accordingly, the Patents Rules, 1972 were notified and brought into force w.e.f. 20.4.1972. These Rules were amended from time to time till 20 May 2003 when new Patents Rules, 2003 were brought into force by replacing the 1972 rules. These rules were further amended by the Patents (Amendment) Rules, 2005 and the Patents (Amendment) Rules, 2006. The last amendments are made effective from 5 th May 2006.

(For details the learners may visit the official website at http://www.patentoffice.nic.in)

Requirements to apply for patent

The permission for applying for a patent remains with the inventor of that particular product/idea. Sometimes there comes a problem as to who is the true inventor? The clear identification of the inventor is a fundamental step in commercializing inventions, which involves the entrepreneur. On the other hand, the ownership claim varies as there may be joint inventors who will own the patent and will have the equal share of patent right. But this factor is an added problem in the commercialization of IP. The general duration of patent is 14 to 20 year but under some consideration it can be extend by 5 more years.

In brief, it can be said that the patent owner has the right (during the tenure of patent) over the invention. The owner can exploit the right in terms of hiring, selling, licensing, importing and using a process to do something.

It is very important to mention here another or different question in an application of patent like 'who is the man behind the new idea'? Is the invention still confidential? Is the invention any tangible object or a new process for doing something? Etc.

15.4.2 Cyber Law

According to Wikipedia, the cyber law covers the legal issues related to the use of inter networked information technology. It is less a distinct field of law in the way that property or contracts are as it is a domain covering many areas of law and regulation.

Internet has evolved as a new medium. We receive e-mail, we take information from different website, we conduct electronic commercial transactions on pre-determine site, we download movie, songs. There are so many important necessities which the internet helps to fulfil. But we never bother about the different issues regarding cyber law unless we are somehow involved. We need to have a brief but clear concept on cyber law for our own benefit.

15.4.2.1 Types of cyber crime

1. **Individual affected by crime**

   Based on how an individual is affected ness by crime, cyber crime is differentiated into three categories- **Infringement of Privacy, Identify theft, and Cyber stalking.**

2. **Economy affected by crime**

   Based on how the economy is affected ness by crime, cyber crime is broadly differentiated into three categories- **Hacking, Computer virus etc.** Those who have watched the film *Om Jai Jagadish* or *Fida* can understand the reality of Computer Hacking. There are many films featured on the particular topic 'Hacking'. Hacking refers the unlawful penetration of a computer system. Information Technology Act 2000 provides for imprisonment upto 10 years or Rs. 2 Lakhs fine or both 'Hacking' as an offence.

3. **National Security affected by crime**

   Based on the national security being affected by crime, cyber crime is broadly divided into different categories. Out of which

Cyber Terrorism is considered most important. The creation of terrorism through cyber space is called cyber terrorism.

4. Other crimes through cyber space

The word 'pornography' is much known to us. Blue film, sex tourism, other pornography incidents through cyber space are some of the factors that cause problem for our growth.

15.4.2.2 Cyber laws in India

In May 2000, both the Houses of the Indian Parliament passed the information Technology Bill wich is known as the IT Act 2000. It includes cyber laws. IT Act emphasizes the legal infrastructure for e-commerce, legal frame work for all electronic records.

The IT Act aims to provide legal recognition for transactions carried out by means of electronic data interchange and other means of electronic communication, commonly referred to as "electronic commerce", which involves the use of alternatives to paper-based methods of communication and storage of information. It also facilitate electronics filing of documents with the government agencies.

In addition, the Central Government also notified two distinct kinds of Rules. These rules are: The Information Technology (Certifying Authorities) Rules, 2000 and the Cyber Regulations Appellate Tribunal (Procedure) Rules, 2000.

15.4.3 Drug and Magic Remedies Act, 1954

Drug and Magic Remedies (Objectionable Advertisement) Act, 1954 had been enacted to control the advertisements of drugs in certain cases and to prohibit the advertisement for certain purposes of remedies alleged to have possessed magic qualities and also to provide for matters connected therewith.

As it stands, the Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954, basically prohibits four kinds of

advertisements pertaining to drugs and magical cures. Section 3 of the Act says that no person shall take any part in the publication of any advertisement promoting a drug or leading to the use of a drug for the procurement of miscarriage in women or prevention of conception in women; the maintenance or improvement of the capacity of human being for sexual pleasure; and correction of menstrual disorders in women.

Section 3 further prohibits any advertisement promoting drugs for the diagnosis, cure, mitigation, treatment or prevention of any disease, disorder or condition specified in the Schedule. The schedule lists a number of diseases, disorders or conditions such as diabetes, cataract, cancer, fevers (in general), obesity, rheumatism, impotence, high or low blood pressure, female diseases, epilepsy, stature of persons, venereal diseases, glaucoma, sterility in women, dropsy, etc.

Section 4 of the Act prohibits those advertisements relating to a drug if such advertisements contain any matter which directly or indirectly gives a false impression regarding the true character of the drug or makes a false claim for the drug or which is otherwise false or misleading. Section 5 of the Act prohibits advertisements of magic remedies for treatment of certain diseases and disorders.

Violation of the law attracts imprisonment for six months or fine or both, for first conviction and for subsequent conviction, imprisonment for a year or fine or both.

15.5 AWARDS FOR SCIENCE COMMUNICATION

Kalinga Award

The **Kalinga Prize for the Popularization of Science** is an award given by UNESCO for exceptional skill in presenting scientific ideas to lay people. It was created in 1952, following a donation from the Kalinga Foundation Trust in India.

NCSTC AWARDS

National awards for science communicators are presented every year to recognize outstanding achievements of individuals and institutions. Each award comprises an attractive cash prize, a memento and a scroll presented at a national function on Science Day. The categories are-

- Outstanding Effort in Science & Technology Communication
- Outstanding Effort in S&T Communication through Books & Magazines
- Outstanding Effort in S&T Popularization among Children
- Outstanding Effort in Translation of Popular S&T Literature
- Outstanding Effort in S&T Communication in the Print Medium
- Outstanding Effort in S&T Communication in Electronic Medium

ISCA AWARD

Indian Science Congress Association instituted this award in 1994-95, and is given annually to an Indian national who has sustained interest for Popularising Science. The award carries a cash amount and a plaque. The recipient has to deliver a lecture on the topic of his/her contributions in the **Committee on Science and Society** during the Science Congress.

INSA INDIRA GANDHI PRIZE FOR POPULARIZATION OF SCIENCE

The award was instituted by the Indian National Science Academy in 1986 to encourage and recognize popularization of science in the country. The prize shall be awarded once in three years for outstanding work done by an individual for the popularization of science in any Indian language, including English. The nominee must have had a distinguished career as a writer, editor, journalist, lecturer, radio or television programme director, science photographer or as an illustrator, which has enabled him/her to interpret science (including medicine), research and technology to the public. He/ She should have knowledge of the role of science, technology and research in the enrichment of cultural heritage and in solution of problems of humanity. The first award was made in 1986.



15.6 LET US SUM UP

- The earliest regulatory measures can be traced back to 1799 when Lord Wellesley promulgated the Press Regulations, which had the effect of imposing pre-censorship on an infant newspaper publishing industry.
- the most significant day in the history of Media Regulations, was the 26th of January 1950 – the day on which the Constitution was brought into force.
- Freedom of speech and expression is the most basic of all freedoms granted to the citizens of India under Article 19(1)(a).
- There is no provision in our Constitution for the suspension of the Fundamental Rights except during the Emergency period as mentioned under the provisions in Part XVIII.
- Article 358 deals with National Emergency, which empowers the state to suspend the operation of Article 19 (Right to Freedom of Speech and Expression which includes Freedom of Media) during the operation of a Proclamation of Emergency made under Article 352.
- Defamation is an intentional false communication, either written or spoken, that causes injury to a person's reputation, which is considered his precious property.
- There are two kinds of defamation: Written and Verbal.
- The Official Secrets Act, 1923 (OSA) is a comprehensive document relating to official secrets and it defines a number of offences.
- In 2005, the Right to Information Act 2005 (Act No. 22/2005) was enacted by the Parliament of India giving the citizens of India access to records of the Central Government and State Governments.

Prasar Bharati (Broadcasting Corporation of India) Act, 1990 came into force from 15th of September, 1997. This act provides for the grant of autonomy to electronic media, namely, All India Radio and Doordarshan.

- The copy Right Act 1957 was amended in 1994.This right is not transferable to anyone.
- Cable Television Networks (Regulation) Act, 1995 basically regulates the operation of Cable Television in the territory of India and regulates the subscription rates and the total number of total subscribers receiving programmes transmitted in the basic tier.
- The Cinematograph Act of 1952 has been passed to make provisions for a certification of cinematographed films for exhibitions by means of Cinematograph.
- A patent is an exclusive right granted for a product or a process that provides a new way of job/work or offers a new technical solution to a problem.
- The earliest known patent on an invention was awarded in Florence in 1421 to Filippo Brunelleschi for a barge with hoisting gear capable of transporting marble.
- The cyber law covers the legal issues related to the use of inter networked information technology.
- In May 2000, both the Houses of the Indian Parliament passed the information Technology Bill wich is known as the IT Act 2000.
- Drug and Magic Remedies (Objectionable Advertisement) Act, 1954 had been enacted to control the advertisements of drugs in certain cases and to prohibit the advertisement for certain purposes of remedies alleged to have possessed magic qualities and also to provide for matters connected therewith.
- The Kalinga Prize for the Popularization of Science , instituted in 1952, is an award given by UNESCO for exceptional skill in presenting scientific ideas to lay people.
- Indian Science Congress Association instituted the ISCA award in 1994-95 which is given annually to an Indian national who has sustained interest for Popularising Science.
- The INSA Indira Gandhi Prize for Popularization of Science was instituted by the Indian National Science Academy in 1986 to encourage and recognize popularization of science in the country.



15.7 FURTHER READING

1. Bucchi, Massimiano & Brian Trench (2008), *Handbook of Public Communication of Science and Technology*, Routledge
2. Wilson,Anthony (1998), *Handbook of Science Communication*, Overseas Press



15.8 ANSWERS TO CHECK YOUR PROGRESS

Ans. to Q. No. 1: Defamation is an intentional false communication, either written or spoken, that causes injury to a person's reputation, which is considered his precious property.



15.9 MODEL QUESTIONS

A. Short Questions (Answer each question in about 150 words)

Q. 1: What is Cyber Law? What are its different types?

Q. 2: What are the different laws related to science communication?

Q. 3: What are the basic requirements for applying a patent?

B. Long Questions (Answer each question in about 300-500 words)

Q. 1: What are the different awards that have been instituted in the field of science communication?

Q. 2: Discuss the Indian Patent System right from its inception to its present stage.

Q. 3: Do you think Cyber Law has been able to clamp down on the growing incidence of cyber crime? Give reasons in support of your answer.

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3) Bucchi, Massimiano & Brian Trench (2008), *Handbook of Public Communication of Science and Technology,* Routledge

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Important websites -

Kerala State Council for Science, Technology and Environment (KSTEC), https://kscste.kerala.gov.in/

Institute of Fundamental Technological Research, Polish Academy of Sciences, https://www.ippt.pan.pl/en/scientific-activities/popularizing-science

Website of Vigyan Prasar / NCSTC / CSIR-NISCAIR / ASTEC, Science Outreach & Popularisation, https://www.indiascienceandtechnology.gov.in/covid-19-the-pandemic/awareness-material/science-outreach-popularisation

Boosting public understanding of science and technology in developing countries, https://www.nature.com/wcs/c16.html