

SCIENTIFIC LITERACY AND HUMAN VALUES: ROLE OF MEDIA FOR DEVELOPING A SUSTAINABLE LIVING

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ABSTRACT

The preparation of scientifically literate citizens is the central and the most important curricular goal of Science education. There are various conceptions of scientific literacy like awareness and understanding of Science concepts, development of process skills, understanding of nature of Science, etc., but one of these is the understanding of Science, technology and society interface (STS) which is the common core element of scientific literacy. Role of media is instrumental in spreading information, awareness against superstitions, initiating debates on critical scientific issues and ultimately developing human values. Media in its several forms influences society in order to build up a scientific attitude in people which becomes the precursor for the development of a scientifically literate person who has the essential attributes of awareness and understanding the Science vocabulary and also use them in their daily lives, a sensitivity towards their environment which leads to a sustainable living culture. This paper is an attempt to showcase the role of various forms of media for developing scientific literacy for sustainable development. With the help of few empirical experiences the role of media in spreading awareness and changing the lives of masses is the part of this paper.

Key words: *scientific literacy, sustainable development, media, Science education, mass awareness, human values*

Introduction

Scientific literacy (SL) has become a buzzword in Science education circles worldwide. Achieving scientific literacy for all is the central goal of Science education. Scientific literacy is the capacity to apply scientific knowledge, to analyze and to evaluate and synthesize information to understand the societal and environmental issues and to take informed decisions. The preparation of scientifically

literate citizens is the central and foremost important curricular goal of Science education. There are various conceptions of scientific literacy like awareness and understanding of Science concepts, development of process skills, understanding of nature of Science, etc., but one of these is the understanding of Science, technology and society interface (STS) which is the common core element of scientific literacy.

Reading and writing of Science articles can also be included in the definition of scientific literacy. Also the development of attributes

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related to Scientific literacy prove to be precursor for development of human values in an individual.

Role of media (here we are restricting to media variants other than Social Media) is instrumental in spreading information, awareness against superstitions, initiating debates on critical scientific issues. Media in its several forms influences society in order to build up a scientific attitude in people which becomes the precursor for the development of a scientifically literate person who has the essential attributes of awareness and understanding the Science vocabulary and also use them in their daily lives, a sensitivity towards their environment which leads to a sustainable living culture. The balance between the technology usage and its impact on society is the key to a sustainable culture. The techno-exploded lifestyle of today may lead us towards exploitation of natural resources and may ruin the natural equilibrium essentially to be maintained between the biotic and abiotic world. It is imperative to bring awareness among the citizens for the better use of available resources to bring out maximum for the betterment of the society.



Source:<http://image.slidesharecdn.com/roleandimpactofmediaonsocietyfinalppt-121115214512-phpapp02/95/role-and-impact-of-media-on-society-final-ppt-5-638.jpg?cb=1353015980>

What is Scientific Literacy?

The term scientific literacy is defined as “a civic competency required for rational thinking about Science in relation to personal, social, political, economic problems and issues that one is likely to meet throughout life” Hurd (1998).

Scientific literacy is a very broad term and it has variety of diverse meanings. Roberts (1983) echoed this view “scientific literacy has had so many interpretations that it now means virtually everything to do with Science education” and now it has “become an umbrella concept to signify comprehensiveness in the purposes of Science teaching in the schools”

Scientific literacy is a comprehensive term that not only includes scientific ideas and concepts, but also scientific processes.

PISA (1998) defined scientific literacy as “The capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity”.

PISA (2006) defines SL as the “ability of students to use their scientific knowledge and skills in different areas and in different life situations”. Hazen & Trefil, 1991 defined scientific literacy as “the knowledge you need to understand public issues. It is a mix of facts, vocabulary, concepts, history, and philosophy” Defined at the simplest level “scientific literacy” is just another name for “what the general public ought to know about Science” (Durant, 1993).

According to Bybee (1997) “The phrase scientific literacy for all learners expresses the major goal of Science education—to attain society’s aspirations and advance individual development within the context of Science and technology”.

Pella et al. (as cited in Laugksch) in 1966 attempted to give an empirical basis for the definition of scientific literacy. According to Pella, et al. scientifically literate people have clear understanding of following dimensions:

- a) Interrelationship between Science, technology and society
- b) Work Ethics of scientists and how ethics influence their work
- c) Nature of Science

- d) Difference between Science and technology

- e) Interdependence and interrelationship between Science and arts.

Pella’s concept of scientific literacy was further expanded by Showalters in 1974. He integrated literature on scientific literacy of 15 years and put together into a definition of scientific literacy. According to Showalters scientific literacy has seven dimensions and a scientifically literate person has following attributes (here she is used for she/he both):

1. She has the understanding of Nature of Science.
2. She can use scientific knowledge in solution of socio societal problems.
3. She can interact with his/her environment in a manner which is consistent with the values and ethics of Science.
4. She can appreciate the diversity and laws of nature. A scientifically literate person is always a lifelong learner.
5. She has the understanding of interrelationship and interdependence of Science, technology and society.
6. She has various skills such as observation, drawing inference, evaluation and prediction, etc. which she can accurately apply while interacting with her environment.
7. She has the ability to use processes of Science in making informed decisions and drawing conclusions.

Attributes of a scientifically literate person

Scientific literacy is a multidimensional concept and scientific literacy is of various types and degrees. Shen, 1975; Shamos 1995; National Research Council (NRC) National Science Education Standards in 1996 has given a comprehensive definition of scientific literacy and has enlisted some attributes of a scientifically literate individual (NRC, 1996).

According to National Science Education Standards indicate a scientifically literate individual has an understanding of following six major components of scientific literacy:

- (1) Science as enquiry
- (2) Science content
- (3) Science and technology
- (4) Science in personal and social perspectives
- (5) History and Nature of Science
- (6) Unifying concepts and processes.

Why is Scientific Literacy Important?

Scientific literacy is very important for following reasons:

1. The most important reason for having scientifically literate citizenry is that having basic understanding of Science and technology is the key to development and progress of a nation. Scientific Literacy can be seen as a form of human capital that ameliorates the health of a nation.
- 2 Scientific literacy is a prerequisite for a just and equitable society where there is no place for superstitions. A scientifically literate citizenry take informed decisions based on logic and

reasoning. As Shamos (1996) argues “a scientifically literate individual is aware of some of the major conceptual schemes (the theories) that form the foundations of Science, how they were arrived at, and why they are widely accepted, how Science achieves order out of a random universe, and the role of experimentation in Science. This individual also appreciates the elements of scientific investigation, the importance of proper questioning, of analytical and deductive reasoning, of logical thought processes, and of reliance upon objective evidence.”

3 Scientific literacy is also must for personal development of an individual. By having scientific literacy people would develop more positive attitude towards Science. Scientifically literate would be free from biases and superstitions and are more rational beings. Scientific literacy can be thought of an antidote to superstitions and antiScience.

4 Scientific literacy is also advocated for its key role in creating a democratic society. Thomas and Durant supported this argument by stating “Scientific literacy may be thought to promote more democratic decision-making (by encouraging people to exercise their democratic rights), which may be regarded as good in and of itself; but in addition, it may be thought to promote more effective decision-making (by encouraging people to exercise their democratic right wisely” (Thomas & Durant, 1987).

Assessment of Scientific Literacy

For assessing scientific literacy various issues need to be considered. Being scientifically literate is not a 'yes' or 'no' thing. There are various levels of scientific literacy. Shen (1975) has suggested the following levels of scientific literacy:

1. The lowest level is called functional literacy and refers to 'the ability of a person to function normally in their daily life as a consumer of scientific and technological products.'
2. Higher levels of literacy include civic literacy and cultural literacy. Civic literacy refers to the ability of a person to take informed decisions while dealing with scientific and technological issues. Cultural or ideal literacy refers the ability to appreciate scientific endeavour.

Shamos (1996) developed "passive to active scale" for assessing level of scientific literacy of an individual. Individual at passive level can only recall scientific terms and facts while individual at active level can effectively communicate and use scientific knowledge in daily activities.

Bybee (1997) has developed a multidimensional theoretical scale for assessing scientific literacy comprehensively. This scale can be effectively used for assessing scientific literacy of school students. This scale is hierarchical in nature which can be useful for instructional purposes. According to this scale there can be following levels of scientific literacy:

Scientific illiteracy: Scientifically illiterate students are those who are not able to respond to a scientific question and who do not have vocabulary of Science and cannot identify the problem as a scientific one.

Nominal scientific literacy: Students at nominal scientific level can recognize scientific concepts, but have various misconceptions regarding scientific knowledge

Functional scientific literacy: Students at functional scientific literacy level can explain a scientific concept but have limited understanding of that concept.

Conceptual scientific literacy: Students at conceptual scientific literacy level had some conceptual understanding of general Science and can relate to scientific knowledge. Students have the procedural abilities and can understand the process of scientific enquiry.

Multidimensional scientific literacy: Students at multidimensional scientific literacy level had an adequate understanding of Science that transcends beyond the facts and concepts of Science. They had understanding of epistemology of Science, i.e. how Science works. Achieving scientific literacy required lifelong learning. Students must have positive scientific attitude and interest in Science. National Research Council (1996) in the U.S (as cited in Schwartz et al., 2006) states "Scientific literacy has different degrees and forms; it expands and deepens over a lifetime, not just during the years in school. But the attitudes and values

established toward Science in the early years will shape a person's development of scientific literacy as an adult".

Assessment is an inseparable component of all teaching and learning process. Assessing scientific literacy is an important task when achieving scientific literacy is the key curricular goal of Science education. In recent times PISA and TIMSS are two programs which assessed scientific literacy in a very comprehensive manner. PISA stands for Program for International Student Assessment and is organized by the Organization for Economic Co-operation and Development (OECD) after every 3 years and students of all participant countries are assessed in this program. The main objective of PISA is to evaluate how well students are able to apply scientific knowledge in solving contemporary problems at their local level, i.e. "practical knowledge in action". According to PISA scientifically literate students can recognize questions as scientific and can sift relevant information and have the ability to arrive at conclusions only after critically evaluating them and can appropriately communicate scientific ideas. TIMSS stands for Trends in Mathematics and Science Studies (TIMSS). It mainly evaluate how well a student can recall the scientific content.

Role of Media in Developing Scientific Literacy and Human Values among Individuals

The term 'media' is the plural of medium, which has several meanings in its own, few of them can be addressed here 'An intervening substance through which something else is transmitted or carried on', one more description says 'An agency by which something is accomplished, conveyed, or transferred'. A medium is something that serves as a middle person for transferring information. Media started from hand published newspapers/ pamphlets/ magazines to evolving in the multibillion industry of today. Media in its best has the capability of toppling governments, making someone a superstar, spreading awareness and information related to contemporary issues and peoples rights among a large number of audiences. This information and awareness also help people to build their attitude towards logical thinking rationality, criticality, value system, sensitivity towards their environment in order to lead a sustainable life.

Types of Media

Electronic Media: This is the form of media through which communications are delivered via electronic or electromechanical energy.

Digital Media: This is the form of electronic media used to store, transmit and receive digitised information.

Broadcast/ Telecast/ Webcast Media: This is the form of media through which communications are delivered over mass electronic communication networks.

Advertising Media: This type of media content deals with the buying and selling of goods, basically it deals with publicity and popularisation of things related to business and others.

Mass Media: This category of media encompasses all means of mass communications.

Multimedia: This is the form of media involves communications that incorporate multiple forms of information content and processing, etc.

Hypermedia: This is the media with hyperlinks.

Need of different Media

The question essentially pertains that what is the need of media in our lives? While trying to get the answer we have to keep in mind that we are living in the age of information and being well-informed or spreading it can make a lot of difference. Media is the largest stakeholder in terms of spreading information, and this task has been done by various media variants very

efficiently. This throws a high level of responsibility on the shoulders of media as the information which is being spread can trigger various responses from the masses.

Studies suggest that continuous exposure to media reports can trigger variable or distinct physiological responses in human beings, this shows the path of using media as a tool for developing scientific literacy in individuals.

Analogies of Media Contribution in Developing Scientific Literacy and Human Values

The first case to mention here is reported from Rampur, India, an evaluation of the impact of a Backyard Poultry Farm School radio program, broadcast in the local language weekly on the national broadcaster, All India Radio-Rampur for 13 weeks between April 6 and June 29, 2005, concluded that the broadcasts helped in creating awareness, bringing change in negative attitudes towards backyard poultry farming, mobilising people and increased farmer participation and inclination in farm schools and poultry farming (Sasidhar, et al., 2008).

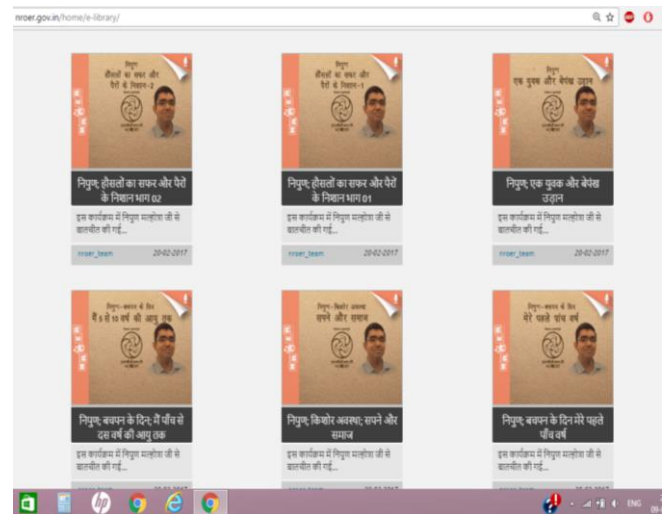
The next case is of a National ICT awardee of year 2011, Dr. Hari Krishna Arya from Rajasthan. Using the local environment for exploration and encouraging participatory approaches, Mr. Arya has been successful in overcoming typical resource constraints of a rural school. Leveraging a variety of technological tools, he has helped students take ownership of their learning and presenting it to a peer group for acceptance. Enthused by the success, he has developed a web based virtual classroom expanding his methods to five remote schools in the district (ICT Awards citation booklet, 2010-2015). The use of communication devices and techniques has helped him let the students from many remote villages of Rajasthan connect with teachers from best schools of Delhi. This effort has also

contributed in the development of these children in multifarious ways.

A personal experience needs a mention here refer to the programs produced by 'Vigyan Prasar' which are based on Science and Technology, Mathematics, Communication, etc. The different series made by them are highly informative and provide empirical evidences of using scientific concepts processes and phenomenon in the daily lives of all of us. Including these there are various Audio, Video and Multimedia programs on contemporary issues and on generating awareness towards Science developed by Central Institute of Educational Technology (CIET), National Council of Educational Research and Training (NCERT) which are available in the form of DVDs from the campus as well as now they are made available through the National Repository of Open Educational Resources (NROER) and the ePathshala website and

Mobile Application. These programs are recorded and developed in CIET studios with the help of experts from the areas. The activity based programs like Chemistry Physics, Mathematics and Biology experiment series are very effectively prepared under the guidance of respective subject faculties from NCERT departments, and can prove to be highly useful for the students everywhere, but especially for those they are more helpful who do not have the opportunity to be taught by very good teachers.

In continuation to the mentioned stories, various Audio/Video programmes are being developed where success stories of specially abled persons have been recorded, for example a series on 'Nipun Malhotra' who is suffering with a problem called Arthogryposis (It is a disease where children are born with one or more joint contractures, have abnormal fibrosis of the muscle tissue causing muscle shortening, and therefore are unable to perform active extension and flexion in the affected joint or joints), this audio series of 6 programs called 'Rahein kathin to hain magar' provides its listeners the sense of gratitude and empathy. Also the extraordinary efforts made by the specially abled makes us think humanistically and develops human values in us.



Source: nroer.gov.in

Conclusion

The balance between the technology usage and its impact on society is the key to a sustainable culture. The techno-exploded lifestyle of today may lead us towards exploitation of natural

resources and may ruin the natural equilibrium essentially to be maintained between the biotic and abiotic world. It is imperative to bring awareness among the citizens for the better use of available resources to bring out maximum for the betterment of the society. This is possible only when the citizens of today adopt scientific literacy and its key ingredients in their lifestyles. Role of media is instrumental in spreading information, awareness against superstitions, initiating debates on critical scientific issues and in turn becoming instrumental in developing human values. Media in its several forms influences society in order to build up a scientific attitude in people which becomes the precursor for the development of a scientifically literate person who has the essential attributes of awareness and understanding the Science vocabulary and also use them in their daily lives, a sensitivity towards their environment which leads to a sustainable living culture. Various examples have proven that different media forms have proven to be very effective in developing scientific literacy among the individuals and enabling them to lead a sustainable life.

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