ROLE OF PRINT AND TRADITIONAL MEDIA IN POPULARISING SCIENCE IN RURAL KERALA: A CASE STUDY OF KERALA SASTHRA SAHITYA PARISHATH

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DECLARATION

I, Muhammadali. N, hereby declare that this thesis entitled **Role of Print and Traditional Media in Popularising Science in Rural Kerala: A Case Study of Kerala Sasthra Sahitya Parishath** is a bonafide record of research work done by me and that it has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar title or recognition in the University of Calicut or any other University.

Calicut University
Date: 21.11.08

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CERTIFICATE

This is to certify that the thesis entitled **Role of Print and Traditional Media in Popularising Science in Rural Kerala: A Case Study of Kerala Sasthra Sahitya Parishath** is a record of bonafide research carried out by **Muhammadali. N** under my supervision and guidance.

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CONTENTS

PREFACE

Popularisation of science and technology plays a vital role in all-round development of societies. In particular, science popularisation stimulates intellectual accomplishments, catalyses technological advancement, promotes creativity, produces proficient human resources, prevents environmental degradation and strengthens educational systems.

Recognizing such potential of science popularisation, vigorous efforts have been made in both developing and developed nations over the last fifty years to increase the level of public understanding of science. But, the results have been less than satisfactory. Why did the science popularisation programmes failed to achieve the desired outcome?

To seek answers to this question, many studies have been carried out by academia as well as governmental agencies. Most of the studies however, approached the problem from sociological or educational perspective, overlooking the significance of 'communication' in science popularisation process. And, the limited number of studies conducted from communication perspective have tended to focus on the issues like coverage of science in popular media, public perception of science and so on, ignoring the need to examine the scope of public science movements and traditional media. Moreover, science communication in most of the developing nations has remained unexplored. It is in this context that the present study was carried out.

The study sought to examine the rural people's dependence on alternative sources of science information through a case study of Kerala Sasthra Sahitya Parishath (KSSP), a non-formal public science movement of Kerala State in India.

In particular, the study assessed the varying reliance of rural people on KSSP's print media, traditional media as well as other sources of science communication such as public meetings, exhibitions, seminars and so on. In

addition, understanding of science among KSSP media users and non-users was assessed to ascertain whether KSSP media users have a better science understanding in relation to the non-users of KSSP media. Data collected on these facets through a survey at the village level have revealed the relative importance of KSSP media in social distribution of science information. Besides unveiling the relationship between socio-demographic variables and media use for science information, the study has provided a new insight into the existence of science knowledge gap in rural societies.

The details of the study are organized in five chapters. The first chapter provides a comprehensive overview of science as a knowledge area, the concept of public communication of science and the KSSP's organizational structure and its science communication efforts through various media.

A brief review of literature related to the topic is given in Chapter II. The past studies reviewed are detailed in five sections such as source, message, channels, receiver and effect studies. And, under each section, related studies have been ordered to give better understanding of the inquiry trends in the area. As a necessary requisite, KSSP related studies have also been reviewed.

Chapter III describes the methodology used for the investigation. A detailed description of the sampling technique and data collection tools used for the study forms the central theme of the chapter.

While the Chapter IV presents the results of data analysis and summarizes findings in five units corresponding to the study objectives, the final chapter discusses the findings in the context of science communication process in rural areas.

Though the present investigation has not examined any hypothesis, it provides pointers to certain propositions that are worth investigating as hypotheses in future studies. In addition, the last chapter also provides certain recommendations for science communication at the grass root level and for research studies of such endeavors from a communication perspective.

List of Tables

List of Figures

Chapter I

PUBLIC COMMUNICATION OF SCIENCE

INTRODUCTION

In the last few decades, communication of science has become a much-discussed theme at all levels of public discourses and policymaking. Most policy makers now integrate the concept into the cultural progress and economic wellbeing of nations and societies. Some scholars stress the value of science in terms of citizens' cultural development while others reckon its significance as a prerequisite for technological innovation and the ensuing social development (Irwin, 2001). Some view that public understanding of science will permit people to understand scientific basis of modern life, so that they can more actively participate in social and political debates and initiatives (Lam, 2001). But, there is no consensus on how scientific information can be disseminated to people effectively, for equipping them to evaluate and utilize the socio-political and economic dimensions of contemporary world in a scientific perspective.

Much of empirical research published so far on science communication has analysed the problem from sociological or educational perspective, ignoring communication standpoints. Similarly, a large number of studies have overlooked the process of popularisation of science among rural people and the intricacies involved in such communication contexts. The present study, which is envisaged as a case study of a public science movement engaged in popularisation of science, is an analysis of communication strategies employed to increase science awareness among rural masses. In that sense, the present work attempts to explore various dimensions of popularisation of science from a communication perspective, rather than the traditional sociological or pedagogical prisms.

To get a fuller understanding of the concept of popularisation of science, this chapter is organized to provide a comprehensive overview of science and its evolution in historical perspective and the concept of public communication of science through various methods and channels. The chapter also deals with the emergence of science popularisation movements

in general and Kerala Sasthra Sahitya Parishath, the case under this study, in particular.

SCIENCE, SOCIETY AND DEVELOPMENT

Science is a body of empirical, theoretical and practical knowledge about the natural world, produced by making use of scientific methods, which emphasize the observation, experimentation and explanation of real world phenomena. It is supposed that scientific knowledge is reliable because it is continually tested and retested. However, scientific knowledge is never considered as infallible; that is why at no point scientists assume that they have arrived at a final, definitive truth. So, science is just a methodological interpretation of the universe, its elements and various concomitants. In this sense, science is naturalistic: it is all about natural processes and events. Science involves both description, which tells what happens / has happened and explanation, which tells why it happens / happened (Heilbron, 2003).

In the very beginning of human history, man started to observe and explain his surrondings in order to survive against natural challenges. Many ancient civilizations collected astronomical information in a systematic manner through simple observation. And, these abstract investigations were known as natural philosophy, where reason was not considered as opposite to belief and viceversa as seen in the discourses of modern science. The dichotomy betweem religion and science, as seen now, never existed in the calssical antiquity. The *natural philosophers* considered themselves as practitioners of skilled professions as well as followers of religious traditions simultaneously and they passed advice and knowledge from generation to generation through oral tradition. But, this information dissemination was most often confined to the upper hierarchy of the society (Lakatos, 1976).

It is from the Middle Ages that employment of scientific method and emphasis on rationalism started to appear in investigations. The important legacy of this period included substantial advances in factual knowledge, especially in anatomy, zoology, botany, mineralogy, geography, mathematics and astronomy; an awareness of the importance of certain scientific problems, especially those related to the problem of change and its causes; and a

recognition of the methodological importance of applying mathematics to natural phenomena and of undertaking empirical research. Preservation of scientific results in written form was also intensified during this phase of history (Rousseau and Porter,1980). However, overemphasis on rationlism and confinment of scientific information in textual form led to the alienation of the clergy and the believers from science though there were sincere attempts to communicate science with the public by scientists like Galileo Galilei (AD 1564 - 1642).

The dawn of modern science is generally traced back to the early modern period, which is charecterized by the Scientific Revolution of the 16th and 17th centuries. Innovations during this period revolutionized human destiny permitting new power structures to come up and define societal relationships which again helped widen the gap between science and a major portion of the society. However, liberal political thinking and democratization of knowledge in 19th century paved the way for public's engagement with science, though, in a limited manner (Grant, 1996).

During the post World War era science was identified as a better tool for equittable development of the societies and public's engagement with science as an index of national progress. This prompted nations to incorporate public communication of science into development communication, where the process of communication is not just an interaction between the sources and receivers but, a complex system fulfilling certain social functions.

Scientific research being a true political, cultural, social and economic driver, science communication has become essential to all democracies to ensure participatory policy making in science and technology matters (Giovanni, 2006). Mintz (2005) observes that as the world is profoundly shaped by science, the corollary assumption is that everyone needs to understand science. Unarguably, many science-related topics have public policy implications. A democratic form of government is predicated on the existence of well-informed electorate, capable of participating in the decision making process. This creates both a challenge and an opportunity for science communicators especially those who communicate science with people. Not

just this. It is also important to prevent the birth of a social class, made up of people who know nothing about the progress of the techno-sciences, and cannot understand how the modern world works, and are therefore unable to participate in the life of a technological society.

Communication of science can also help inform other scientists of the activities in various branches of science overcoming the gaps among different disciplines. Progress in science and technology are, in fact, so rapid and numerous that in general scientists are only able to keep themselves updated in a highly specialized niche area of knowledge. All scientists, in other words, are part of the public when something, which lies outside of their field, is discussed (Wellcome Trust, 2000).

All such derivations lead to the necessity of pursuing an effective strategy for communicating science with public in order to construct social consensus on scientific policy, the very foundation of national development.

Supporting this view, Kai Xun (2003) observes that influence of science on a society is determined by the level of development of science on the one hand and by the extent of public understanding of science on the other. Such a two dimensional relationship of science with human development increases the relevance of the concept of public communication of science.

PUBLIC COMMUNICATION OF SCIENCE

Burns et al. (2000) defines public communication of science as the use of appropriate skills and channels to produce one or more of the following public responses to science: awareness, enjoyment, interest, opinion forming and understanding.

According to Lewenstein (1992), the aim of communicating science to public is the ‘understanding of science’ by citizens to ensure a great support for science and scientific approaches. Historically, most initiatives for communicating science with public emerged from within the scientific community itself, be it the case of Galileo or Archimedes, though they failed in it desperately.

It is with the rise of mass circulation of newspapers in Europe and in the United States of America in 19th century, that scientific information began

to reach the public intensively. However, even in the second half of the 20th century, this penetration could not evoke enough intellectual public support to scientific ways of thinking. By the middle 1970s, these concerns led to well-designed surveys, which attempted to measure public knowledge of, and attitudes towards science and technology (Ziman, 1992). The surveys showed that only 5 percent of the public even in developed countries were scientifically literate, and only 20 percent were interested and informed. The rest, by formal definition, were ‘residual’ (Miller, 1983).

These studies have led to concerns over the lack of scientific knowledge among laymen, and then follow new approaches for providing information to fill knowledge gaps (Ziman, 1991). This approach is known as the *deficit model* of science communication, as it describes a deficit of knowledge that must be filled, with a presumption that after fixing the *deficit*, public understanding of and support for science will increase. This way of dealing the problem focused on the linear effects of one-way top-down asymmetrical flow (of knowledge) from the considerably active scientific community through the mass media or directly to the public. Scholars have identified a series of difficulties with the *deficit* model (Greco, 2004).

In communication perspective, this conceptualization, which is based on the power of scientific information sources, resembled the hypodermic needle theory that holds that the media are so powerful that the audience is powerless to resist their influence. Moreover, in *deficit* model, science and society are considered as two social bodies separated by a sort of semi-permeable membrane that allows the flow of information (dissemination) and actions (technological innovation) from science into society (Resnick and Resnick, 1977).

Another criticism of *deficit* model is that after decades of active attempts to affect public knowledge of science through this approach, no remarkable change in the level of public understanding of science was noticed as was revealed in several intercontinental surveys. Despite vigorous activity in public communication of science and technology, perspective of "filling the deficit" does not seem to have reduced the problem.

To overcome inherent shortcomings in *deficit* model the *contextual* model was developed. The *contextual* model acknowledges that individuals do not simply respond as empty containers to information, but rather process scientific information according to social and psychological schemas that have been shaped by their previous experiences, cultural context and personal circumstances. *Contextual* model also recognizes the ability of social systems and media representations to either dampen or amplify public concern about specific issues (Kasperson *et al.* 1988). In this approach, receivers are considered as active elements of communication process.

It is very much evident that the second phase of media effects research, which is called limited effects approach, has influenced the development of *contextual* approach in science communication. According to this approach, people control their exposure to and use of media content through various selectivity processes - selective exposure, selective attention, selective perception and selective recall- considering their contextual viability (Bucchi, 1998).

PUBLIC UNDERSTANDING OF SCIENCE

Public understanding of science refers to the scientific literacy of the public. Shen (1975) suggested that the public understanding of science and technology could be divided into practical scientific literacy, cultural scientific literacy and civic scientific literacy. While practical scientific literacy means possession of the kind of scientific knowledge that can be used to help solve practical problems, civic scientific literacy enables citizens to become sufficiently aware of science and science-related public issues so as to involve themselves in the decision making process. Cultural scientific literacy is generally motivated by a desire to know something about science as a major human achievement.

Gregory and Miller (1998) argue that there are some basic reasons for improving the public understanding of science. Firstly, some knowledge in science will enable the public to make better political and social decisions. Science literates are bound to make better political choices as compared to the scientifically illiterate. In the absence of widespread scientific knowledge,

science elite will develop policies that may subsequently lead to the erosion of the democratic institution. Secondly, an understanding of the basis of modern technology brings better economic returns and promotes sound public life. Thirdly, it will eradicate irrational views about life and nature. The fourth reason is that behaviours will improve if the public knows the consequences of unscientific practices, and finally, familiarity with the scientific knowledge is supposed to lead to a more ethical worldview.

Miller (1983) observes that, given the wide array of scientific and technical applications in everyday life, scientific literacy might include everything from reading the label on a package of food, to repairing an automobile, to reading about the newest images from the Hubble telescope. Miller holds that, given the nature of the postulates of different kinds of scientific literacy, civic scientific literacy is conceptually most appropriate with the concept of public understanding of science.

Keeping this in mind, Miller (1983) argues that civic scientific literacy is a multi-dimensional construct. He suggests that civic scientific literacy should be conceptualized as involving three related dimensions: i) a vocabulary of basic scientific constructs to read competing views in a newspaper or magazine, ii) an understanding of the process or nature of scientific inquiry, and, iii) some level of understanding of the impact of science and technology on individuals and society. Miller's conceptualization has become prevalent in the discourses of public understanding of science and civic scientific literacy has been used as an equivalent construct for public understanding of science in most empirical studies conducted in the area.

Another question is about the ways of creating scientifically literate public. Science attempts to settle a conjoint of systematic ideas, with a logical structure; whereas, very often, common knowledge is non-systematic and based on statements, devoid of logical rationality. Therefore, when science attempts to reach large audiences, it is necessary for professional communicators to overcome the distance between both types of knowledge. Thus, the concept of science popularisation is positioned at the epicenter of science communication studies as a means to increase public understanding of science (Kearl, 1963).

SCIENCE POPULARISATION

The term “science popularisation” was coined in the late 1950s, and appeared in print for the first time in Paul Hurd’s (1958) publication entitled *Science Literacy: Its Meaning for American Schools.* Hurd introduced the concept in modern premises as a way to achieve public understanding of science which simply means that the public should have some knowledge of science. The term encompasses a variety of activities, disciplines and approaches that seek to communicate science to a heterogeneous, large audience. Since the practices are usually carried out in appropriate and available practical ways, without proper theory to sustain, there is no commonly accepted definition for science popularisation (Olivera, 2004).

According to Johansson (2004) popularisation of science is much more than a translation of a complex language to a more understandable one, or just a way to simplify scientific knowledge in order to make it more digestible. The aim of popularisation is to make target group understand the way science explains the world, and the paths science is obliged to travel in order to achieve its objectives, methods and procedures, how scientific knowledge is validated, and that this knowledge is continually changing. He also observes that the recent scientific and technological progress has not been accompanied by appropriate penetration in modern society.

Hurd’s conceptualization motivated sociologists and educationalists to study more about the sociological premises of popularisation of science. Sociologist Showalter (1974) derived seven sociological dimensions of science popularisation. He observes that scientifically literate person i) understands the nature of scientific knowledge ii) accurately applies appropriate science concepts, principles, laws, and theories in interacting with his universe, iii) uses processes of science in solving problems, making decisions, and furthering his own understanding of the universe, iv) interacts with the various aspects of his universe in a way that is consistent with the values that underlie science, v) understands and appreciates the joint enterprises of science and technology and the interrelationship of these with

each and with other aspects of society vi) develops a richer, more satisfying, and more exciting view of the universe as a result of his science education and continues to extend this education throughout his life, and vii) develops numerous manipulative skills associated with science and technology.

Hurd (1958) advocated that social consensus was highly imperative to frame better science and technology policies, which catalyze national development. However, social consensus is not automatically created, based on how good the cause is objectively; rather it needs to be actively pursued with effective communication. According to him, the sustainable way for this was to create appropriate environment of extended scientific literacy through popularisation methods.

Burnham (1987) argues that creating a conducive environment for improved public understanding of science that involves most of the major fundamental features of civic scientific literacy, is not possible without developing a civic communication method, which is centered on the concept of popularisation through simplification and cultural proximity.

POPULARISATION METHODS

Perelman (1989) points out that when a scientist speaks to his peer group he gets into the subject straightaway assuming that they are aware of the subject and its concomitants. On the contrary, when a populariser addresses the “public”, he introduces the topic, then details its various facets to make communication effective. But, Stichweh (2004) views that science popularisation is no longer a translation of information into another channel without intellectual claims of its own. He adds that it is to be much nearer to the status of being a general self-reflection of the thinking of the society. That is popularisation invents new genres and shapes cognitive traditions of its own that are based on maximum simplification without compromising the authenticity of scientific dimensions of the message.

Miller (1983) finds simplification as the appropriate method of communication of subjects new to common people. Such a method will enhance absorption of basic concepts that are essential for further inquiry.

According to Miller (1983), simplification meant for both cognitive and behavioural change is based on an array of message variables, on which the process of simplification rests. They are language, content and narrative of the message. Based on these factors, Eveland and Dunwoody (2001) carried out extensive studies on the methods of cognitive load reduction through simplification aiming at popularisation. Macedo -Rouet (2003) also conducted a study to explore user satisfaction of science report through paper and hypertext, incorporating one more factor–design. In short, recent studies have pointed that message variables such as design, understandability, language and narration (style of presentation) are critical contributing factors to audience satisfaction in relation to simplification.

Design /Visual Performance

In the context of science popularisation through print media, visual design of text and graphics assumes importance. The main objective of visualization and design is legibility, which can be defined as the adequacy between a given text and its intended readership There are several "levels of legibility", ranging from surface to deep levels, based on physical characteristics of the materials (i.e., typography, colours, contrast, and so forth). Print technologies allow the use of large display areas, multicolour, font variety and so on. Epskamp (2006) says when it comes to performative communication contexts like that of drama, visual display in the print is replaced with visual performance (demonstration) which is live and energetic in creating an environment of attraction and emphasis as what design adds to printed words.

Understandability

Understandability is a fundamental prerequisite for simplified content in popular information sources (Funkhouser and Maccoby, 1973). In educational

psychology, understandability is to know or realize the meaning of what the communicator intends. It means, understanding is a meaningful mental agreement between the sender and receiver. As a variable, it can be attributed to both message and audience. In communication effect studies, understandability is conceptualized as a message stimulus that induces learning resulting in cognitive effects (knowledge, information), affective effects (emotion, feeling, desire etc.) and behavioural effects (overt behaviour and action) (Ball-Rokeach, 1985). In the process of simplification of complex ideas, message is designed to be understandable with lesser cognitive load. There are two basic approaches to explaining learning: active and passive approaches. The active approach is drawn from cognitive psychology and it assumes that the audience is active and engages in mental activities that result in learning. Active approach holds that learning occurs because people are motivated to learn and mentally engaged in acquisition of information. And, the passive approach assumes that people are either unmotivated or unable to learn, so effective messages must be created to attract attention and instill information. However, Perse (2001) observes that the reality of learning is a combination of these two approaches. It means that learning is an interaction of both the audiences' mental activity and media content, which results in (i) attention (devoting mental energy and effort to information task) (ii) recognition or categorizing (identifying what the information relates to) and (iii) elaboration (rehearsing information, relating to prior knowledge). Considering these fundamental cognitive processes involved in learning, Eveland and Dunwoody (2001) observe that reduction of cognitive load is the basic function of simplified content development.

Language

Language is another important factor that facilitates simplification. In simpler sense, language refers to potentially self-reflexive structured system of symbols that catalogue the objects, events and relations in world, using rules of syntax, semantics and phonology. However, in popular science messages, it takes a complex dimension as it warrants creation of a lateral communication context by way of effective language that simplifies scientists' technical terms and complex concepts so as to make the messages

understandable. Like understandability, language is also assumed as both audience and message variable. However, most often it is considered as a message variable, especially when language is viewed as a part of symbolic culture (Funkhouser and Maccoby, 1971).

Narratives

Narratives represent an important means for science communication to transmit and recreate information in an accurate, memorable and enjoyable way. Narratives used in science popularisation are of two types: fictional narratives and factual narratives. Negrete (1989) suggests that style of narration or presentation of information determines the attractiveness of scientific content and users' capability of learning. He also finds that information through fictional narrative is retained for lengthier periods than information provided through factual narratives.

Among the science narratives, science fiction is the most popular genre, which deals principally with the impact of actual or imagined science on society or individuals. Forerunners of the genre include Mary Shelly's *Frankenstein* (1818), Robert Louis Stevenson's *The Strange Case of Dr. Jekyll and Mr. Hyde* (1886), and Jonathan Swift's *Gulliver's Travel* (1726). From its beginnings in the works of Jules Verne and H.G.Wells, it emerged as a self-conscious genre in the pulp magazine *Amazing Stories*, founded in 1926. It came into its own as serious fiction in the magazine *Astounding Science Fiction* in the late 1930s and in works by such writers as Isaac Asimov, Arthur C. Clarke and Robert Heinlein.

A great boom in popularity followed World War II, when numerous writers' approaches included predictions of future societies on Earth, analyses of the consequences of interstellar travel and imaginative explorations of intelligent life in other worlds (?). Much of recent fiction has been written in the 'cyberpunk' genre, which deals with the effects of computers and artificial intelligence on anarchic future societies. Radio, film, television have reinforced the popularity of the genre.

Science fiction provides an array of conceptual frameworks for engaging with scientific or technological issues. It speaks directly to people's concerns, fears, anxieties and desires, encouraging them to work through the possible implications of different scenarios while, at the same time, promising to keep them entertained in the process. Fictional narratives borrowed from novels or films both reflect and nourish diverse publics' fascination and fears about 'tampering with nature' (Hamilton, 2003; Nerlich *et al*., 1999).

SCIENCE POPULARISATION CHANNELS

One of the objectives of public communication of science is to stimulate, sustain and increase the capacity of people to know how to think, how to inquire, how to work and how to solve problems scientifically to better the quality of life. Thus, science popularisation aims at all the three dimensions of communication effects: cognitive, behavioural and affective. To perform this task, a mix of communication processes and properties are applied, including interpersonal, group and mass communication contexts and visual materials, both verbal and written, using print, electronic and traditional folk channels.

Interpersonal Contacts

Interpersonal interaction has been found to be effective in disseminating science information. At a time when print and other advanced versions of communication channels were unavailable, interpersonal contact was the only method to diffuse scientific information. Even after the advent of print and electronic modes of communication, interpersonal contact remains a prime mode depending on the intensity of social networks and advantages of the method such as proximity, interactivity and openness. Communication scholars have identified four key steps in interpersonal contact in science popularisation process as in the case of diffusion of innovation since a number of similarities exist between public understanding of science and diffusion of innovation in societies (Paul, 2004). The four steps are knowledge, persuasion, decision and confirmation.

Print Media

People at all levels of society generally verbalize a very strong positive attitude towards reading. Popularisation of science through print media is as old as the invention of printing and duplicating techniques. Newspapers, magazines, books, pamphlets etc are found to be effective in science popularisation thanks to their media characteristics. Print media are capable of existing on their own, independently, of those who produced them initially and can produce greater retention than other types of media as well, as they can be used by readers at their conveniences though they require greater participation on the part of the readers. Moreover, re-exposure is possible in the case of print media (Klapper, 1960). Stichweh (2004) observes in his study that the major mode of science popularisation in developing countries is print media, especially newspapers and books. Newspapers, followed by magazines and books, supply the most important reading material for adults. In developing countries, a copy of printed medium may be passed from hand to hand, not purchased from the press. Local newspapers and magazines, which carry photographs, folklore, poetry and short stories are most popular in rural areas. They have proved to be a strong tool in disseminating scientific information at local level.

Broadcast Media

In modern times, broadcast media, such as radio and television are widely used for science popularisation given their distinctive features. Their status as the most massive media in terms of reach, time spent and popularity has prompted science communicators to rely on broadcast media for popularisation of science. Because of their high degree of regulation or licensing by public authority, broadcast media are intensively used as official channels for science popularisation by governments. Capacity of broadcast media content to create an illusion of ongoing reality helped science popularisation through radio and television to be accepted by the audiences effortlessly. It was also found that radio and television were perceived to be credible and trusted sources of science information (Dayan and Katz, 1992). Moreover, factors such as national and international domains, diverse content forms, increased possibility for entertainment, economic production of multiple

content and flexible interactivity have made broadcast media a vital means of science popularisation.

Internet

The World Wide Web is increasingly used as a medium for producing and delivering information. Many magazines and newspapers nowadays have online versions. In the realm of public communication of science, the www, more popularly known as the Internet, is regarded as a "new space", where authors can “guide” readers through diverse information sources and types (Trench, 2000), and where the general public can access a body of information that was previously “hidden” from them (Peterson, 2001). Either as a news making or as a dissemination tool, the Web is changing the practice of science writers and making new stories possible, although it has raised some concerns about source reliability and information quality (Trumbo et al., 2001). Eveland and Dunwoody (2001) observe that reasons exist to believe that the Internet will be adopted as an important medium for science popularisation in the future. Speed, breadth, interactivity and cost of delivery are important issues that may promote science popularisation through the Internet.

Traditional Media

Traditional media, typical of the tribal and ethnic rural life the world over, is the spontaneous expression of people, shaped by them to suit their needs. They are tools of special nature. This peculiarity is derived from the fact that they have no grammar or literature, yet they are nurtured through oral and functional sources (Diner, 1965). Dagron (2001) observes that theatre, puppets, dance and music are firmly rooted in the traditional cultural and artistic expressions of many communities. It is difficult to imagine a community that has completely forgotten any of these forms of collective participation and entertainment According to Singh, (1993) traditional media are the most credible channels of communication in traditional, developing societies.

There are different forms of traditional media: music, song, drama, skits, puppets shows, ballads, painting, sculpture and handicrafts. Symbolic meanings may often be an important consideration in the use of any one or

combination of these forms of expression, and therefore the thought process behind selection of forms assumed significance.

India has an impeccable legacy of communication through traditional art forms. More than 2500 years ago in India, the religious leaders Budha and Mahavir used traditional media to preach religion to the masses (Singh, 1993). Thereafter, *Harikatha*, the art of telling stories of God was developed so that the rural masses could be educated with respect to the subtle concept of religion and social values. Later, throughout the country, there were such attempts as part of *Bhakti* movement. During the time of struggle against colonialism, Mahatma Gandhi used traditional media for spreading the messages of nationalism particularly in the rural areas.

Using traditional media for science communication is not a new phenomenon. Governmental and non-governmental agencies world over have been using them to sensitize people to health messages, science awareness and developmental initiatives. In modern India, the Song and Drama Division of Central Government, the Directorate of Advertising and Visual Publicity (DAVP), and similar such agencies are keen to use these media for development and health communication. Non-Governmental agencies like Indian Peoples' Theatre Association (IPTA) employ pure traditional communication forms and contemporary adaptation of them for *agit-pop* purposes. Folk dramas, street theatre, *Sasthra Kala Jathas* (Group marches blended with various folk art forms) were widely used by these agencies. Universally, traditional media mostly involve performative communication processes, including theatre, which is taken to refer to the complex phenomenon associated with the performer-audience transaction to what takes place between and among the performers and spectators.

PEOPLES' SCIENCE MOVEMENTS

During 1960s and 70s, as a consequence of democratization of scientific knowledge various groups interested in science popularisation with diverse objectives begun to emerge in different parts of the world (Champagne and Newell, 1992). One of them is science education community, which is concerned with the nature, performance and reform of

existing educational system. This group concentrates on the issues related to science education curriculum, teaching and evaluation methods. Science curriculum developers and professional science education associations are the backbone of this group. Their targeted audience is students.

The second interest group is of social scientists and public opinion researchers concerned with science and technology policy issues. They are concerned about the extent of the public's support for science and technology, as well as their participation in science and technology policy activities. Most of them worked as a part of the legitimate power hierarchy of respective countries.

The next interest group comprising sociologists of science and science educators employs a sociological approach to public understanding of science. They relate scientific temper with people's political conscience and participation. Their targeted audience is adults in democratic society. The fourth group is of those interested in informal science education community and those involved in popularisation process at grass root level. They include personnel involved in science museums and science centers as well as members of creative teams engaged in science exhibitions and science displays. Science journalists and writers also belong to this group.

Emergence of this sort of interest groups gradually led to the formation of peoples' science movements, which keep the interests of all the above-mentioned groups in one way or the other. The emergence of people's science movements was an indication of a popular will to be included into wider spheres of science. The coming up of such movements has been viewed differently in different social contexts. In democratic societies, it was interpreted as a clue to the people's collective awareness to participate in science and technology policymaking (Degaard, 2001). In sociological discourses, they were considered a positive move of societies to collectively face challenges of life (Koolstra et al. 2006). Moreover, science movements were justified as an alternative bridge between science and society when scientists fail to communicate with public due to their prejudices and concerns about over simplification of complicated concepts or due to the public apathy towards scientific knowledge (Daniel and Jacques, 1991).

Here it is important to remember that dissemination of science information by peoples' science movements through publications, electronic media, conferences and a variety of other activities may not be of value to unprivileged audiences like the rural communities. Even when access is facilitated, the scientific literature is riddled with jargon which only a few would understand. In addition, the information may not have direct use or may not be in the appropriate prospective. Sometimes the targeted audiences may have the information but are not motivated to act (Mintz, 2005). This phenomenon suggests that scientific information alone is insufficient to benefit society unless it is further processed, simplified and effectively communicated to reach a wide audience. Such as situation calls for more studies in the field. Resultantly, studies on the efficacy of science popularisation activities at governmental and non-governmental levels have become a thrust area in development communication domain. However, very little has been studied about the science popularisation activities and organizations in India despite it being the largest democracy and the second largest populated country in the world and a thriving team player in global science and technology realm.

SCIENCE POPULARISATION IN INDIA

India is a country with a remarkable tradition in science and its communication[1]. Since ancient times, scientific explorations and research activities have been encouraged by kings and rulers. And, notable results have been achieved in fields like astronomy, physics, medicine, mathematics and so on. However, a wide gap between scientific knowledge and common man has persisted. No considerable effort appears to have been taken by the rulers to bridge the gap (Vilanilam, 1993). Analysing the state of affairs in

[1] With the development of science and technology in ancient India, the skills for communicating science were also developed. Ancient Indian scholars even laid down the rules and regulations for communication of science, developing their own metaphors and idioms. The very purpose of such communications was popularisation of newly discovered truths. Thus, simplification was the crux of their communication techniques. Natyashastra'of Bharat Muni as the treatise full of ideas on better communication with laymen. In Natyashastra, communication has been referred as 'Sadharanikaran'- which literally means simplification, and it was conceived as a process involving 'Sahridayas'- people having common sympathetic heart. Bharat Muni asserted that a perfect 'Sadharanikaran' context would result in 'Ras Utpathi' and 'Ras Aswadan'- feeling of aesthetic pleasure. Production of aesthetic pleasure among the 'Sahridayas' confirms that the 'message' has been conveyed properly from the 'source' to the 'receivers' (Yadav, 1986).

India, John A. Lent (1998) observes: “(in India), science and technology ended up in hands of high level officials, scientists and technocrats who raked in the benefits of themselves and a small elite group, while displaying very little social awareness about millions of absolutely poor people in the country”.

The most recent history of science communication in India dates back to the end of the 19th century, when the first science books imported from Britain were translated into the Indian languages and distributed among the upper echelons of society (Mazzonetto, 2005). Following Independence, first popular movements for science communication began to emerge. In 1950s, the new Indian government decreed the need to build the new nation based on a widespread scientific approach to development. The first Prime Minister Jawaharlal Nehru, introduced the concept of modern ‘scientific temper’, a phrase taken to mean an enquiring attitude and analytical approach that lead to rational thinking and the pursuit of truth without prejudice. Accordingly, the Constitution of India included a special provision to develop scientific temper, humanism and spirit of enquiry[2].

Taking cue from the Constitution and inspired by the Nehruvian concept of scientific temper, India begun to implement several development communication projects, mostly clubbed under the Five Year Plans of the Government of India. The aim was to sensitize the masses to scientific practices in health, agriculture, home management, family planning, environmental protection etc. This resulted in the beginning of a systematic institutional science communication pattern at the Government front. Simultaneously Government started to promote popularisation activities of individual writers and activists besides ensuring a wider coverage of scientific information in mass media. An intensive era of publishing and translation of school and popular science books began. Flowing from such efforts, science

[2] Jawaharlal Nehru, the first Prime Minister of India is the first statesman who recognized the significance of scientific temper in nation building. Nehru well ingrained the concept of scientific temper into his vision of making a new India. According to him, scientific temper is not just acquiring science knowledge but to inculcate a positive attitude towards science and its capability to transform human life in a progressive direction. He has believed that scientific temper reflects one’s logical, rational and analytical thinking, systematic and orderly way of his performance in all spheres of life, his reasonable behaviour and conduct in the society and of course a rational decision making power. The scientific temper and method of science portray one’s overall personality, which is clearly visible through actions. He hoped that replication of these actions from personal level to societal level would make India an ideal State.

writers and activists began to form peoples' science movements in various parts of the country.

Mazzonetto (2005) observes that at present, apart from the mass media, there are two types of science popularisation modes in India. On the one hand, there is institutional communication, managed at a governmental level by National Council for Science and Technology Commission (NCSTC) whereby information is conveyed through mass communication and national education system. On the other hand, there is communication among the population itself, mostly by peoples' science movements, which aim at the dissemination of basic science knowledge among the lower strata of the society.

At institutional level, NCSTC has offices and delegations in all Indian states and territories to carry out popularisation activities in regional languages. It has set up a network of more than one hundred organizations at governmental and non-governmental levels. Another official institution is *Vigyan Prasar. S*et up in 1989 by Government of India. *Vigyan Prasar* extensively publishes printed materials for distribution among the public. It also coordinates science popularisation activities of scientific institutes, schools, universities, museums and academies. The National Center for Science Communicators (NCSC), National Institute of Science, Technology and Development Studies (NISTADS) National Council of Science Museums (NCSM), are some of the other institutions dedicated to science popularisation in India.

Mass media including newspapers, magazines, radio and television channels, Internet sites and publishing houses are also actively contributing to the communication of science by producing content with a popular flavour. Many newspapers publish weekly science and technology pages. *Vigyan Prasar* provides weekly ready-to-print science content to around 21 newspapers in Hindi and English. All India Radio (AIR) which reaches 99 per cent of India's population, broadcast in 24 languages and 246 different dialects also plays a vital role in science popularisation. AIR's *Manava Ka Vikas,* 144 part series on human evolution was a major landmark in the history of science popularisation efforts. Doordarsan, India's official television

is also actively engaged in science popularisation through a variety programmes aimed at different segments of society. Interactive modes such as science exhibitions, fairs, seminars, workshops, tours, and film screening are conducted by governmental and non-governmental agencies, have contributed to science popularisation.

In 1980s, the movements set up over the years in different parts of the country were networked into an umbrella organization called 'People's Science Movement' which later changed its name to the All India People's Science Network (AIPSN). Among these networked science movements, Kerala Sasthra Sahity Parishath (KSSP) is the largest and eldest surviving group.

KERALA SASTHRA SAHITYA PARISHATH

The roots of Kerala Sasthra Sahitya Parishath (KSSP) rest in the three science popularisation episodes that unfolded in Kerala during the late 1950s and the mid 1960s. Chronologically, the first among them was the *Sastra Sahitya Samity* (Science Literary Forum) formed in 1957 by a handful of popular science writers in Malayalam at the Bhadra Kala Conference held at Ottappalam, Palakkad district of Kerala (KSSP, 2003). The aim of the *Samity* was to set up a platform to encourage science writing and popularisation in Malayalam.

Though short-lived, the *Samity* published a book titled *Adhunika Manusyan* (Modern Man) in Malayalam modeled on the Penguin Science News Series. This 102-page publication, priced one rupee, contained several articles on various subjects ranging from mathematics to food science. Following its success, *the Samiti* published yet another book titled *Adhunika Sastram*, (Modern Science). It could not materialize the next project of translating and publishing Darwin's 'Origin of Species' in Malayalam due to financial crunch. Eventually with the members becoming more involved in other projects, the organization ceased to function.

The most vital episode that paved the way for the birth of the present-day KSSP was the initiative by a gathering of science writers at Kozhikode in 1962. Dr. K.G. Adiyodi was the mastermind behind the initiatives. Adiyodi,

who had completed higher studies in Zoology in Madras Christian College, Chennai and returned to Kerala in 1958 as a college lecturer, found that science reading material in Malayalam was confined to a few books and occasional articles in weekly supplements of Kerala's mainstream newspapers. From 1958 to 1962, Adiyodi advocated the need to harness the potential of science for Kerala's development. He invited science writers and science enthusiasts to a meeting held at Calicut on April 8, 1962. It was here that Kerala Sasthra Sahitya Parishath came into being with Dr. K.Bhaskaran Nair as president and KG Adiyodi as secretary and N.V.Krishna Warrier, the treasurer (Adiyodi, 1982).

The main objective of KSSP was to cultivate an interest in and awareness of modern science among the masses. To that end, it sought to publish science books and periodicals in Malayalam; organize meetings, discussion, science film shows; and assist other organizations working towards similar goals. It was Konniyoor R. Narendranath who suggested the name *Kerala Sasthra Sahitya Parishath (*It is spelt as *Kerala Sastra Sahitya Paridhad also)* which can be translated to English as 'Science Literary Movement of Kerala'. Though formed on April 8, the formal inauguration of KSSP took place on September 10, 1962 in Kozhikode by Fr. Rev. Theodosius, Principal of St. Joeph's College, Devagiri, Calicut.

Following the inauguration, KSSP conducted a five-day exhibition of science books and seminars as well on various science topics. Further, KSSP compiled a *'Who is Who'* of popular science writers in Malayalam and distributed it to the prominent Malayalam print media to promote their coverage of science content.

The third episode was KSSP-centric. In the latter half of 1960s, a team of Bombay-based Malayalee scientists and science activists joined KSSP. Some of them had completed their higher studies in Moscow and had a different perspective of science popularisation. In later years, the new members radically shaped KSSP activities in vogue today (Isaac and Ekbal,1988, Zachariah and Sooryamoorthy, 1994).

Objectives of KSSP

The objectives of KSSP are to (i) popularise science and scientific outlook among the people, (ii) develop a sense of optimism in them instilling a sense of self-confidence that they can change the world and can build a better tomorrow, (iii) expose and oppose the abuse of scientific knowledge detrimental to the interests of the majority , (iv) expose and oppose abuse of environment and (v) propose and help implement alternative models for development through research and development to transfer technologies from laboratories.

KSSP's Philosopy of Science

KSSP's philosophy of science is based on the conceptual framework that Indian society is a dialectical composition of the haves and the have-nots, of which the former is a minority but continuously getting richer and the later, a majority continuously getting impoverished due to the unequal distribution of resources and unscientific social policies. The KSSP claims that it takes on every issue, a stand partisan to this majority and it believes that the only solution to the problem is to arm them with the weapon of science and technology to fight against impoverishment. In 1973 that aim coalesced into a popular slogan 'Science for Social Revolution' (Zachariah, 1989).

Though the term 'science' is generally defined as systematically organized knowledge, tested logically or empirically, the KSSP views it in an alternative way giving importance to its functional dimension instead of equating it with certain branches of knowledge. KSSP believes that science must be perceived as a process or means by which human beings attempt to explore relationship between cause and effect, whether in the natural or social world (Zachariah and Suryamoorthy, 1994). It also perceives that science is a social process that demands "large scale communication", leading to 'information transfer', 'attitudinal change' and 'action initiation' aiming at an overall improvement in human life. Hence, popularisation of science, according to KSSP, is to enhance the people's power to understand and analyse social issues in a scientific way so as to help them play a more active role in the society (www.kssp.org).

Organizational Structure

As an organization, the KSSP has a four-tier structure comprising (i) units functioning at village level, (ii) sub-regional committees catering to about 10-15 units, (iii) I4 district committees and (iv) State committee. The office bearers at State level comprise of president, two vice-presidents, general secretary, treasurer and three secretaries. Election is held every year and nobody is allowed to hold the same office for more than two terms. According to the 45th Annual Report, it has formed sub committees to coordinate issues related with development, education, publications, environment, art and culture, gender issues and health issues (KSSP, 2007).

KSSP Members

As per the 45th Annual Report, KSSP has 32869 members in 2007, all of them working on voluntary basis. The most predominant group is that of educated employed and unemployed youth and the next important group is that of teachers. KSSP embraces all sections such as engineers, doctors, lawyers, agricultural workers, administrators, technicians, nurses, teachers, peasants, students, scientists, political activists, social activists, etc. Out of the total 32896 members, 6958 (21.15 per cent) are women. However, there has been a decline in its memberships since 2002. See Table 1.1.

Table 1.1 : Fall in KSSP Membership

Year	Total Members	Drop-outs (in Percentage)
2002	45913	31.32
2003	41325	32.73
2004	35342	34.83
2005	36434	25.34
2006	34400	28.29
2007	32896	26.38

Sources: KSSP Annual Reports from 2002 to 2007.

Wings of KSSP

To provide a knowledge base to its wide range of activities, KSSP has established three institutions with the help of both State and Central governments. They are the Integrated Rural Technology Centre, the Environment Centre and the Educational Research Unit.

Integrated Rural Technology Centre (IRTC)

Apart from its science popularisation activities, KSSP has been focusing on research and development areas with an emphasis on rural and traditional technology. And, it made remarkable achievements in the areas like cost effective house construction, solid waste management and alternative energy generation. Among these, its first attempt was to develop a fuel efficient smokeless oven (*Chulah*). Being inexpensive the *Chulah* became highly popular and successful. This prompted KSSP to establish IRTC in 1987, which became an independent autonomous society in 1995. Focusing on rural areas, IRTC works in the fields like environment, health, local area planning, energy, education and construction. IRTC tries to sensitize people to practical scientific literacy through its research projects like fuel efficient stoves, energy conservation methods, solar thermal devices, low-cost construction techniques, land and water management, sustainable farming practices, etc.

Environment Centre (EC)

Inspired by United Nations International Conference on Protection of Environment in Stockholm, Sweden, KSSP has been keen on environmental protection since 1972. Protest against the industrial pollution of the Chaliyar River, the main water source of northern Kerala, was the first environmental protection initiative of KSSP. However, its commitment to environmental matters was acclaimed with its fight for the protection of the Silent Valley, an evergreen forest with unique ecosystem and rich biodiversity. From these two experiences, KSSP realized the need to set up a centre to coordinate and facilitate popularisation of environmental issues and formed the Environment Centre in 1987.

Educational Research Unit (ERU)

Education Research Unit (ERU) is a project of KSSP, operated by the IRTC. At present it is operated from three campuses: Thiruvananthapuram, Thrissur and Kozhikkode. Its objectives include curriculum development, content analysis of textbooks, pedagogical experiments and studies on education evaluation methods. It has a few full time faculties, consisting of retired teachers and academics (www.kssp.org).

COMMUNICATION CHANNELS OF KSSP

As a science movement, KSSP has developed an alternative communication system comprising print and traditional media for popularisation of science in Kerala. And, recently it has entered the world of new media by developing its own website and releasing some audio visual materials (KSSP, 2008). In terms of the organizational objectives of KSSP, its communication activities can be classified as communication for information transfer, for attitudinal change and for action initiation. While print media like magazines, circulars, posters, notices, pamphlets, documents and interpersonal used for information transfer and attitudinal change, traditional media and agit-pop methods are employed for action initiation. KSSP's communication channels can be classified as:

Interpersonal and Group Communication Methods: Study classes, lectures, public meetings, discussions, open defenses, demonstrations, exhibitions etc where people get a chance to interact with the sources of communication to seek clarification and immediate feedback.

Print Media: Print media include popular science books, pamphlets, internal communication materials and periodicals.

Traditional Media: KSSP widely uses traditional/ethnic art forms like *Ottanthullal, Kolkkali, Komaramthullal, Kurathiyattam, Chavittunatakam, Villadichanpattu, Chakyarkoothu, Mappilappattu,* etc. to get across its messages and perpetuate its ideologies. The traditional media are, however, not used in traditional way. Several of them are adapted in innovative ways. Often, they are converged to form new content as is done in Science Art Processions (*Sasthra Kala Jathas*) and street performances.

Electronic Media: This category mainly includes documentaries, video CDs and websites. KSSP entered the electronic media world with a documentary named '*Nilavili*' (Scream), which depicts environmental issues. But, the use of the Internet for science communication has not been taken by KSSP in an active way though there are individual initiatives by its members and units.

PRINT MEDIA OF KSSP

KSSP's niche in science communication is in print media. It has already developed a sustainable market for popular science books in Malayalam and has published more than 900 titles. KSSP claims that it is the single largest science publisher in Kerala with about 30 to 40 new titles and reprints per year (KSSP, 2006).

Popular Science Books

In Kerala, popularisation of science was started by introducing fundamentals of science and technology in modern curriculum. For long, science was confined as a traditional knowledge area accessible only to those who controlled the power and dominated the social hierarchy. And the social elites communicated science in limited circuits only, that too for protecting

their vested interests. As a result, social evils like casteism, untouchability, and denial of literacy prevailed aggravating the condition of the deprived and the down-trodden . Recognizing to the need to correct such a social scenario, social activists and reformers started to conceive methodologies for popularisation of science through formal and informal education. Consequently, volumes of articles and books on science related topics began to surface in Malayalam (Balakrishnan, 2007).

Early Malayalam science publications which primarily focused on ayurveda, astronomy and mathematics were mostly translations of traditional Sanskrit texts. The first science article in Malayalam appeared in *Paschimodayam* launched in 1847 by Dr. Herman Güntert. The book titled *Yogamritom*, which is believed to be written by a Namboothiri of Perinjallur village , now in Kannur district, is considered the first printed science book in Malayalam. A revised edition of *Yogamritom* was published by Oopota Cannan in 1861 at Calicut. It was with the initiatives of *Sasthra Sahitya Samity* and KSSP that science publishing in Malayalam entered the professional era.

Annually KSSP publishes 21 new titles and 20 reprints on an average, according to the statistics in the Annual Reports from 2004 to 2007. The year-wise details of the publication are given in Table 1.2.

Table 1.2: Book Publishing – New Titles and Reprints

Year	New Books	Reprint
2004	26 (95000)	12 (44000)
2005	26 (85000)	20 (65000)
2006	23 (84000)	34 (122000)
2007	11 (36000)	13 (32000)

Number of copies in parenthesis

Sources: KSSP Annual Reports from 2004 to -2007

Every year KSSP collects annual average revenue of Rs 40.84 lakh from the sale of popular science books during sales campaign which are usually held during November and December along with annual *Sasthra Kala Jathas.* The revenue details are given in Table 1.3.

Table 1.3: Annual Income from Book Sale* from 2001 to 2007

Year	Annual Collection *(Rs in Lakhs)*
2001	28.1
2002	49.3
2003	35.6
2004	40.2
2005	40.5
2006	52.4
2007	39.8

Source: KSSP Annual Reports from 2001 to 2007

** Data of book sale during Sasthra Kala Jatha campaign period only*

KSSP publishes popular books on a variety topics ranging from basic science to nanotechnology and gender issues to developmental matters.

Pamphlets

Pamphlets are considered effective means of communication by KSSP. It brings out pamphlets on current issues of topical interest and circulates them among the public through interpersonal contacts. This mode of direct selling offers a two-way communication system between KSSP activists and the public. Every year KSSP publishes average 7 pamphlets on a variety of issues and topics. The average number of copies of pamphlets published annually is 78387. See Table 1.4 for details.

Table 1.4 : Publication of Pamphlets from 2004 to 2007

Year	Numbers	Total copies
2004	6	44000
2005	9	146050
2006	6	63500
2007	7	60000

Source : KSSP Annual Reports, from 2004 to 2007

Sasthragathi **Magazine**

The first magazine that the KSSP published with an objective of creating increased awareness of the public understanding of science in Malayalam was *Sastragathi*, which means 'The Science Path'. The target audience was the adults. Launching *Sastragathi* was not easy (Panicker 1982). At its beginning, the primary concern of the KSSP was to disseminate science information in Malayalam. For this, the easy way was to publish a science magazine. But, KSSP had no fund for it. So, in 1966, it approached publishers of the two major newspapers in Kerala – the *Mathrubhumi* and the *Malayala Manorama* – to finance a science monthly in Malayalam, with the assurance that KSSP would take whole responsibility for the editorial content without claiming any remuneration. But, both publishers turned down the proposal saying that there was no marketing scope for a science magazine in Malayalam. Following such a discouraging response, KSSP decided to launch the magazine on its own and a three-member editorial team comprising N.V.Krishana warrier, P.T.Bhaskara Panicker and M.C. Nambudiripad, was

constituted. The first issue contained 12 articles on various subjects like water, electronic computer, flowers, and a special article on the KSSP and the importance of science popularisation in Malayalam. The founder editor of the *Mathrubhumi* Daily, K.P.Kesava Menon, released this 120-page quarterly magazine, priced at Rs. 1.50, at Calicut on November 28, 1966 (Panicker, 1982).

In 1968, when KSSP was under the presidency of P.T.Bhaskara Panicker, *Sastragathi* captured a secured circulation and its quarterly schedule became more stable. When the increase in circulation was visible, it was made a bimonthly in 1970. Now it is a monthly publication.

The thrust area of the magazine in its early years was science and its influence on society. It remained so till mid 1990s when it began to publish more articles on social issues than on science-oriented subjects. The 38th Annual Report of the KSSP remarks: “the content of *Sastragathi* has become more centered on the current socio-political issues, though there are a few articles related to science and society. The main reason for this shift is the unavailability of pure science articles. The editorial team constantly failed to get such articles” (KSSP, 1992). To overcome this problem, *Sastragathi* conducted a science-writing workshop for college students to ferret out new talents. However, the result was not so positive. Another important problem that the magazine faces is that its circulation has not registered any spectacular growth over the years. See Table 1.5.

Table 1.5: Circulation of *Sasthragathi* from 2000 to 2007

Year	Number of Copies (Monthly average)
2000	6425
2001	5470
2002	6137
2003	6150
2004	5250
2005	6000
2006	6800
2007	7600

Sources : KSSP Annual Reports from 2000 to 2007

Sasthragathi covers almost all aspects of pure and social sciences and their influence on society. It is through *Sasthragathi* that new perspectives and innovations in science domain are firstly disseminated in Malayalam. The three dominant areas covered are physical science, social sciences and development issues (See Table 1.6).

Table 1.6: Content of *Sasthragathy* from 2004 to 2007

Subject area	2007	2006	2005	2004
Physical Science	13	14	14	12
Natural Science	15	6	12	7
Technology	2	6	10	8
Health	5	12	4	11
Social Sciences	18	8	13	7
Agriculture	9	13	4	12
Gender	7	4	1	6
Development	12	24	16	21
Others	19	13	26	16

Figures denote number of articles published

Sources: KSSP Annual Reports from 2004 to 2007

The data shows that there is no uniformity or structured patterning in covering branches of knowledge across the years. However, almost all areas of science are being covered in one or other way.

Sastra Keralam Magazine

After the success of *Sastragathi*, KSSP launched its second monthly magazine, *Sastrakeralam*, (Scientific Kerala) on June 1, 1969. Its target group was adolescents and young adults in the age-group from 15 to 20 years. P.T.Bhaskara Panicker was the editor. This 48-page magazine, priced at 50 paisa, was launched by the then Education Minister of Kerala C.H. Mohamed Koya.

The first editorial itself declared that the objective of the publication was to popularise science and create scientific temper in the life and thought of the young generation. Now it caters to their scientific information needs of high school and college students. Its circulation is growing every year from 2005. See Table 1.7.

Table 1.7 : Circulation of *Sasthra Keralam* from 2003 to 2007

Year	Number of Copies (monthly average)
2003	6500
2004	6500
2005	6800
2006	7700
2007	8200

Sources: KSSP Annual Reports from 2003 to 2007

Eureka Magazine

The third periodical publication is *Eureka*, a children's magazine. It was first published on June 1, 1970 under the editorship of Dr. K.N.Pisharodi. At first, it was published under the auspices of the Thrissur district committee of KSSP. As stated in its first editorial, the objective of the magazine was to

generate a scientific outlook in the minds of the children studying in all schools in the State. Now it is published twice a month. Content focuses on middle school science curriculum. Details of its circulation are given in Table 1.8.

Table 1.8 : *Eureka* Circulation from 2003 to 2007

Year	No of copies
2003	18950
2004	18400
2005	18500
2006	19800
2007	21300

Sources : KSSP Annual Reports from 2003 to 2007

Grama Patram

It is a unique venture that the KSSP initiated for rural communication. It was in July, 1981 that KSSP started to use *Grama Patram* (Village Poster) extensively for communicating science news in rural areas. *Grama Patram* is a regular wall poster, fixed in places like village junctions, bus-waiting centers, reading rooms etc, where rural folk assemble. Though popular in the early years, it is now on the verge of extinction (KSSP, 2006).

Parishath Varta

Parishath Vartha is a bulletin launched by KSSP with an objective of disseminating organizational information among its activists. It is a biweekly publication. The content deals with organizational news, press releases, policy declarations etc. Though it is envisaged by KSSP that *Parishath Vartha* should be read and discussed in each of the unit meetings, the 38th and 41st Annual Reports of KSSP observe that the units are not keen on observing this practice.

TRADITIONAL MEDIA USED BY KSSP

Kerala culture is rich with a variety of traditional communication channels having deep roots in social conscience. KSSP has been making use of these channels for its science popularisation activities from 1970s. This experiment was initially confined to presenting individual art forms without integrating them into KSSP's media-mix strategies. However, in 1980 KSSP started to bring together traditional and modern art forms along with other media under the umbrella of *Sasthra Kala Jatha* which means Science Arts Processions. *The Sasthra Kala Jatha* is held annually from November first week to December first week to promote scientific thinking about social problems. (Zachariah, 1989).

Every year, well before the preparation of programme schedule of the *Sasthra Kala Jatha*, KSSP teams comprising of performers, elocutionists, musicians, percussionists and singers start rehearsal of the art forms. For this, rehearsal camps are conducted in rural areas, with the help of local KSSP units. Based on the scripts containing scientific messages prepared by well-known writers in Malayalam, the teams rehearse for weeks. Usually the genres of the scripts are of folk songs like *Kuravanpattu, Padayanipattu, Villu*pattu, *Mappilappattu, Kuravanpattu* etc or folk dance/theatre forms like *Kakkarissi Natakam, Oppana, Kolkkali, Ottanthullal* etc.

After rehearsal, the team sets out to perform art forms in rural areas according to the preplanned schedule. Before starting the event, there would be announcement in traditional style, with local drumbeats of *Chenda (traditional drum)*. During the *Jatha* month, the teams (sometimes, two or more separate teams for south, west and middle regions of Kerala) visit and perform programmes on an average of 350 venues whose number has increased from 345 in 2004 to 397 in 2007. This suggests their popularity in Kerala, (See Table 1.9). Along with the *Sasthra Kala Jatha*, KSSP workers sell popular science books and scripts of the programme. The Topics covered in the *Sasthra Kala Jatha* include agriculture, water, development, gender issues, equity, health issues and environmental problems.

Table 1.9 : Details of *Sasthra Kala Jatha* from 2004 to 2007

Year	No. of Venues	No. of Audience	Group Members	Topics Covered

		Members (approximate)	**Male**	**Female**	
2004	345	*(Data not available*	20	28	Women issues, water problems, environmental issues, development
2005	358	125000	*(Data not available*)		Equity, health issues, environmental issues, development, women issues
2006	270	*(Data not available*)	Total 60		Scientific life, development, environmental issues, women issues, health issues
2007	397	101500	71	26	Equity, autonomy, agricultural problems, water problems

Sources: KSSP Annual Reports from 2004 to 2007

For KSSP, *Sasthra Kala Jatha* is a multi-fold strategy in communicating science through sale of books and other interactions, besides ingraining scientific temper through performing arts, public meetings, debates and discussions. A highlight of the *Sasthra Kala Jathas* is the use of traditional art forms.

As detailed in Table 1.10, progammes in *Sasthra Kala Jatha* are performed in a variety of traditional art forms. *Sasthra Kala Jatha* scripts of yesteryears reveal that more than 10 traditional art forms of Kerala have been copiously and constantly used by KSSP in its *Sasthra Kala Jatha*s.

Table 1.10: Traditional media used in *Sasthra Kala Jatha* from *2000 to 2007*

No	Script Title	Traditional Art Form	Theme
1	*Uppu* (Salt)	*Mappilappattu* (Folk song)	Against Iodized salt
2	*Thudippattu-* (Drumbeat)	*Kuravanpattu* (Folk song)	Literacy
3	*Unarthu Pattu* (Awakening song)	*Nadanpatt*u (Folk song)	Environment
4	*Vikasanam* (Development)	*Kurathiyattam* (Folk dance and drama)	Water management
5	*Adhikaram* (Power)	*Kurathiyattam* (Folk dance and drama)	Self reliance and scientific temper
6	'A yes T yes'	*Pananpattu* (Folk song)	Environment
7	*Puthan Adimakal* (New slaves)	*Nadanpattu (*Folksong)	Science literacy
8	*Gramangal* (Villages)	*Vadakkanpattu* (Folksong)	Rural development
9	*Vanagatha* (Jungle songs)	*Koithupattu and Krishippattu*, (Folk Songs)	Environment, water management and health
10	*Padayani*	*Padayani* (Song and dance)	Science literacy
11	*Vanaparvam* (Forestry)	*Kakkarissi Nata*kam (Folk drama)	Environment, health
12	*Papi* (The sinner)	*Villupat*tu(Folk skit)	Evolution
13	*Dharmashupatri* (Public Hospital)	*Ottan thull*al (Folksong and dance)	Public health and hygiene
14	*Mathayikkoru Katthu* (A Letter to Mathai)	*Ottanthull*al (Folksong and dance)	Self Reliance, science literacy
15	*Saksharat*a (Literacy)	*Ottanthull*al (Folksong and dance)	Literacy
16	*Narabali*	*Villupattu* (Folk skit)	Superstitions
17	Galileo	*Villupattu* (folk skit)	Biography of Galileo
18	A farmer's suicide note	*Nadanpattu (*Folk song)	Agriculture
19	Chat	*Komaranthullal* (Folk skit)	Indigenous knowledge
20	*Balasapam* – (Children' curse)	*Natankali* (Folk musical skit)	Unscientific curriculum

Sources: Sasthra Kala Jatha scripts from 2000 to 2007

Art forms like *Mappilappattu*, *Pananpattu, Kurathiyattam* and *Kuravanpattu*, and *Komaranthullal* are traditional art forms of *Mappilas* (ethnic Muslims in Malabar), *Panas* (nomadic singers of Kerala), *Kuravas* (a tribal group), and *Komarams* (Hindu ritual performers) respectively. Art forms like *Kakkarissi Natakam, Kurthiyattam, Villupattu, Padayani* and *Vatakkanpattu* are region centric and *Koithupattu, Krishipattu, Njattupattu* are traditional peasant songs. *Ottanthullal* is a popular art form developed by poet *Kunjan Nambiar* centuries ago. It is a satiric programme incorporating song and dance. KSSP selects the art forms for the programme in accordance with the nature of the theme and audience.

From the foregoing discussion it emerges that science has been redefined itself over the years, offering more possibilities as well as challenges to innovators, practitioners and communicators and the society at large. Science is no longer confined to laboratories and scientists; it is well ingrained in the complex milieu of politics, economy and governance.The growing demand for democratization of information and transfer of science information coupled with the media boom and the changed information acquisition patterns have made science the locus of modern society dynamics. There is a growing concern that any country, which moves forward without a scientifically informed citizenry, would jeopardize its own future in the globalization scenario where transnational dissemination of scientific knowledge and diffusion of innovations are at an electric speed. The concept that the civic scientific literacy and resultant public engagement in science and technology are inevitable to formulate and legitimize any national policy which emphasizes scientific advancement is getting momentum among political leadership. Along with these, the emergence of people's science movement has also helped bring science communication to the central stage of the present-day political and developmental discourses.

It is recognized that the role of people's science movements in popularising science is as important as that of mass media and government agencies. In some social contexts, they can excel both. Cultural proximity, innovativeness and informal organizational capabilities are the reasons for

their success in most cases. However, it is doubtful whether the potentials of people's science movements are tapped sufficiently and studied seriously.

Science communication among the rural folk is yet another overlooked area. The reason is that science popularisation activities through mass media and governmental channels have remained directed to the urban lot, who are privileged with high-end information sources and acquisition. In such a situation, people's science movements have a vital role to play in rural areas.

Several studies on science popularisation, especially those of recent times, have recognized the power of the audience to selectively choose and use media content. In this context, improving the potential of selectivity of science popularisation media becomes a major task. Here it is worthwhile to note that media selection and subsequent impact of communication are determined by audience perception of the media, their content and controlling agencies. This necessitates identification of user's perceptions and their association with the media use and the extent of subsequent effect on the understanding of science. An understanding of those factors will help evolve better strategy for science communication.

NEED FOR THE STUDY

The disparities in science knowledge acquisition and use prevailing between the urban and rural masses are an impediment to equitable development. Experiences have suggested that there is no shortcut to the solution, other than the planned and scientifically implemented science popularisation strategies, utilizing all means of rural communication. To make it a reality, in-depth studies on the existing rural communication patterns and their potentials as well as their impact on society have to be conducted.

However, in most studies, communication of science has been viewed through pure sociological or political spectrums ignoring the communication dimensions. And, a few studies which deal the subject from communication perspective focus either on the concept of communication of science by scientists for technical purpose or on the coverage of science by news media. Studies on popularisation of science from development communication perspective are scarce. This trend, most often, gets in the way of conceiving

strategic policies for public understanding of science and related development activities. Similarly, the impact of communication strategies of public science movements remains unexplored.

Against this background, the present study has been conceived to explore these aspects of science communication channels in rural Kerala with a special emphasis on the Kerala Sasthra Sahitya Parishath. Such an attempt, it is hoped, would help all developmental agencies, both government and non-government, in redesigning their practices in rural communication in general and science communication in particular.

Considering the reach and prospective of the work, a wide range of literature has been reviewed to form a judicious conceptual framework for investigation. The review of literature is presented in the next chapter.

Chapter II

REVIEW OF LITERATURE

Among other objectives, the study seeks to determine the Public Understanding of Science (PUS) in Kerala and evaluate KSSP's role in popularising science and scientific temper especially in rural areas. That being the context, it is essential to review past studies covering various aspects of science communication and science popularisation endeavors, both in India and elsewhere. Here, it is must be pointed out that there are scores of studies relating to communication of science within the community of scientists and academics. Such works are not being reviewed in this chapter, for they do not come under the purview of the present study. The literature reviewed here relates directly to science communication efforts dovetailed towards general public. Such studies have been conducted to investigate aspects relating to give basic elements of communication – source, message, channel, receiver and effects. Accordingly, in this chapter, literature has been reviewed under these five sections. And, under each section, topically related studies have been ordered to get a better understanding of the trends of inquiry in the area. As a necessary requisite, KSSP related studies have been reviewed separately.

SOURCE STUDIES

Do all scientists, the primary sources of science information and knowledge, consider science popularisation through mass media an effective strategy? The answer appears to be uncertain. This was the finding of a study conducted by Gravengaard, (2003) as part of the Market and Opinion Research International (MORI) on the sources' perception of the channels of science popularisation. He found that most of the scientists among the respondents were uncertain about the effectiveness of the news media in science popularisation. Their perception of channel efficiency was found to be significantly associated with the perceived inaccuracy of popular science content. However, science campaigners among the respondents of this study perceived mass media as the most effective means for communicating science. He also observed that gender and field of specialization of scientists

had significant association with their interest in science popularisation activities.

In a similar inquiry, Kyvik (2005) explored the roles of university faculty as science popularisers in contributing to public discourse on science through publishing popular articles. Mail surveys conducted by Kyvik in 1992 and 2001 among the faculty members at Norwegian universities showed that academic staff in the humanities and social sciences published more popular scientific articles and contributed more to public debate than their peers in the natural and medical sciences and technology.

Likewise, Nielsen *et al*. (2006) conducted a web-based questionnaire survey among Danish scientists in the natural science and engineering science departments to find out the sources' perception of the performance of various channels of science popularisation. The main objective of the study was to investigate the preference of scientists in Danish universities in using different media of science communication as well as their active participation in science popularisation. The findings of this study were different from the earlier cited studies.

Nielsen and his team found that a majority of the respondents viewed the news media as being the most important in disseminating information about the results and methods of science. The study also revealed that respondents reported to give a higher priority to mass media like television, newspaper, and radio than to institutional communication channels for science popularisation purpose. However, most scientists took no particular interest in writing popular science books though they were interested in writing science books of academic nature. Such a low interest in writing popular science books stemmed from their belief that simplification of scientific information would lead to vulgarization of science.

MESSAGE STUDIES

Several of message variables contribute to communication effects. Funkhouser and Maccoby (1973) found two such message variables –

stylistic and rhetorical treatments, contributing to comprehension of science messages. They tested the effects of manipulated stylistic and rhetorical simplification in specialized science writing on audience variables such as enjoyment, attitude, and information gain. Articles on enzymology, polymer chemistry, and plasma physics were prepared with manipulated textual variables such as sentence length and vocabulary difficulty and the effects of the manipulations were tested on audiences with different educational backgrounds. It was found that stylistic and rhetorical simplification had positive effects on audience achievements. And, these effects were found to be more intensive on educationally less-qualified audiences.

Similarly, graphics are known to enhance comprehension of science messages, as evidenced in studies of Smeltzer and Vance (1989). They studied the impact of graphics on variables such as receivers' interest, comprehension and retention and information clarity. Their investigation revealed that messages with graphics positively contributed to comprehension compared to messages without graphics. Another finding was that the perceived quality of the graphics was significantly related to the perceived effectiveness of the science content.

The semio-linguistic and communication analysis of French popular science publications conducted by Schiele (1993) also substantiated these findings. His study revealed that a general series of visual and design elements made up of headlines, graphics, photos and captions contributed to easy comprehension of message and perceived satisfaction of the readers.

The findings of Simonneaux and Jacobi (1997), who conducted studies to explore the main barriers in science popularisation through print media, upheld the potentials of the simplifications of message in science popularisation process. They reported that spatial design, technical terms and conceptual complexity were the main barriers in science popularisation through print media.

Kobayashi (2002) investigated the effects of text organization and formatting on the comprehension of science content. His main finding was that text organization and formatting had a significant positive correlation with

the readers' performance in and satisfaction with textual comprehension. Furthermore, when texts were clearly structured, the readers achieved better results in answering open-ended questions and summary writing as well. Then they concluded that text organization and formatting had positive correlation with information reproduction.

How do science content developers perceive the message variables like simplified language and attractive visual display? Hijmans *et al*'s (2003) study revealed that majority of science content developers perceived that easy comprehension of science information was possible through simplified language and attractive visual display. Moreover, content developers believed that critical use of graphic organizers and textual adjustments such as short sentences and narrative techniques contribute to easy comprehension.

Of the message variables, narrative styles, both fictional and factual, are of importance. Many scholars studied the effect of narrative techniques on receivers' satisfaction of science content. For instance, Negrete (2004) inquiry showed that fictional narrative contributed to easy comprehension of science than factual narrative.

In his study, Negrete examined the extent to which people can understand, remember and learn scientific information in science fictions compared to that in traditional factual texts. The study also explored the motivational dimensions of fictions as a tool for communicating science. The two sample groups (fictional and factual) selected for the study performed differently in remembering the scientific information over one-week period. The results of this study suggested that science could easily be learned through fictional narratives since it represents a more enjoyable way of learning compared to factual narrative in traditional textbooks. The results also suggest that information received through factual narrative deteriorates at a faster rate than the information received through fictional narrative since the later provides numerous mnemonic devices and cognitive aids for storing and retrieving information.

A similar study conducted by Saunders *et al*. (2004) on the role of narration of science in textbooks in non-formal life-long learning found that

fictional narration had significant positive correlation with higher achievement of adult learners in science disciplines.

Mcinerney *et al*. (2004) investigated the nature of dissemination of science information related to genetically modified (GM) food focusing on the language and message genres in the scientific literature, newspapers, and popular magazines. A comprehensive search of these sources from 1992 to 2002 revealed a wide contrast in the language and message genres used in the popular publications and professional science literature. While the lay press stressed on simplified content using basic vocabulary, professional science messages including press releases prepared by scientists included jargons and complex ideas which were difficult to comprehend. It was concluded that message variables were likely to contribute more to the communication barriers existing between scientists and laymen as compared to other variables.

Meyer's (2005) study revealed that popular science books, which employed strong fictional narrative, simple language and the account of personal experiences were perceived to be more helpful for easy comprehension. He also found that the content of popular books focused on the natural tendency of readers to seek continuity across their experiences in any aspect of their life by constructing a series of narratives that link these experiences together. Based on the findings, he held that fictions could more easily engage the attention of an audience compared to factual narrative.

Metaphors are essential elements in fictional narratives. Leydesdorff and Hellsten (2005) studied the role of metaphors in science communication and found that readers' satisfaction was positively correlated with metaphors used in the content. It was also found that metaphors had potential to reduce cognitive load in learning process.

A recent study suggests that the use of graphics in science content does not contribute to a particular kind of comprehension only. Kools *et al*. (2006) examined the effect of graphics on the comprehension of a health science brochure text and compared subjective and objective comprehension measures. Participants read a brochure text about asthma with and without

graphics, and subjective and objective text comprehension was measured. It was found that graphics and graphic organizers had effects on objective comprehension as indicated by the responses to open comprehension questions. However, on the subjective comprehension measure using Likert-type scales, the groups with and without graphic organizers did not differ from each other. Based on such findings, they concluded that science texts could benefit from simplification techniques such as graphics to increase comprehension.

Studies have upheld the role of visual display in easy comprehension of science messages. Arsenault (2006) found positive contribution of visual display to ease of comprehension, rhetorical power and consensus formation. Graphs and non-graph illustration, overall theme of the layout were also found to be influencing reader satisfaction and understandability.

A similar result was detected in a study conducted by Vaughn and Edmonds (2006) which explained that expository texts, graphic organization and visual performance of the message were highly useful for users of science messages in organizing key concepts, vocabulary and information.

CHANNEL STUDIES

Studies under this category show that there are many channel related factors such as science news flow and gate keeping patterns that define the coverage of science in various media.

Nunn (1979) investigated the dynamics involved in the readership and coverage of science and technology and found that coverage of science and technology in newspapers was mostly associated with the availability of the articles through news agencies, and other sources rather than the interests of the audience. Thus, science information needs of the audience were not likely to be fulfilled by the newspapers to the fullest extent.

Studies revealed that the extent of the coverage of science was related to the type of media. Hinkle and Elliott (1989) studied science coverage in three newspapers and thee supermarket tabloids and found that type of scientific information was significantly associated with type of the media. While newspapers tended to project innovative aspects of scientific

discoveries and their impact on human society, tabloids were more likely to project curious aspects of scientific achievements overlooking their influence on human life. And, they found that selection of scientific content in both types of media was done in significantly different ways. While information needs of the readers were the primary selection criterion in newspapers, the tabloids' selection of science information was being largely driven by market consideration and promotion of consumer goods. In terms of perceived credibility also, there was a significant difference between newspapers and tabloids. When newspapers' science content was perceived to be more credible, content of the tabloids was considered less reliable and less accurate.

What is the trend in coverage of science news by mass media over decades? An important study in this area is of Pellechia (1997). He studied about the science content of popular media and found an increased coverage of science in popular media and perhaps in response to, as well as reflection of, the public's growing interest in science. He also found that in terms of the diversity of coverage, there was little difference in the range of topics covered in each of the three periods. In each of the periods, articles relation to medicine and health issues had a high salience (72 per cent to 75 per cent) of the total science coverage. The proportion of coverage relating to natural and physical sciences accounted for 17 per cent to 25 per cent of the articles in each of the periods. And, technology related subjects were the least covered (7 per cent to 11 per cent) in all the times. Although science articles represent only a small percentage of the total number of articles in the newspaper, this percentage was found to increase steadily.

Zimmerman *et al*. (2001)'s study identified popular print media as the most preferential source of new information about scientific research for members of the scientific community outside the areas of expertise and for the public.

But, the study carried out in the next year by Brandi *et al.* (2004) found that for the laymen, television was the most preferred source of science information followed by science magazines and science books. Another important finding was that age was a crucial factor in determining the level of

interest and awareness in science. Yet another variable found to be influencing science awareness and interest was education. According to the data, the low level of education – the lower the education level, the lower the sensitivity to science topics.

Koolstra *et al.* (2006) conducted a meta analysis based on empirical studies in Europe and found that television was regarded as the most important medium for science popularisation, because (i) people use television more frequently than the Internet, (ii) television is more effective in transferring messages to the public than the Internet, and (iii) people have more trust in television than in the Internet as a reliable information source. His conclusion is that channel variables such as accessibility, trustworthiness, and information transfer capacity are significantly associated with audience selection of science information sources.

The perceived credibility of science websites aimed at popularisation of science was investigated by Treise *et al*. (2003).The respondents answered questions about their perceptions of science sites with the .com and .gov domains. The findings suggested that the sites with a .gov domain were perceived to be more credible. Trumbo *et al*. (2001) who studied the audience perception of the Internet as a science information source found that science information available on the Internet was perceived by the audience as less reliable compared to the information available through other channels.

Besides, mass media other media too have been investigated to detect their efficacy as channels of science information dissemination.

The extent of the reach of science messages through interpersonal communication was investigated by Conradie and Grobler (2003) by conducting a survey among South African adults. They found that majority of the respondents, irrespective of their gender and age, reported to get science information through interpersonal contact. This finding contradicts with Zimmerman *et al*'s (2001) results which identified that print media were the most preferred information sources.

Hwang and Southwell (2007) conducted a survey among 667 respondents on the predicators of interpersonal science communication and

found that sensationalizing science information was possible to evoke more social contexts for science communication through interpersonal contact.

To understand the impact of science festival has on the visitors, Grant (2003) carried out a detailed evaluation of Cheltenham Festival of Science in Liverpool. Using interviews, questionnaires, electronic voting, observation and media tracking, data was collected from over 700 ‘festivalgoers’ as well as speakers, sponsors, science communicators and media representatives. The study revealed that dissemination of scientific information through entertainment was more effective than that through traditional education modes. A significant proportion of visitors felt that their attitude towards science had changed after attending the festival, and all of the shifts in attitude were positive.

The results of the study indicated that individual talks or events would be of value in science education, whereas the “festival experience” as a whole would lead to shifts in attitude towards science. Informal discussion facilities such as ‘Science Cafés’ were found to be an effective means of engaging respondents in discussion of scientific issues in an informal and non-intimidating environment.. Science information received through hands-on experience in the festival was found be recalled by more respondents that too for relatively longer time. It was also found that festival was a motivating factor since they prompted respondents to seek out more information about science, especially by buying books and using the Internet.

The role of channels such as museums, science centres, planetariums were significant in science popularisation as suggested by the study of Davis (2004). Of these channels, museums and science centres were found to be most frequently used ones. Majority of the users perceived that free choice learning channels could not keep up with the rapid pace of scientific research as mass media could. But, the data showed that the perceived informational utility of free choice learning channels was less related to their use. However, curiosity and need for hand-on science experience were found to be significantly associated to their use. Similarly, Saunders (2004) also revealed that non-formal life-long learning had significant positive correlation with public understanding of science.

Kothari and Kothari (2004) conducted a comparative analysis of the impact of low-cost science communication aids and group communication methods in science popularisation. The study was conceived as an evaluation of the impact of a project implemented in Kucth area in Gujarat state of India where a massive earthquake occurred in 2002. To eliminate fear and superstitions about earthquake and to explain scientific aspects of such natural phenomena, innovative kits consisting of around 25 science communication aids and activity materials were distributed. Along with this, workshops and lectures were also conducted. The post-project study found that science communication using activity materials and tools was more effective than group communication modes like workshops and lectures.

Can advertisements contribute to science popularisation? The answer is 'yes' as revealed by the study of Pitrelli *et al.* (2006).They carried out a quantitative study on a sample of daily, weekly and monthly publications throughout 2002 and 2003, on the frequency of science messages in advertising, the occurrence of science content in the images, the context in which they are set and the type of language used. The findings can be enumerated as follows: (i) science messages are consistently present in advertisements, more so they are more present in the advertisements of foods and health products and electronic and hi-tech goods, (ii) science information in advertisements are likely to attract audience to advertisements, and (iii) the type of language used in advertisement to detail scientific aspects of the products and their operation is significantly associated with the targeted consumers.

The position of various media in science popularisation in India was explored by Thakar and Kothari (2004). They found that print media, followed by radio, were the primary sources of science information for rural people in the country. This result is not different from the findings of some earlier studies like that of Conradie & Grobler (2003) and Brandi *et al.* (2004). Thakar and Kothari also found that rural people's dependence on the radio for science information was significantly associated with its nature as an entertainment medium.

RECEIVER STUDIES

The foregoing studies showed that there was no linear and single way of reading or understanding "media texts", and that there was a selection process based on various possible interpretations of the same media stimuli. In the same way, different readers express different thoughts on the same content stimuli. The interpretative reception of media content points to the fact that characteristics of the recipients as well as the type of media and their contents are of importance in evaluating the effectiveness of science popularisation process. The studies cited below substantiate this approach.

Kreighbaum's (1959) study revealed the positive influence of audiences' demographic variables such as gender, age and economic status on their interest in reading science content in mass media. More males than females reported to use science information. Likewise, lesser age groups and higher income groups were found to be more interested in reading science content.

Similarly, public attitude towards science was found to be associated with public understanding of science in a project undertaken at the Institute for Communication Research at Stanford University by Funkhouser and Maccoby (1971). They found that majority of the respondents perceived science as an unattainable knowledge domain reserved for the upper hierarchy of the society. Yet another influencing factor is audiences' pre-knowledge in science. This was revealed in a study on the popularisation of science related with climate change conducted by Heinrichs and Peters (2003). The main objective of the study was to find out the pattern of reception and interpretation of information by the audience. The result showed that the reception of climate change information provided through popular media was an interpretative process, which evoked a broad spectrum of thought depending on the audience's pre-knowledge in science. And, the cognitive responses were not only influenced by scientific information received but also by the message variables such as simplicity of the language used and the level of understandability of the content.

The variable of cultural setting of the audience was also found to be associated with the reception of science message. Raza and Singh (2004) found that the relationship between culture and public understanding of

science was highly significant since peoples' complexity of thought is defined by culture. Moreover, this association would vary depending upon the nature of science information provided and the characteristics of cultural sub-groups at the receiving end.

EFFECT STUDIES

Since 1970s, various countries have been conducting national level surveys to measure public knowledge of and attitudes towards science to design better strategies to make people more attentive to science and technology policies. Prominent among them is the National Science Foundation (NSF) of the USA. Its 1997 survey revealed an increase in the mean level of interest in scientific discoveries from 61 in 1979 to 71 in 1997 indicating that science and technology are becoming an increasingly integral part of American culture. However, the survey showed that many Americans had a limited vocabulary of scientific and technical concepts. Similarly, the mean score on the Index of Scientific Construct Understanding (ISCU) was 55. This score had remained relatively constant since 1988. The ISCU mean score was significantly correlated with the educational level of the respondents, but not with their media use.

These results substantiate the findings of Miller (1983) that that public's interest in and attention to science content in media were unrelated to their awareness in science related matters. In his study conducted among American adults, he estimated that about 20 percent of American adults were attentive to science policy related content in the mass media. About 75 per cent of them regularly read newspapers, but were dissatisfied with the science coverage and just 9 per cent rated the newspapers as a good source of science news. Such an evaluation of science news content had a bearing on their understanding of science subjects as two thirds of the attentive public could not pass a relatively minimal test of scientific literacy.

A similar result was noticed in the study conducted by Pilisuk and Acredolo (1988), which suggested that public's regular use of broadcast media was less related to their better understanding of science and technology.

Conversely, Mazur and Conant (1978) found public's exposure to science content had influence on their understanding of and response to science related issues. Their inquiry revealed that people who learned about a proposed nuclear waste site through mass media were more opposed to it than those who had not heard about it. Mazur (1981a, 1981b) found that media coverage of a scientific controversy increased public opposition to the technology, even when such coverage was not negative. Results in similar direction were detected in some other studies too. For instance, Baker (1986) found that the health science news in newspapers influenced the audiences' perceptions of health hazards and motivated to be careful about diseases. Albert's (1986) study suggests that magazine coverage of the scientific aspects of AIDS disease in the early 1980s found to be highly influential in prompting people to take a cautionary note to the disease.

Based on the agenda setting theory, Brown and Potosky (1990) studied the effects of science news in mass media. They observed that placing a science issue high on a public's issue agenda could have more effects on public understanding of science than the independently covered science matters. For this reason, they noticed that the need to detect colon cancer early increased in the US following the extensive media coverage of Reagan's colon cancer surgery. Similarly, Bowman and Hanaford (1977) reported that environmental protection campaigns were more effective when conducted in connection with special events such as Earth Day.

Chew *et al.* (2006) reported that news media coverage of health science related issues had a tendency to influence public more than any other area in science.

Ishii (2001) conducted a study to asses the level of public understanding of science in Japan. The objectives of the study were: (i) to measure the level of public understanding of science in Japan and compare it with the other countries, (ii) to expose the influence of institutional communication sources such as science centers and science museums on the level of public understanding of science, and (iii) to find out the influence

of peoples' liking of science at school age on their understanding of science after having grown-up.

The study revealed that the level of public understanding of science in Japan was relatively low, compared to a significant number of European countries and the United States. Demographic variables such as gender, age, and education were found to have significant influence on people's perception towards and understanding of science. And, those who liked or opted for science at school and college level were more interested in science content in mass media than those who liked or opted for non-science subjects. According to the results, interaction with science museums and science centers had significant influence on their understanding of science.

Macedo-Rouet *et al.* (2003) examined the effects of print and online presentations of science information on reader's attention, comprehension, and satisfaction. They hypothesized that compared to print media users; online media audience would show poorer results. Higher cognitive load and poorer comprehension of hypertexts substantiated their assumption.

Using media dependency theory approach, Elliott and Rosenberg (1987) investigated the effect of repeated exposure to science content in mass media on people's beliefs about science and technology. They found that users' social position and purpose of using media considerably influenced their recurring exposure to science information in media. At the same time, perceived credibility of the medium, competency of the source and structural stability of the social environment in relation to scientific and technological advances were also related to individual's dependency on science content in media.

Smith (2007) studied the impact of electronic media on the science communication structure and found that the significant increase in the use of electronic modes and systems for acquiring science information did not affect the inherent structure of the public communication of science.

STUDIES ON KSSP

Studies conducted on the science communication efforts of Kerala Sasthra Sahitya Parishath are very few. Of these, the studies that have relation with science popularisation activities of KSSP are cited below.

Zachariah and Sooryamoorthy (1994) studied the sociological aspects of science popularisation activities of KSSP. They conclude that KSSP's aim in popularisation of science goes beyond the traditional view of science awareness building, to a new philosophy which considered science as a powerful political tool for social change. The study observed that KSSP could develop and introduce an alternative communication system, which is democratically accessible for the people in Kerala. It was also observed that communication strategy of KSSP imbibed many potential cultural factors from traditional setting of the society and successfully utilized them to propagate the idea that social revolution is possible through science.

Vilanilam and Jayan (1988) investigated the effectiveness of *Sasthra Kala Jathas* of KSSP in communicating science and technology. As a part of the study, they carried out audience survey in eight places in four of the fourteen districts of Kerala. The objective of the study was to ascertain the audience reactions to the programmes performed and the levels of their understanding of the content of those programmes. It was also their objective to determine which programme had the maximum impact. They found that demographic variables such as religious and political leanings had significant association with the peoples' perception of KSSP as a source of scientific information. While 40 percent of respondents viewed that KSSP had political bias, 60 per cent saw it as an unbiased source. Political and religious inclinations significantly influenced this perception. Gender-wise analysis showed that more males were attracted to KSSP *Jatha* programmes and held positive attitude towards the organization. Higher education groups were also found to be keeping positive attitude to the credibility of KSSP as an information source. However, in aggregate 88 percent of the respondents from various social categories reported to perceive the *Jatha* as an effective programme. After analysing the processes involved in developing the content and communication strategy for the *Jathas*, they concluded that there was a top-down rather than a bottom-top communication approach.

Devan (1986) conducted a study on the effectiveness of the massive science campaign organized by KSSP during the appearance of the Halley's Comet in 1986. During this time, KSSP offered various programmes at 10,000 venues across the state to eliminate superstitions prevailing in society regarding astronomy. It also arranged facilities to watch Halley's Comet so as to provide maximum available scientific information. Devan's study found interactive programmes and demonstrations more effective than traditional classroom lectures.

The afore cited studies reviewed provide some crucial insights into the process of science popularisation in respect of universals of communication such as source, channel, message, receiver and effects.

The source-centric studies revealed the critical role of socio-demographic variables in defining the sources' perception of the efficacy of the very process of simplification of science for popularisation purpose (Gravengaard, 2003; Kyvik, 2005) as well as in defining the sources' selection of medium for communication of science with lay audience (Nielsen *et al*., 2006).

Message studies highlight the bearing of variables such as stylistic and rhetoric simplification (Funkhouser & Maccoby, 1974), design and graphics (Smeltzer & Vance, 1989; Schiele, 1993, Koos *et al*., 2006; Arsenault *et al*., 2006, Vaughn & Edmonds, 2006), technical terms and conceptual complexity (Simonneaux & Jacoby, 1997), text organization (Kobayashi, 2002) textual comprehension (Hijman *et al*., 2003) narratives (Negrete, 2004; Saunders *et al*., 2004, Leydesdorff & Hellsten, 2005) linguistic simplicity (Meyer, 2005) on the use of science communication media as well as on the comprehension of science information by the targeted audience.

The studies of channel revealed that factors such as science news flows and gate keeping patterns define the way science information is covered. Type of information sources such as mass media (Hinkle & Elliott, 1989; Zimmerman *et al*., 2001; Granti, 2003; Brandi *et al*., 2004, Koolstra *et al*., 2006), and non mass media (Conradie & Grobler, 2003; Davis, 2004, Hwang & Southwell, 2007) and the area of scientific knowledge (Pellechia,

1997) were found to have influence on people's exposure to science information sources.

Similarly, socio-demographic variables such as gender, age, education and income, were found to critically control audiences' access to and appreciation of science information sources as evidenced from the studies (Funkhouser & Maccoby, 1971; Kreighbaum, 1959; Heinrichs and Peters, 2003; Raza and Singh, 2004) reviewed under receiver and effect studies. The review of related literature revealed that KSSP activities yet to be seriously studied in communication perspective.

The review of literature has made it clear that science communication is a complicated process as compared to other kinds of development communication activities because it involves simplification of complex ideas in order to match with relatively lower cognitive competence of the public. At a time when science and technology are profoundly shaping the world order and the knowledge gap in that domain is seriously jeopardizing the social equilibrium, public communication of science becomes ever more essential. Such a social context necessitates enquiries in science communication to face multifaceted issues such as measuring the efficacy of various types of communication channels in terms of audiences' socio-demographic characteristics.

It is against this background that the present study seeks to investigate the role of print and traditional media in science popularisation in rural settings, based on the activities of Kerala Sasthra Sahitya Parishath, a public science movement. The objectives of this investigation and the methodology used for the inquiry are detailed in the next chapter.

Chapter III

OBJECTIVES AND RESEARCH METHODOLOGY

Conceived as a case study, the present work investigates Kerala Sasthra Sahitya Parishath's (KSSP) communication strategies in popularising science in rural Kerala, with a special emphasis on its print and traditional media. Thus, the study is titled as 'The role of print and traditional media in popularising science in rural Kerala: A case study of Kerala Sasthra Sahitya Parishath'.

STUDY OBJECTIVES

The general objective of the study is to examine the role of KSSP's communication policies and strategies in popularising science among rural people. More specifically the study seeks to:

1. Identify the use of print and traditional media of KSSP as science information sources.
2. Identify the socio-demographic variables that influence the use of KSSP print and traditional media.
3. Analyse the audiences' perceived satisfaction with KSSP media in terms of their form and content.
4. Identify the pattern of the use non-KSSP communication channels as science information sources by rural people.
5. Measure the level of Public Understanding of Science (PUS) among users and non-users of KSSP communication channels in rural area.

Being an exploratory study, the present investigation does not seek to examine any hypothesis. The findings of this study, however, will certainly help in generating hypotheses for future explorations.

OPERATIONAL DEFINITIONS

Some key terms that are repeatedly used in this study while describing methodology and presenting the results of data analysis warrant operational definitions. These are given below:

Mass Media Sources

The term mass media sources refer to mass mediated information sources used by a relatively large, heterogeneous and anonymous mass. Mass media selected for this study are newspapers, magazines, books, radio, television and the Internet**.**

Non-Mass Media Sources

The non-mass media sources are institutions and individuals involved in communication with the public. Included in this category are government level extension workers, science institutions, exhibitions and other public functions.

Perceived Satisfaction with Media Performance

It refers to audience's satisfaction with media, based on their four form and content parameters such as visual performance, comprehensibility of content, simplicity of language and capacity of narration to contribute to understanding. This four dimensional performance of the medium is an important construct in the present work as it defines the user's satisfaction with operational efficiency of each medium.

Public Understanding of Science (PUS)

Public Understanding of Science (PUS) is a concept well rooted in the science popularisation discourses. In simple sense, the term stands for what the public ought to know about science. It also implies public's appreciation of the nature, aims and achievements of science and their understanding of important scientific ideas. The term, usually regarded as being synonymous with 'civic scientific literacy', is measured in this study using a 13-item scale of Public Understanding of Science.

Public Understanding of Science scale is a standardized measure to evaluate the civic scientific literacy. Developed by Miller and Durant in 1988

and utilized widely in public understanding science surveys in the USA and UK, this relatively durable measure was constructed on the conceptualization that civic scientific literacy is a two-dimensional construct which involves (i) a vocabulary of basic scientific ideas essential to read and comprehend the competitive views in mass media and an understanding of the basic scientific processes and (ii) concepts which are closely related with the origin, development and sustenance of human beings and their surroundings.

Earlier, civic scientific literacy was considered as a three-dimensional construct with the third one being some level of understanding of the impact of science on society and on individuals. As this dimension was found to be varying substantially among different nations, two-dimensional approach was adopted for the use in cross-national surveys.

It was in a1988-collaboration between Miller in the USA and Durant in the UK that the need for an expanded, standardized set of knowledge items to measure to evaluate public understanding of science was first realized. Thus, a combination of closed-ended and open-ended items were prepared to gather significantly better estimates of public understanding of science than any prior survey. Further, considering the field manageability, this core set of closed-ended knowledge items was used in Canada, Japan, Korea, New Zealand and Spain (Miller, 1996).

This scale includes a set of 13 statements related to an array of scientific subjects ranging from astronomy to botany and medicine to earth sciences. Each statement has two option of true and false. To a large extend, these core-items have provided a desirable set of measure with minor additions and deletions over the last decade (For the detailed knowledge items, see Appendix I).

KSSP Print Media

The print media of KSSP selected for this study are confined to *Sasthragathi* (a monthly meant for adults), science books both fictional and non-fictional, and pamphlets published by KSSP.

KSSP Traditional Media

Traditional media selected for this study refer to *Sasthra Kala Jatha*, a unique folk-based communication tool developed by KSSP to sensitize people to scientific way of life.

Users and non-users of KSSP

Users of KSSP are those who had exposure to the selected science communication channels of KSSP such as *Sasthra Kala Jatha*, *Sasthragath*i, pamphlets and science books in any of the regularity categories such regular, quite often, sometimes and rare.

Non-users of KSSP are those who never had any kind of exposure to any of the KSSP media.

Regularity Categories

To determine the frequency of the use of KSSP communication channels by the audience four regularity categories were used. They are: regular, quite often, sometimes and rare. And, these regularity categories are predefined according to the type of media considering the differences in their periodicity. Details of the regularity categories of each medium are given in Table 3.1.

Table 3.1: Medium-wise Regularity Categories

Communication Medium	Regularity Categories			
	Regular	**Quite Often**	**Sometimes**	**Rare**
Sasthra Kala Jatha	Every year	Once in two years	Once in three or four years	Once in more than four years
Sasthragathi	12 issues a year	11-7 issues a year	6-2 issues a year	less than two issues a year
Pamphlets	6 or more a year	5-4 a year	3-2 a year	less than 2 a year
Science Books	4 or more a month	3 a month	2 a month	one a month

METHODOLOGY

The major objective of the study is to examine the role of a peoples' science movement in popularisation of science among rural masses. So, it was envisaged as a case study hoping that the findings in relation to this particular case may hold some vital clues to the problems of science popularisation activities in developing countries.

Conceived as a case study, there was a need to collect data relating the science popularisation activities of KSSP. In view of the fact that KSSP uses a variety of channels to disseminate its messages, it was critical, from the point of view of the objectives of the study, to collect data on the target audiences' use of and evaluation of the channels and messages of KSSP. Taking these facts into account, sample survey method was used to generate necessary data for the study as it allows for examining the relationships between psychological and sociological variables of populations in relation with the case. Sample survey research also helps draw conclusions about the relationships and group differences in connection with the study objectives.

SAMPLING TECHNIQUE

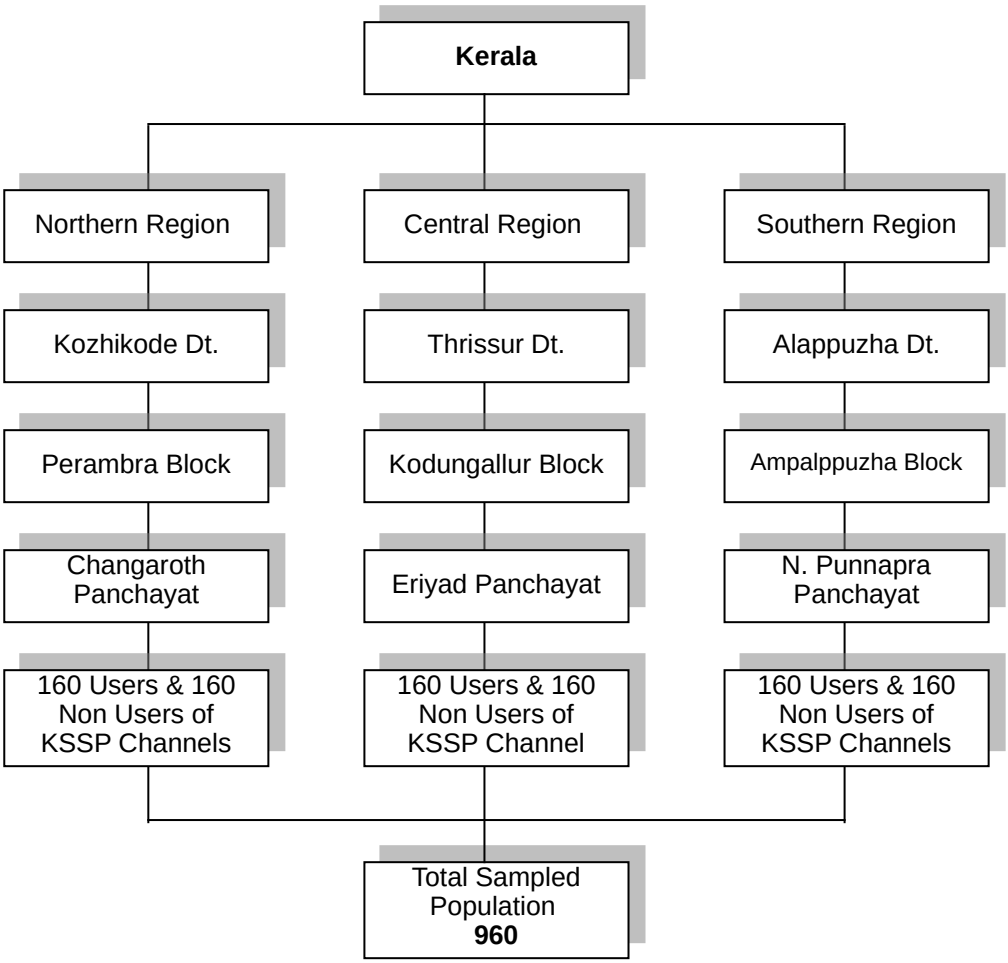
Since KSSP activities are spread across the State of Kerala, it was crucial to gather data from the State as a whole. As the entire population cannot be studied, a multi-stage random sampling technique was used to arrive at the study sample, which would represent the entire State.

With that objective, one district was randomly chosen from each of the three geographical regions – Northern, Central and Southern Kerala. This geographical division has two reasons. Firstly, KSSP usually conducts its programmes such as *Sasthra Kala Jatha and* campaigns on the basis of northern, central and southern region of the state. Secondly, Kerala has a historical division of three parts: Malabar, Kochi and Travancore which represent northern, central and southern parts respectively. This geographical division validates the historical roots of the differences existing at cultural, social as well as political domains of each area. Such a division permits representation of these differences. Thus, the districts of Kozhikode, Thrissur and Alappuzhas were randomly chosen to represent northern, central and southern parts of the state respectively.

From each of these districts one block Panchayat was randomly selected. Out of 12 block Panchayats of Kozhikode, Perambra was chosen to represent the northern region, and Kodungallur from 17 block Panchayats of Thrissur district, to represent the central region. And, Ambalappuzha block Panchayat was chosen from 12 block Panchayats of Alappuzha district represents the southern part of the State.

Finally, one village Panchayat each from the selected blocks was chosen randomly. Thus, Changaroth Panchayat of Perambra block, Eiryad Panchayat of Kodungallur block and N. Punnapra Panchayat of Ambalapuzha block were selected to represent the rural areas of northern, central and southern regions of Kerala (See Diagram 3.1).

Figure 3.1: Steps in Sampling



From each of these panchayats a quota sample of 160 users and 160 non-users of KSSP channels was purposefully chosen. However, in drawing individuals, care was taken to ensure adequate representation of all sections of rural population.

DATA COLLECTION TOOL

A data collection tool had to be prepared to elicit data on various facets of science popularisation activities of KSSP and science information seeking pattern of rural people. For this purpose, an interview schedule was prepared.

Interview Schedule

The interview schedule had four parts. While the first part of the schedule extracted data on the respondents' personal profile, the second part dealt with the general pattern of information acquisition of the sample. The third part contained questions about the level of understanding of science of the respondents and the final section explored their use of and satisfaction with print and traditional media of KSSP. See Appendix I for the interview schedule. Description of each part of the schedule is given below.

Part I: Respondents' Profile

The first part of the schedule was meant to collect data on demographic information of the respondents. It contained six items such as name (optional), sex, age, education, monthly family income and geographical location.

Part II: Respondents' Information Acquisition Pattern

The second part of the interview schedule was meant to elicit data on the regularity of the use of various information sources – mass media and non mass media sources – available in the study area. There were 10 questions in this part. The first three questions related to the use of print media such as newspaper, magazines and books respectively. The subsequent three questions dealt with the electronic media –radio, television and cinema. The next question was meant to gauge the frequency of Internet browsing. There were three other questions in this part that elicited data on the respondents' use of public functions, government extension agents and science exhibitions/ centres and the like. All the questions in this part were given with four response options such as 'Regular', Quite Often, 'Sometime' and 'Never'.

Part III: Measurement of Public Understanding of Science

The third part of the interview schedule was aimed to measure the level of public understanding of science of the respondents. The PUS statements developed by Miller and in National Science Foundation survey in the US and *Eurobarometer S*urvey in the UK was taken as the base to measure the respondents' understanding of science. The scale had a set of 13 knowledge items that concern the composition of matter, the nature of the universe, the basic processes that have shaped the planet and the basic biology that

supports life. The answer format had two options to choose – 'True' and 'False'.

Part IV: Users' Exposure to and Assessment of KSSP Channels

The fourth part of the interview schedule was prepared to find out the respondents' exposure to and perceived satisfaction with the print and traditional media of KSSP. *Sasthragathi* magazine, pamphlets and science books published by KSSP were included in the category of print media while the annual *Sasthra Kala Jatha* which KSSP has developed using folk-based communication channels of Kerala represented the traditional media.

In this part, for the questions pertaining to the regularity of the use KSSP channels, four response options such as 'Regular', 'Quite Often', 'Sometime' and 'Rare' were given.

Apart from this, a performance evaluation scale was also given in this part to collect data on the user's perceived satisfaction with the performance of KSSP channels. The scale was prepared using four statements about four message variables such as design (visual performance in the case of *Sasthra Kala Jathas*), understandability of content, simplicity of language and narrative style. There were three response options for each statement 'Agree', 'Neither Agree Nor Disagree', 'Disagree'.

DATA COLLECTION PROCEDURE

Sufficient copies of the interview schedule were prepared initially. The investigator then personally visited all the three villages in 2006 and elicited data from respondents using the schedule. Utmost care was taken to ensure accuracy and perfection. However, at the final scrutiny, 60 schedules were incomplete and therefore were discarded. Thus, data elicited from 900 respondents was taken up for analysis.

Chapter IV

ANALYSIS AND FINDINGS

The present study seeks to determine the role of print and traditional media in popularising science in rural areas of Kerala. To get a better understanding of the problems and issues, the work was conceived as a case study of Kerala Sasthra Sahitya Parishath, the largest and the earliest surviving peoples' science movement that strives to create a scientific temper among the people of the State. Given the fact that KSSP employs a variety of science information dissemination methods and channels to fulfill its objectives, it was essential, from the point of view of the study objectives, to collect data on the use of these channels and the messages by the target audience.

Since KSSP activities cover entire Kerala, it was critical to draw data from the State as a whole. Moreover, to find out the role of KSSP and its channels in science popularisation process, the study objectives included a comparative analysis of the users and non-users of KSSP channels in terms of their exposure to various information sources and its influence on their level of understanding of science. Taking these fundamental factors into consideration, a survey was conducted to elicit data from users and non-users of KSSP channels among the rural people of Kerala.

For this purpose, a multi-stage random sampling technique was used taking geographical units of the State such as districts, blocks and village panchayats into consideration. From the village panchayats which represent the rural areas of the State, a quota sample of 480 users of KSSP channels and 480 non-users of KSSP channels was arrived at. However, data of 60 respondents was incomplete. Thus the final sample for the study was 900 – 450 users of KSSP channels and 450 non-users of KSSP channels.

The data was collected using a four-part interview schedule that focused on demographic details, information acquisition habits and science

awareness level of the sampled population. It also extracted data on their exposure to and evaluation of print and traditional media of KSSP.

The present chapter is dedicated to anaylse the data elicited from the sampled population. The results are given in four units. While the first unit illustrates demographic details of the respondents, the second unit describes their exposure to and evaluation of print and traditional media of KSSP in terms of the respondents' four demographic variables such as gender, age, education and income. Such a detailed analysis of KSSP print and traditional media use by the respondents belonging to various demographic groups was essential to determine the role of KSSP print and traditional media in the level of science understanding of rural people. The third unit details their regularity of the use of mass media and non-mass media information sources. The final unit illustrates the results of the analysis of data collected on the level of public's understanding of science using a 13-knowledge item scale of public understanding of science.

SAMPLE DESCRIPTION

As mentioned earlier, the entire sample from which the data was elicited was 900, comprising of equal number of users and non-users of KSSP channels. As could be noted from Table 4.1, the representation of male and female was nearly equal in the total sample of 900. While male formed 52.89 per cent, the female constituted 47.11 per cent of the total sample. A similar distribution was present in the case of non-users of KSSP channels too. But, the difference of proportion between male and female was a little higher in the case of the users of KSSP channels.

Table 4.1: Sample Description

Demographic Details	Users of KSSP Channels		Non-users of KSSP Channels		Total	
Gender Groups	**Frequency**	**Percent**	**Frequency**	**Percent**	**Frequency**	**Percent**
Male	244	54.22	232	51.56	476	52.89
Female	206	45.78	218	48.44	424	47.11
Total	450	100.00	450	100.00	900	100.00
Age Groups						
20-29 years	143	31.78	169	37.56	312	34.67
30-39 years	130	28.89	93	20.67	223	24.78
40-49 years	117	26.00	153	34.00	270	30.00
50-59 years	60	13.33	35	07.78	95	10.56
Total	450	100.00	450	100.00	900	100.00
Education Groups						
Below SSLC	72	16.00	116	25.78	188	20.89
SSLC	121	26.89	93	20.67	214	23.78
Plus-Two	132	29.33	120	26.67	252	28.00
Degree	103	22.89	102	22.67	205	22.78
PG and above	22	4.89	19	4.22	41	4.56
Total	450	100.00	450	100.00	900	100.00
Monthly Income Groups						
Below Rs.5,000	197	43.78	233	51.78	430	47.78
Rs.5,001-10,000	205	45.56	200	44.44	405	45.00
Rs.10,001-15,000	41	09.11	17	03.78	58	06.44
Rs.15,001-20,000	7	01.56	0	00.00	7	00.78
Total	450	100.00	450	100.00	900	100.00

Age is yet another demographic variable on which the data was gathered. Respondents' age ranged from 20 years to 58 years. The mean age was 36.5 years. For analytical purpose, the sampled population was classified into four age groups: 20-29 years, 30-39 years, 40-49 years and 50-59 years. Of these, the youngest age group of 20-29 years had the highest share (34.67 per cent) followed by 40-49 year group (30 per cent) and 30-39 year group (24.78 per cent). The least represented segment was 50-59 year group. A similar pattern of representation of age group was present in the user and non-user categories also. In user and non-user categories, the youngest age group had the highest representation – 31.78 per cent and 37.56 per cent respectively. The least represented was the eldest group in both the categories of users and non-users of KSSP channels.

According to their educational qualifications, the respondents were categorized into five groups such as below SSLC, SSLC, Plus-Two, Degree, and PG and above. Of these, those with below SSLC, SSLC and degree level of education were by-and-large uniformly represented in the sample with their share ranging from 20.89 per cent, 23.78 per cent and 22.78 per cent respectively. The proportion of representation of respondents belonging to Plus-Two and PG and above education levels was different from the other three groups. While respondents with Plus-Two education constituted the largest majority (28 per cent) of the sample, those with higher education formed a bare 4.56 per cent of the sample. A similar trend was noticeable in the users and non-users of KSSP channels as well (See Table 4.1).

As in the case of age and education, the respondents were also classified into four sub groups according to their monthly family income range. The income groups are: below Rs 5,000, Rs 5,001-10,000, Rs 10,001-15,000 and Rs 15,001-20,000. The sample having been drawn from rural populace, the low-income groups were expected to have a large share in the sample. Accordingly, almost 93 per cent of the respondents were in the low income groups of below Rs 5,000 and Rs 5,001-10,000. The higher income groups constituted a little over 7 per cent of the sample. Such a trend in the distribution was in evidence in users and non-users of KSSP channels categories too. In the user category, over 45 per cent of the samples were in

the second low-income group of Rs 5,001-10,000. In the non-user category, those belonging to the income level below 5,000 constituted a little over 51 per cent of the sample.

PATTERN OF THE USE OF KSSP CHANNELS

KSSP communicates its ideas and philosophy of science through a variety of print and traditional media. In the print media sector, it brings out three regular publications: *Sasthragathi,* a monthly for general public; *Sasthra Keralam,* a monthly for college students, and *Eureka,* a biweekly for school children. In addition, it periodically issues pamphlets and books on a wide variety of science subjects.

Besides print media, KSSP employs, *Sasthra Kala Jatha,* a novel cultural program with innovative theatrical experiments and participatory communication approach using traditional art forms of Kerala. The art forms used by KSSP in *Sasthra Kala Jathas* range from *Ottanthullal* to *Mappilapattu* and *Kakkarissi Natakam* to *Villupattu*, which are an integral part of rural Kerala. Being indigenous art forms born and nurtured by the people, they are attended to by the village communities without any reservation. That being the potential, KSSP has been employing them to communicate science messages. What is the usage of pattern of these channels among those who depend on KSSP communication media for science information? This question is being explored in this section.

The present enquiry, however, limits itself to KSSP print media comprising of *Sasthragathi* monthly, pamphlets and science books, and the traditional media represented by *Sasthra Kala Jatha.* The two other popular KSSP publications, namely *Sasthra Keralam* and *Eureka*, were not included as they cater to college students and school children respectively.

To answer the first objective of the study relating to the usage pattern of the KSSP print – *Sasthragathi*, pamphlets and books – and traditional media among KSSP channels' users, the sample users of KSSP channels

were asked to indicate their regularity of using the three selected print media and *Sasthra Kala Jatha*, the traditional media.

Along with this, an attempt was made to analyse the audiences' evaluation of the channels studied, based on their four variables such as design, content, language and presentation style (narration). Such an investigation was essential to explore the nature and depth of the audiences' involvement and interest with the media in terms of four vital dimensions of their form and content. Moreover, such an assessment was critical to identify the possible areas of communication barrier and to determine the operational efficiency of each medium.

For this purpose, an evaluation scale comprising of four statements about form and content of each medium was prepared. The statements which pertained to the variables of design, content, language and narration were: a) 'The design / visual performance is attractive', b) 'It is easy to understand the content', c) 'The language is simple', d) 'The narration contributes to understanding'. And, the respondents were asked to choose their response from three options such as 'Agree', 'Neither Agree Nor Disagree', 'Disagree' (See Appendix I).

The results of the analysis of data on the use and evaluation of the KSSP channels by the sampled population are reported in this unit.

Regularity of the Use of KSSP Channels

The analysis reported in Table 4.2 amply highlights the popularity of *Sasthra Kala Jatha* as a major science communication vehicle among the users of KSSP channels.

Table 4.2 : Regularity of the Use of KSSP Channels

KSSP Channels	Regularity Nature				Total
	Regular	Quite Often	Sometimes	Rare	
Sasthra Kala Jatha	207 (46.00)	229 (50.89)	0 (0.00)	14 (3.11)	450 (100.00)
Sasthragathi	26 (5.78)	124 (27.56)	205 (45.56)	95 (21.10)	450 (100.00)
Pamphlets	12 (2.67)	332 (73.78)	83 (18.44)	23 (5.11)	450 (100.00)
Science Books	2 (0.44)	69 (15.33)	243 (54.00)	136 (30.22)	450 (100.00)

Figures in parentheses denote percentage

As many as 207 (46 per cent) of the 450 respondents indicated that they regularly attended the annual *Sasthra Kala Jathas*. Another 229 (50.89 per cent) respondents reported to attending *Jathas* quite often, ie. once in two years. Those who attended rarely constituted a minority of 3.11 per cent of the respondents.

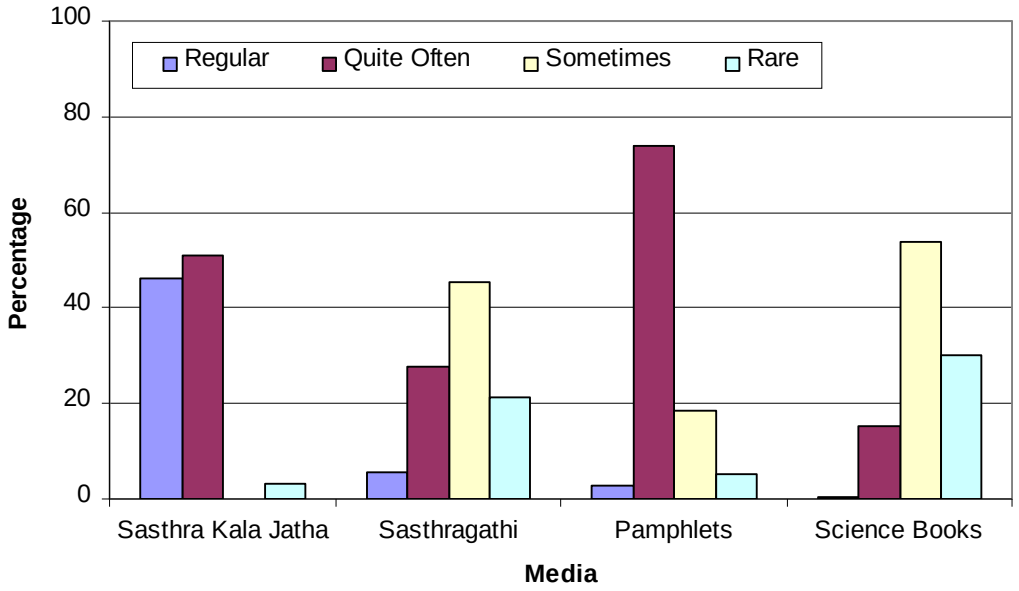
While noting the popularity of *Sasthra Kala Jathas* it is important to keep in view that it is an annual affair, whereas the other KSSP media such as pamphlets, science books and *Sasthragathi* are brought out more frequently. For instance, *Sasthragathi* is a monthly publication, pamphlets are issued several times a year and around 40 new or revised editions of books are published annually. Hence, the regularity of the use of *Sasthra Kala Jatha* and other KSSP media may appear to be incomparable. In view of such a possibility, the regularity categories of ‘regular’ ‘quite often’, ‘sometimes’ and ‘rare’ have been appropriately defined taking the periodicity of each publication into consideration.

In contrast to such a popularity of *Sasthra Kala Jathas*, the traditional communication channels used by KSSP to advance scientific information and knowledge among rural audiences, the popularity of other three print media

was dismal. Among the three, *Sasthragathi,* which was regularly read by only 5.78 per cent respondents was followed by pamphlets (2.67 per cent). Science books were the least regularly read print media. In the 'quite often'-read category, the first place (73.78 per cent) belonged to pamphlets. Books on science subjects issued by KSSP were being read 'sometimes' by 54 per cent of the respondents. In addition, over 30 per cent of the respondents read books rarely.

From such a distribution, it clearly emerges that *Sasthra Kala Jathas*, the traditional medium remains the most popular science communication vehicle of KSSP, followed by *Sasthragathi,* pamphlets and science books in that order. This finding cetainly assigns importance to the role of traditional media in popularising science in contemporary rural Kerala. It validates the assumption that the traditional art forms employed in *Sasthra Kala Jathas* have immense potential to increase people's participation and hopefully initiate social change because they are compatible with the cultural values of the audience and are more persuasive, persistent, and personal. In addition, they are participatory in nature with ample scope for people to play an active role in their production and performance. Such an involvement often erases the distinction between the performer and the audience. Moreover, they are inexpensive and affordable. They require no elaborated stage arrangements, excessive accompaniments and intricate microphysical movements as in the case of classical art forms. With such unique features, these art forms provide for easy interpersonal communication with a potential for greater impact in rural communities than the impersonal mediated channels of electronic and print media. Their cultural proximity and traditional belongingness permit them to match well with the cognitive competence of rural masses. Naturally, it is assumed that all these characteristics of the traditional art forms used in the *Jathas* positively contribute to their popularity.

Figure 4.1: Regularity of the Use of KSSP Channels



USE AND EVALUATION OF KSSP TRADITIONAL MEDIA

Such being the popularity of *Sasthra Kala Jatha,* which represents the traditional media used by KSSP for science popularisation, an effort was made to investigate whether the demographic variables of gender, age, education and family income had a bearing on the respondents' frequency of attendance.

Regularity of Attending *Sasthra Kala Jatha* by Gender

The analysis reported in Table 4.3 revealed that male and female did not differ much in the frequency of attending *Sasthra Kala Jathas.* The large majority of both male and female respondents attended *Sasthra Kala Jathas* either 'regularly' or 'quite often'.

Table 4.3 : Regularity of Attending *Sasthra Kala Jatha* by Gender

Gender Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Male	114 (46.72)	120 (49.18)	0 (0.00)	10 (4.10)	244 (100)
Female	93 (45.15)	109 (52.91)	0 (0.00)	4 (1.94)	206 (100)
Total	207 (46.00)	229 (50.89)	0 (0.00)	14 (3.11)	450 (100)

Figures in parentheses denote percentage

Pearson Chi-square: 2.03588, d f=2, p=.361351

Regularity of Attending *Sasthra Kala Jatha* by Age

In terms of the four age groups, there were statistically significant differences in the way the *Sasthra Kala Jathas* were attended to. The incidence of attending *Sasthra Kala Jathas* 'rarely' (8.33 per cent) and 'quite often' (63.33 per cent) was dominant in the elderly age group of 50-59 years (See Table 4.4). The tendency of attending *Sasthra Kala Jathas* 'rarely' was found to decrease with increase in age of respondents. Such a distribution which was found statistically significant (p = .000337) suggests that middle and younger age groups attended *Sasthra Kala Jathas* more frequently than the elderly in rural Kerala.

Table 4.4: Regularity of Attending *Sasthra Kala Jatha* by Age

Age Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
20-29 years	58 (40.56)	84 (58.74)	0 (0.00)	1 (0.70)	143 (100)
30-39 years	69 (53.08)	59 (45.38)	0 (0.00)	2 (1.54)	130 (100)
40-49 years	63 (53.85)	48 (41.03)	0 (0.00)	6 (5.13)	117 (100)
50-59 years	17 (28.33)	38 (63.33)	0 (0.00)	5 (8.33)	60 (100)
Total	207 (46.00)	229 (50.89)	0 (0.00)	14 (3.11)	450 (100)

Figures in parentheses denote percentage

Pearson Chi-square: 25.0383, df=6, p=.000337

Regularity of Attending *Sasthra Kala Jatha* by Education

As noted in Table 4.5, those with Plus-Two education (56.06 per cent) were the most regular in attending *Sasthra Kala Jathas* as compared to those with PG and above (54.55 per cent), below SSLC (38.89 per cent) and SSLC (37.19 per cent) educational qualifications. In contrast to such high regular attendance by those educational groups, less than 7 per cent graduates attended *Sasthra Kala Jathas* regularly. They also constituted the largest majority of those who rarely attended the *Sastha Kala Jathas*. The incidence of attending *Sasthra Kala Jathas* ‘ quite often’ was the highest among ‘below SSLC’ respondents followed by SSLC, Degree, Plus-Two and PG and above educational groups. Such an education-wise distribution of respondents in terms of their frequency of the use of *Sasthra Kala Jathas* was found to be statistically significant at a probability level of .01044(See Table 4.5).

Table 4.5: Regularity of Attending *Sasthra Kala Jatha* by Education

Education Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Below SSLC	28 (38.89)	44 (61.11)	0 (0.00)	0 (0.00)	72 (100)
SSLC	45 (37.19)	72 (59.50)	0 (0.00)	4 (3.31)	121 (100)
Plus-Two	74 (56.06)	56 (42.42)	0 (0.00)	2 (1.52)	132 (100)
Degree	7 (6.80)	48 (46.60)	0 (0.00)	48 (46.60)	103 (100.00)
PG and above	12 (54.55)	9 (40.91)	0 (0.00)	1 (4.54)	22 (100)
Total	207 (46.00)	229 (50.89)	0 (0.00)	14 (3.11)	450 (100)

Figures in parentheses denote percentage

Pearson Chi-square: 19.9758, df=8, p=.010444

Regularity of Attending *Sasthra Kala Jathas* by Income

The analysis of attendance of *Sasthra Kala Jatha* by monthly family income levels revealed that a large majority of all income groups attended *Sasthra Kala Jathas* ‘regularly’ or ‘quite often’. The data reported in Table 4.6 which was found to be statistically significant, reveals that the income group of Rs. 5,001-10,000 had the highest (55.12 per cent) proportion of those who attended *Sasthra Kala Jathas* ‘regularly’ and the lowest regular attendance was that of the income group of 15,001-20,000.

While 59.90 per cent of the respondents of monthly income group of below Rs. 5,000 reported to attend *Sacomsthra Kala Jathas* ‘quite often’ the other groups did not vary much. It was the higher income group of Rs 15,001-20,000, that had the highest incidence of attending of *Sasthra Kala Jathas* ‘rarely’ (14.26 per cent).

Table 4.6: Regularity of Attending *Sasthra Kala Jathas* by Income

Income Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Below Rs. 5,000	76 (38.58)	118 (59.90)	0 (0.00)	3 (1.52)	197 (100.00)
Rs. 5,001-10,000	113 (55.12)	85 (41.46)	0 (0.00)	7 (3.41)	205 (100.00)
Rs. 10,001-15,000	16 (39.02)	22 (53.66)	0 (0.00)	3 (7.32)	41 (100.00)
Rs.15,001-20,000	2 (28.57)	4 (57.14)	0 (0.00)	1 (14.29)	7 (100.00)
Total	207 (46.00)	229 (50.89)	0 (0.00)	14 (3.11)	450 (100.00)

Figures in parentheses denote percentage

Pearson Chi-square: 20.5986, df=6, p=.002170

From the above analysis of the regularity of attending *Sasthra Kala Jathas* by respondents belonging to various demographic variables, it emerges that the variable of gender had no bearing on their attendance in *Sasthra Kala Jathas* organized annually by KSSP in rural Kerala. However, the demographic variables of age, education and income appeared to have some influence on the regularity of attending *Sasthra Kala Jathas*.

Audiences' Evaluation of *Sasthra Kala Jatha*

In addition to assessing the influence of demographic variables on the regularity of attending each of the channels of KSSP, audiences' evaluation of the channels was also carried out. The data of such an analysis was given in Table 4.7 in respect of *Sasthra Kala Jatha'*s form and content parameters namely design (visualperformance), understandability of content, simplicity of language and style of narration.

Table 4.7: Evaluation of *Sasthra Kala Jatha's* Form and Content

Form and Content	Respondents' Evaluation

Parameters	Agree	Neither Agree Nor Disagree	Disagree	Total
'The visual performance is attractive'	396 (88.00)	53 (11.78)	1 (0.22)	450 (100.00)
'It is easy to understand the content'.	355 (78.89)	72 (16.00)	23 (5.11)	450 (100.00)
'The language is simple'	306 (68.00)	144 (32.00)	0 (0.00)	450 (100.00)
'The narration contributes to understanding'	278 (61.78)	172 (38.22)	0 (0.00)	450 (100.00)

Figures in parentheses denote percentage.

A large majority of the respondents reported to be satisfied with *Sasthra Kala Jatha*'s form and content parameters. An overwhelming 88 per cent of the respondents found *Sasthra Kala Jathas* visually attractive. Close to 80 per cent of the respondents reported that they could understand the content of the messages communicated through various traditional modes employed in *Sasthra Kala Jatha*.

The proportion of those who were satisfied with the simplicity of language and presentation style of the messages communicated through *Sasthra Kala Jatha* was relatively less – 68 per cent and 61.78 per cent respectively.

USE AND EVALUATION OF KSSP PRINT MEDIA

Though, a large majority of the respondents did not read the three KSSP print media namely *Sasthragathi,* pamphlets and science books regularly, the data was analysed to examine whether respondent's demographic variables such as gender, age, education and income had any bearing on their regularity of using KSSP print media.

Regularity of *Sasthragathi* Reading by Gender

As reported in Table 4.8, the gender variable appears to have no influence on the regularity of reading of *Sasthragathi*, a monthly magazine of KSSP.

Table 4. 8: Regularity of *Sasthragathi* Reading by Gender

Gender Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Male	11 (4.51)	70 (28.69)	110 (45.08)	53 (21.72)	244 (100)
Female	15 (7.28)	54 (26.21)	95 (46.12)	42 (20.39)	206 (100)
Total	26 (5.78)	124 (27.56)	205 (45.56)	95 (21.11)	450 (100.00)

Figures in parentheses denote percentage

Pearson Chi-square: 1.85549, df=3, p=.602940

The tendency of reading *Sasthragathi* with ranging regularity was similar among male and female members of the population.

Regularity of *Sasthragathi* reading by Age

As detailed in Table 4.9, in terms of age, there were differences in the regularity of reading *Sasthragathi*.

Table 4.9 : Regularity of *Sasthragathi* Reading by Age

Age Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
20-29 years	14 (9.79)	47 (32.87)	64 (44.76)	18 (12.59)	143 (100)
30-39 years	3 (2.31)	37 (28.46)	65 (50.00)	25 (19.23)	130 (100)
40-49 years	3 (2.56)	28 (23.93)	52 (44.44)	34 (29.06)	117 (100)
50-59 years	6 (10.00)	12 (20.00)	24 (40.00)	18 (30.00)	60 (100)
Total	26 (5.78)	124 (27.56)	205 (45.56)	95 (21.11)	450 (100)

Figures in parentheses denote percentage

Pearson Chi-square: 25.8484, df=9, p=.002169

Those who reported to read *Sasthragathi* regularly formed a minority in all age groups. Irrespective of age, a large majority of *Sasthragathi* readers did not read it 'regularly' but reported to read either 'sometimes' or 'quite often'. It was the age group of 30-39 years which stood out as the dominant group reading *Sasthragathi* either 'sometime' (50%) or 'quite often' (28.46 per cent) followed by the youngest age group of 20-29 years, 40-49 years and 50-59 years in that order (See Table 4.9). At the same time, the proportion of those reading *Sasthragathi* 'rarely' appears to increase by age. For instance, while only 12.59 per cent of the youngest age group 'rarely' read *Sasthragathi*, over 19 per cent of those in 30-39 years age group 'rarely' read it. This incidence was much higher in the advanced age groups with the highest incidence of 30 per cent of reading in the elderly group of 50-59 years.

This kind of a distribution which was statistically significant at a probability level of .002 indicates that the youngest age group read *Sasthragathi* far more frequently than the groups of the elderly.

Regularity of *Sasthragathi* Reading by Education

The analysis of *Sasthragathi* readership among various educational groups yielded interesting results. Those with lower educational qualification of below SSLC were found to be reading *Sasthragathi* less frequently than the other educational groups, as could be seen in Table 4.10

Table 4.10: Regularity of *Sasthragathi* Reading by Education

Education Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Below SSLC	0 (0.00)	0 (0.00)	19 (26.39)	53 (73.61)	72 (100.)
SSLC	16 (13.22)	27 (22.31)	60 (49.59)	18 (14.88)	121 (100.00)
Plus-Two	6 (4.55)	43 (32.58)	69 (52.27)	14 (10.60)	132 (100)
Degree	4 (3.88)	46 (44.66)	44 (42.72)	9 (8.74)	103 (100.00)
PG and above	0 (0.00)	8 (36.36)	13 (59.09)	1 (4.55)	22 (100)
Total	26 (5.78)	124 (27.56)	205 (45.56)	95 (21.11)	450 (100)

Figures in parentheses denote percentage

Pearson Chi-square: 173.908, df=12, p=0.00000

A majority of respondents belonging to other educational groups were reading *Sasthragathi* either ‘sometimes’ or ‘quite often’. The incidence of reading *Sasthragathi* ‘quite often’ was the highest (44.66 per cent) among the graduates and the tendency of reading it ‘sometimes’ was dominant (59.09 per cent) among those with PG and above education. Aside these differences, yet another noteworthy feature was that the proportion of reading *Sasthragathi* ‘rarely’ decreased with increase in educational qualification. In

that, those with lower educational qualification of below SSLC stood first with more than 73 per cent pf respondents reporting to read *Sasthragathi* 'rarely'. Also, less than 5 per cent of those with PG and above read it 'rarely'.

This sort of distribution of five educational groups in terms of their frequency of reading *Sasthragathi* was found to be statistically significant at a probability level of .00.

Regularity of *Sasthragathi* Reading by Income

In respect of four monthly income groups also, the majority of the respondents either read *Sasthragathi* 'sometimes' or 'quite often' in that order.

Table 4.11 : Regularity of *Sasthragathi* Reading by Income

Income Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Below Rs 5,000	6 (3.05)	43 (21.83)	74 (37.56)	74 (37.56)	197 (100.00)
Rs 5,001-10,000	16 (7.80)	60 (29.27)	113 (55.12)	16 (7.80)	205 (100.00)
Rs 10,001-15,000	4 (9.76)	17 (41.46)	15 (36.59)	5 (12.20)	41 (100.00)
Rs 15,001-20,000	0 (0.00)	4 (57.14)	3 (42.86)	0 (0.00)	7 (100.00)
Total	26 (5.78)	124 (27.56)	205 (45.56)	95 (21.11)	450 (100.00)

Figures in parentheses denote percentage

Pearson Chi-square: 66.2855, df=9, p=.000000

The incidence of reading 'quite often', which increased by increase in income, was dominant in the upper income group of Rs 15,001-20,000. Also, members of this group either read it 'quite often' or 'sometimes'. Likewise, the incidence of reading *Sasthragathi* 'sometimes' was higher among those with whose monthly income was between Rs 5,001-10,000. The tendency of

reading *Sasthragathi* 'rarely' was the highest in lower income group of below Rs 5,000 and the lowest in the higher income group.

Chi-square test indicates that the differences among four income groups in relation to their regularity of reading *Sasthragathi* are statistically significant at a probability level of .00.

From the above analysis it can be concluded that the demographic variables such as age, education, income of the respondents had influence on their regularity of reading *Sasthragathi*, whereas the demographic variable of gender had no bearing on the respondents' frequency of reading *Sasthragathi*.

Audiences' Evaluation of *Sasthragathi*

The evaluation of *Sasthragathi* by the readers showed that there was room for improving the form and content of this monthly magazine of KSSP in all its parameters. This is evident from the fact that only little more than 56 percent of the readers found the design attractive (See Table 4.12)**.** On the parameter of understandability of content, *Sasthragathi* had a poor showing with only 38 per cent of readers reporting that they understood the content. The language used in its articles was not simple for as many over 44 per cent of the readers, though, about 56 per cent of the readers were satisfied with the style of presentation (narration).

Table 4.12: Evaluation of *Sasthragathi's* Form and Content

Form and Content Parameters	Respondents' Evaluation			
	Agree	Neither Agree Nor Disagree	Disagree	Total
'The design is attractive'	254 (56.44)	163 (36.22)	33 (7.33)	450 (100.00)
'It is easy to understand the content'.	171 (38.00)	266 (59.11)	13 (2.89)	450 (100.00)
'The language is simple'	201 (44.67)	188 (41.78)	61 (13.56)	450 (100.00)
'The narration contributes to understanding'	254 (56.44)	160 (35.56)	36 (8.00)	450 (100.00)

Figures in parentheses denote percentage

Such an evaluation of *Sasthragathi* sends out a message that the form and content of the magazine should be improved so as to make science messages understandable.

Regularity of Pamphlet Reading by Gender

As in the case of *Sasthragathi*, the readership of KSSP pamphlets issued on a wide variety of science issues/topics related with science was examined in terms of the demographic variables of the sampled users of KSSP channels.

The gender-wise analysis reported in Table 4.13 revealed that the incidence of 'regular' use of pamphlets was almost equal in both the gender groups– 2.87 per cent and 2.43 per cent among male and female respondents respectively. A majority of the male (69.67 per cent) and female (78.64 per cent) respondents claimed to read pamphlets 'quite often'. The occurrence of reading pamphlets 'rarely' was found to be higher (7.38 per cent) among the male than the female (2.43 per cent). However, these differences were found to be statistically insignificant.

Table 4.13: Regularity of Pamphlet Reading by Gender

Gender Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Male	7 (2.87)	170 (69.67)	49 (20.08)	18 (7.38)	244 (100)
Female	5 (2.43)	162 (78.64)	34 (16.50)	5 (2.43)	206 (100)
Total	12 (2.67)	332 (73.78)	83 (18.44)	23 (5.11)	450 (100)

Figures in parentheses denote percentage
Pearson Chi-square: 7.42886, df=3, p=.059435

Regularity of Pamphlet Reading by Age

The analysis reported in Table 4.14 suggests that the tendency of reading pamphlets 'rarely' decreased with increase in age. While the lowest age group had the highest incidence (7.69 per cent) of reading pamphlets 'rarely', the lowest proportion was among the eldest (1.67 per cent).

Table 4.14: Regularity of Pamphlet Reading by Age

Age Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
20-29 years	6 (4.20)	111 (77.62)	15 (10.49)	11 (7.69)	143 (100)
30-39 years	2 (1.54)	94 (72.31)	28 (21.54)	6 (4.62)	130 (100)
40-49 years	1 (0.85)	77 (65.81)	34 (29.06)	5 (4.27)	117 (100)
50-59 years	3 (5.00)	50 (83.33)	6 (10.00)	1 (1.67)	60 (100)
Total	12 (2.67)	332 (73.78)	83 (18.44)	23 (5.11)	450 (100)

Figures in parentheses denote percentage
Pearson Chi-square: 25.1420, df=9, p=.002826

Another interesting feature of the result was that the incidence of those who read pamphlets 'regularly' and 'quite often' was the highest among the

elderly (5 per cent and 83.33 per cent respectively). Compared to other age groups, the group of 40-49 years had the highest (29.06 per cent) proportion of those of who read pamphlets ‘sometimes’. This kind of distribution of frequency of the respondents’ pamphlet reading by age was found to be statistically significant at a probability level of .002.

Regularity of Pamphlet Reading by Education

The analysis reported in Table 4.15 revealed that the regularity of reading pamphlets was dismal in lower educational groups as compared to the higher education categories such as degree, and PG and above. None of below SSLC category reported to read pamphlets ‘regularly’.

Table 4.15 : Regularity of Pamphlet Reading by Education

Education Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Below SSLC	0 (0.00)	49 (68.05)	21 (29.17)	2 (2.78)	72 (100)
SSLC	3 (2.48)	92 (76.03)	20 (16.53)	6 (4.96)	121 (100)
Plus-Two	3 (2.27)	112 (84.85)	13 (9.85)	4 (3.03)	132 (100)
Degree	5 (4.85)	70 (67.96)	21 (20.39)	7 (6.80)	103 (100.00)
PG and above	1 (4.55)	9 (40.91)	8 (36.36)	4 (18.18)	22 (100)
Total	12 (2.67)	332 (73.78)	83 (18.44)	23 (5.11)	450 (100)

Pearson Chi-square: 34.3163, df=12, p=.000604

In contrast to this, the tendency of reading pamphlets ‘rarely’ was relatively higher among those with degree, and PG and above educational qualifications. While 2.78 of those with ‘below SSLC’ qualification reported to

read pamphlets rarely, the proportion of such readers belonging to PG and above, and degree educational groups was 18.18 percent and 6.80 per cent respectively.

The tendency of reading pamphlets ‘quite often’ was dominant in all educational groups. In that, it was Plus-Two category that stood out having the largest (84.85 per cent) group reading pamphlets ‘quite often’, followed by SSLC (76.03 per cent) and below SSLC (68.05 per cent) categories. The trend of reading pamphlets ‘sometimes’ was highest (36.36 per cent) among in PG and above category.

This sort of distribution was found to be statistically significant at a probability level of .00 suggesting that educational attainments had a strong influence on the respondents’ pattern of reading pamphlets.

Regularity of Pamphlet Reading by Income

The analysis of pamphlet-reading habit by income suggested that highest income group read pamphlets more frequently. For instance, the propensity of reading pamphlets regularly was higher (14.29 per cent) among the highest income groups as compared to regular reading pattern of other income categories (See Table 4.16). Similarly, no respondent belonging to the highest income group reported to read pamphlets ‘rarely’. It was also revealed that the incidence of reading pamphlets ‘rarely’ was higher in the two lower income categories compared to the middle-income group.

Table 4. 16 : Regularity of Pamphlet Reading by Income

Income Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Below Rs 5,000	6 (3.05)	137 (69.54)	47 (23.86)	7 (3.55)	197 (100.00)
Rs 5,001-10,000	4 (1.95)	163 (79.51)	23 (11.22)	15 (7.32)	205 (100.00)
Rs 10,001-15,000	1 (2.44)	28 (68.29)	11 (26.83)	1 (2.44)	41 (100.00)
Rs 15,001-20,000	1 (14.29)	4 (57.14)	2 (28.57)	0 (0.00)	7 (100.00)
Total	12 (2.67)	332 (73.78)	83 (18.44)	23 (5.11)	450 (100.00)

Figures in parentheses denote percentage
Pearson Chi-square: 20.5751, df=9, p=.014699

A majority of the respondents in all income categories reported to read pamphlets ‘quite often’. With the lower income group of Rs 5,001 – 10,000 standing first (79.51 per cent) followed by the income categories of below Rs. 5,000, Rs.10,001-15,000 and Rs 15,001-20,000 respectively. The tendency of reading pamphlet ‘sometimes’ was highest (28.57 per cent) among those who belong to the highest income group.

This kind of a distribution was found to be statistically significant indicating a strong bearing of the respondents’ economic status on their pattern of the use of pamphlets issued by KSSP.

From the above analysis, it is possible to conclude that all the selected variables except for gender had strong influence on defining the usage pattern of pamphlets.

Audiences' Evaluation of Pamphlets

The respondents' evaluation of KSSP pamphlets revealed a not-encouraging performance of the medium in its form and content parameters such as design, understandability of content, simplicity of language and narration of information. While design and language of pamphlets were rated satisfactory by 68.22 per cent and 63.56 per cent of the readers respectively, it was only less than half of the respondents (48 per cent) who could understand the content. Similarly, the proportion of those who were satisfied with narration was as low as 46 per cent (See Table 4.17).

Table 4.17 : Evaluation of Pamphlets' Form and Content

Form and Content Parameters	Respondents' Evaluation			
	Agree	Neither Agree Nor Disagree	Disagree	Total
'The design is attractive'	307 (68.22)	117 (26.00)	26 (5.78)	450 (100.00)
'It is easy to understand the content'.	216 (48.00)	137 (30.44)	97 (21.56)	450 (100.00)
'The language is simple'	286 (63.56)	139 (30.89)	25 (5.56)	450 (100.00)
'The narration contributes to understanding'	207 (46.00)	193 (42.89)	50 (11.11)	450 (100.00)

Figures in parentheses denote percentage

This kind of audience assessment indicated that selection of content and style of presentation of information for pamphlets should be changed to meet the level of the audience.

Regularity of Science Book Reading by Gender

Analysis reported in Table 4.18 suggested that the gender difference in the use of science book reading by the respondents was not found to be statistically significant as in the case of other print media such as *Sasthragathi* and pamphlets and the traditional media of *Sasthra Kala Jatha*.

Table 4. 18: Regularity of Science Book Reading by Gender

Gender Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Male	1 (0.41)	40 (16.39)	130 (53.28)	73 (29.92)	244 (100)
Female	1 (0.49)	29 (14.08)	113 (54.85)	63 (30.58)	206 (100)
Total	2 (0.44)	69 (15.33)	243 (54.00)	136 (30.22)	450 (100.00)

Figures in parentheses denote percentage
Pearson Chi-square: .472700, df=3, p=.924846

Regularity of Science Book Reading by Age

Though not by gender, there were statistically significant differences in the reading pattern of the books by the respondents in terms of their age. Data in Table 4.19 indicates that the tendency of reading books was abysmally low among all age groups. However, the habit of reading books ‘quite often’ and ‘sometimes’ was prevalent among all respondents. The ‘quite often’ reading was the highest in the 40-49 years age group. And the habit of reading books ‘sometimes’ was the strongest (60 per cent) in the age group of 30-39 years.

Table 4. 19: Regularity of Science Book Reading by Age

Age Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
20-29 years	0 (0.00)	22 (15.38)	85 (59.44)	36 (25.17)	143 (100)
30-39 years	1 (0.77)	12 (9.23)	78 (60.00)	39 (30.00)	130 (100.00)
40-49 years	0 (0.00)	27 (23.08)	48 (41.03)	42 (35.90)	117 (100)
50-59 years	1 (1.67)	8 (13.33)	32 (53.33)	19 (31.67)	60 (100)
Total	2 (0.44)	69 (15.33)	243 (54.00)	136 (30.22)	450 (100.00)

Figures in parentheses denote percentage
Pearson Chi-square: 19.1689, df=9, p=.023823

Regularity of Science Books Reading by Education

Educational qualification was also found to have a significant influence on the respondents' frequency of reading science books. As noted in Table 4.20, proportion of those who read science books 'rarely' was found to decrease with increase in educational level. While 66.67 per cent of below SSLC category reported to read science books 'rarely', only less than 5 per cent of the respondents belonging to PG and above qualification stated to read it 'rarely', indicating that habit of reading science books was being positively influenced by educational attainments. The tendency of reading science books 'sometimes' was strongest among all educational groups, except among below SSLC category. Compared to other educational groups, a considerable share of respondents with PG and above qualification tended to read science books 'quite often'.

Table 4. 20 : Regularity of Science Books Reading by Education

Education Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Below SSLC	0 (0.00)	6 (8.33)	18 (25.00)	48 (66.67)	72 (100.00)
SSLC	1 (0.83)	5 (4.13)	71 (58.68)	44 (36.36)	121 (100.00)
Plus-Two	1 (0.76)	20 (15.15)	84 (63.64)	27 (20.45)	132 (100)
Degree	0(0.00)	30 (29.13)	57 (55.34)	16 (15.53)	103 (100.00)
PG and above	0 (0.00)	8 (36.36)	13 (59.09)	1 (4.55)	22 (100)
Total	2 (0.44)	69 (15.33)	243 (54.00)	136 (30.22)	450 (100)

Figures in parentheses denote percentage
Pearson Chi-square: 96.4785, df=12, p=.000000

Regularity of Science Books Reading by Income

In terms of income, there were statistically significant differences in reading habits of science books published by KSSP. As could be noted from the data given in Table 4.21, the higher income groups' book-reading habit was concentrated in the categories of reading 'quite often' and sometimes'. All the respondents from Rs 10,001-15,000 claimed to read science books of KSSP either 'quite often' (41.46 per cent) or 'sometimes' (58.54 per cent).

Table 4.21 : Regularity of Science Books Reading by Income

Income Groups	Regularity Nature				Total
	Regular	Quite often	Sometimes	Rare	
Below Rs 5,000	2 (1.02)	11 (5.58)	98 (49.75)	86 (43.65)	197 (100.00)
Rs 5,001-10,000	0 (0.00)	38 (18.54)	118 (57.56)	49 (23.90)	205 (100.00)
Rs 10,001-15,000	0 (0.00)	17 (41.46)	24 (58.54)	0 (0.00)	41 (100.00)
Rs 15,001-20,000	0 (0.00)	3 (42.86)	3 (42.86)	1 (14.29)	7 (100.00)
Total	2 (0.44)	69 (15.33)	243 (54.00)	136 (30.22)	450 (100.00)

Figures in parentheses denote percentage
Pearson Chi-square: 66.7768, df=9, p=.000000

Another interesting finding was that the incidence of reading science books 'quite often' increased with increase in monthly family income of the respondents. The proportion of those reading science books 'quite often' increases from a low proportion of 5.58 per cent in the lowest income group to a high share of 42.86 per cent in the highest income group. Further, the incidence of reading KSSP science books 'rarely' decreases with increase in income. The only exception to this trend was in the income group of Rs 10,001- 15,000.

Audiences' Evaluation of Science Books

As in the case of other print media, science books of KSSP was not matching the level of the audience. This was evident from the audience evaluation of science books in respect of their form and content parameters.

Table 4.22 : Evaluation of Science Books' Form and Content

Form and Content Parameters	Respondents' Evaluation			
	Agree	**Neither Agree Nor Disagree**	**Disagree**	**Total**
'The design is attractive'	282 (62.67)	164 (36.44)	4 (0.89)	450 (100.00)
'It is easy to understand the content'.	246 (54.67)	183 (40.67)	21 (4.67)	450 (100.00)
'The language is simple'	261 (58.00)	165 (36.67)	24 (5.33)	450 (100.00)
'The narration contributes to understanding'	178 (39.56)	207 (46.00)	65 (14.44)	450 (100.00)

Figures in parentheses denote percentage

As per the data in Table 4.22, for the sampled users of KSSP channels, attractive design was the best quality of KSSP science books. A majority of (62.67 per cent) found to be satisfied with the design of books. However, simplicity of language and understandability of content were evaluated as acceptable by relatively lower proportion of the respondents – 58 per cent and 54.67 per cent respectively.

Likewise, style of narration in science books was not satisfactory for a majority of the respondents. Only 39.56 per cent of them agreed that narration was attractive.

SCIENCE INFORMATION ACQUISITION FROM NON-KSSP SOURCES

Since the study focused on the science awareness of the respondents belonging to both the users and non-users of KSSP communication channels, it called for an in-depth analysis of information sources other than that of KSSP which possibly provide science information to the public. Such an inquiry was essential to compare the users and non-users of KSSP channels

in terms of their understanding of science. For this purpose, data was gathered on the regularity of the use of various communication channels available to the rural communities in the State.

The information sources available were broadly classified into two: mass media and non-mass sources. Mass media sources are newspapers, magazines, books, radio, television, film and the Internet. Again, for analytical purpose, the mass media information sources were segmented into two: print media and electronic media.

The non-mass media sources are public functions and gatherings, extension workers and science exhibitions/centres. Here it is to be noted that these channels of public communication of science are a common occurrence in the State. Political and cultural organization usually conduct public functions which discuss science related topics, exclusively or as a part of the broader subject under discussion. Similarly, both Central and State Governments have strong network of extension workers at village, block and district levels to disseminate information on health, family planning, public hygiene, agriculture, energy conservation etc. Likewise, educational institutions, science and technology departments, various State and central government institutions organize science exhibitions, fairs and other programmes of similar nature on various science related topics. Annual school science fairs conducted at district and State levels attract lakhs of people all over the State.

Information acquisition habit of the public naturally varies from person to person and time to time because there are characteristics that are unique to each individual and his context. It means that different people depend on different sources to meet their information needs. Relative affinity with different media is associated with different expectation and gratification sought. Similarly, regularity of the use of medium also influences information seeking and acquisition bahaviour of the audience. The more frequent a medium is used, the more influence it may have on the users.

Taking these facts into account, data on the regularity of the use of various information sources by the respondents was collected. Based on the frequency of using a medium for science information, the sample was classified into four usage groups: regular, quite often, sometimes and never. Further, the data of both users and non-users of KSSP channels was analysed in respect of their exposure to various information sources.

Science Information Sources: Print Media

Data regarding the pattern of the use of print media as a source of science information given in Table 4.23 reveals that a large majority of the respondents belonging to both users and non-users of KSSP channels read newspapers regularly. This habit was prevalent in an overwhelming 61 per cent of the users of KSSP channels. And, among the non-users of KSSP channels, the habit of reading newspapers ‘regularly’ was confined to nearly 55 per cent of the respondents. Those who read newspapers ‘quite often’ formed almost 1/3 of the non-users of KSSP channels. In the user category, the ‘quite often’ users of newspapers formed only about 23 per cent. Those who read newspapers ‘sometimes’ or who never read newspapers constituted a majority of the sample. Such a distribution of the usage pattern of daily newspaper reading between users and non-users of KSSP was statistically significant at a probability level of >.02 (See Table 4.23).

Table 4.23 : Use of Information Sources – Print Media

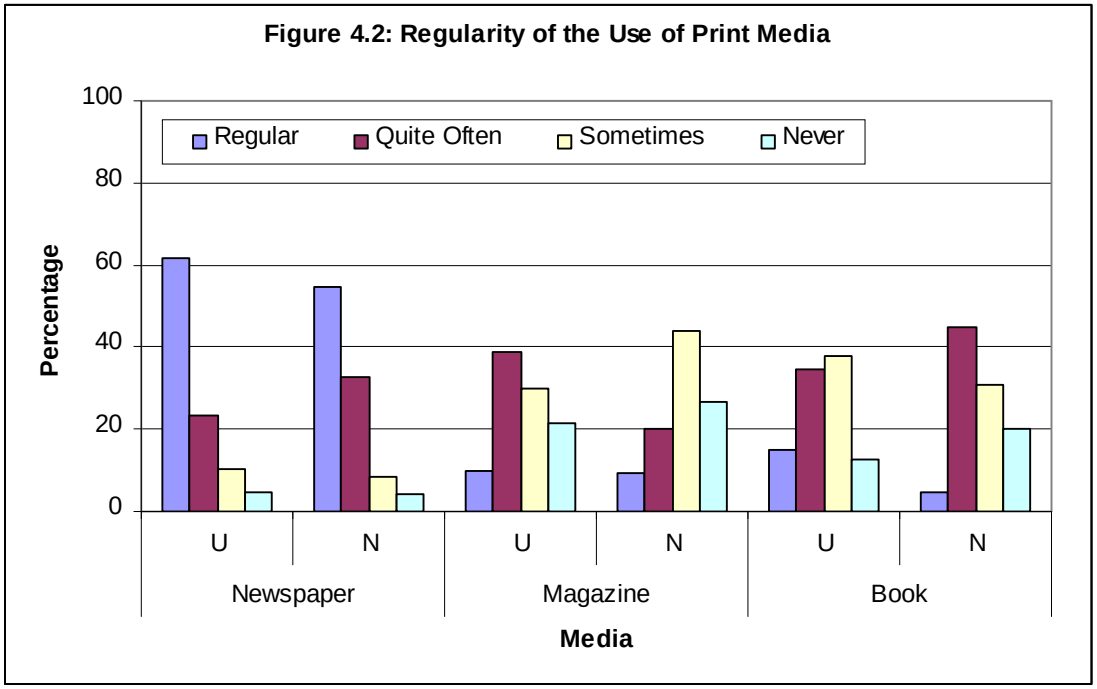
Media / Respondents' groups	Regularity Nature				Total
	Regular	Quite Often	Sometimes	Never	
Newspapers					
Users of KSSP Channels	277 (61.56)	106 (23.56)	47 (10.44)	20 (4.44)	450 (100.00)
Non-users of KSSP Channels	247 (54.89)	147 (32.67)	37 (8.22)	19 (4.22)	450 (100.00)
Total	524 (58.22)	253 (28.11)	84 (9.33)	39 (4.33)	900 (100.00)
Pearson Chi-square: 9.57794, df=3, p=.022530					
Magazines					
Users of KSSP Channels	45 (10.00)	174 (38.67)	135 (30.00)	96 (21.33)	450 (100.00)
Non-users of KSSP Channels	42 (9.33)	91 (20.22)	197 (43.78)	120 (26.67)	450 (100.00)
Total	87 (9.67)	265 (29.44)	332 (36.89)	216 (24.00)	900 (100.00)
Pearson Chi-square: 40.3447, df=3, p=.000000					
Books					
Users of KSSP Channels	67 (14.89)	156 (34.67)	170 (37.78)	57 (12.67)	450 (100.00)
Non-users of KSSP Channels	20 (4.44)	201 (44.67)	139 (30.89)	90 (20.00)	450 (100.00)
Total	87 (9.67)	357 (39.67)	309 (34.33)	147 (16.33)	900 (100.00)
Pearson Chi-square: 41.5813, df=3, p=.000000					

Figures in parentheses denote percentage

Though a large majority of sample read newspapers on a regular basis, only less than 10 per cent of them reported to read magazines 'regularly'.

Those who reported to read magazine ‘quite often’ and ‘sometimes’ constituted the bulk of the sample. While more than 38 per cent users of KSSP channels read magazines ‘quite often’, nearly 44 per cent of the non-users of KSSP channels claimed to read magazines ‘sometimes’. And those who did not read the magazine at all also constituted a significant portion of the sample. Such a magazine reading habit to seek science information by the users and non-users of KSSP channels was also found to be statistically significant at .00 probability level.

Figure 4.2: Regularity of the Use of Print Media



U=Users of KSSP Channels, N = Non-users of KSSP Channels

Reading books to seek science information was more or less similar to the magazine reading habits. In that, the group that uses KSSP channels for information was far more regular than the non-users of KSSP channels in book reading. The largest proportion of (44.67 per cent) of those who reported to read books ‘quite often’ belong to the non-users of KSSP channel category. And, among those who reported to read books sometimes, it was the users of KSSP channels which had the dominance. Those who never read books constituted 20 per cent of non-user category and 12 per cent of user category.

This kind of distribution was found to be statistically significant at .00 probability level.

Science Information Sources: Electronic Media

Of the electronic media television was found to be more popular among both users and non-users of KSSP channels. However, between these groups, the users of KSSP channels were found to be far more regular (51.56 per cent) than the non-users of KSSP channels (26.62 per cent) to watch television (See Table 4.24).

While little over ¼ of the users of KSSP channels reported to watch television to seek science information ‘ quite often’. And, 40 per cent of non-users of KSSP channels depended on television ‘quite often’ to gather science information. The incidence of watching television ‘sometimes’ to gather science information was also higher (26.44 per cent) among the non-users of KSSP channels, in relation to the users of KSSP channel (16.44 per cent) (See Table 4.24). Those who ‘never’ watch television constituted less than 7 per cent sample respondents in each of the groups. Such a dependence of the two groups on television was found to be statistically significant at .00 probability level. Thus, television appears to be one of the primary sources of science information both for users and non-users of KSSP channels.

Table 4.24 : Use of Information Sources : Electronic Media

Media / Respondents' groups	Regularity Nature				Total
	Regular	Quite Often	Sometimes	Never	
Radio					
Users of KSSP Channels	63 (14.00)	184 (40.89)	118 (26.22)	85 (18.89)	450 (100.00)
Non-users of KSSP Channels	38 (8.44)	230 (51.11)	109 (24.22)	73 (16.22)	450 (100.00)
Total	101 (11.22)	414 (46.00)	227 (25.22)	158 (17.56)	900 (100.00)
Pearson Chi-square: 12.5675, df=3, p=.005678					
Television					
Users of KSSP Channels	232 (51.56)	115 (25.56)	74 (16.44)	29 (6.44)	450 (100.00)
Non-users of KSSP Channels	120 (26.67)	180 (40.00)	119 (26.44)	31 (6.89)	450 (100.00)
Total	352 (39.11)	295 (32.78)	193 (21.44)	60 (6.67)	900 (100.00)
Pearson Chi-square: 60.5173, df =3, p=.000000					
Film					
Users of KSSP Channels	10 (2.22)	146 (32.44)	212 (47.11)	82 (18.22)	450 (100.00)
Non-users of KSSP Channels	38 (8.44)	196 (43.56)	129 (28.67)	87 (19.33)	450 (100.00)
Total	48 (5.33)	342 (38.00)	341 (37.89)	169 (18.78)	900 (100.00)
Pearson Chi-square: 43.9935, df=3, p=.000000					
Internet					
Users of KSSP Channels	3 (0.67)	6 (1.33)	9 (2)	432 (96)	450 (100)
Non-users of KSSP Channels	2 (0.44)	4 (0.89)	9 (2)	435 (96.67)	450 (100)
Total	5 (0.56)	10 (1.1)	18 (2.00)	867 (96.33)	900 (100)
Pearson Chi-square: .610381, df=3, p=.894051					

Figures in parentheses denote percentage

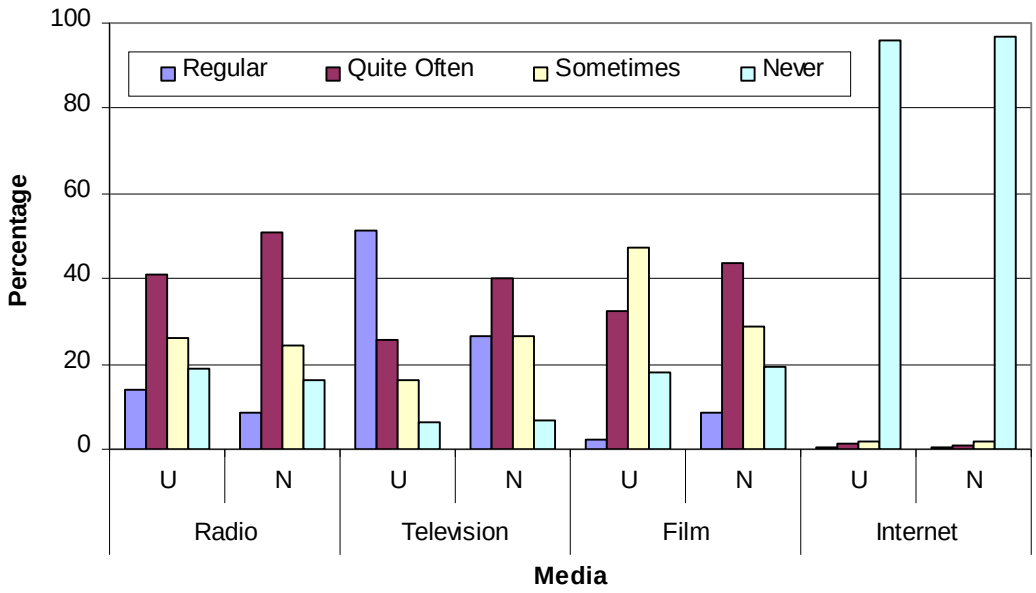
The role of radio as science information source was found to be insignificant as compared to television. This was evident from the analysis which revealed that only 14 per cent the users of KSSP channels tuned to radio to seek science information ‘regularly’. Those who listen to radio ‘quite often’, however, formed a large majority of both the groups. The largest being the non-users of KSSP channels (51.11 per cent followed the users of KSSP channels (40.89 per cent).

Both the groups, however, did not show substantial differences in listening to radio ‘sometimes’ and in not listening to radio at all. Such a distribution was also statistically significant (p = .005) suggesting that radio was not a regular source of science information.

The case of film, which is an entertainment medium, was no different. In fact, the role of film as a source of science information appears to be a relatively lesser in comparison with radio. The analysis revealed that those who watched films regularly were a minority in both the groups–(2.22 per cent among users and 8.44 per cent among non-users of KSSP channels. And, those who attended film with less regularly constitute the bulk of both the groups. Such a dependence on film was also found to be statistically significant at a probability level of .00.

Among the electronic media, the least depended upon for science information was the new medium of Internet. That its penetration both in urban and rural areas is highly restricted was borne out in this study. Unlike the other three electronic media which were being depended upon in varying regularity, the Internet stood out as the medium ‘never’ used by more than 96 per cent of both users and non-users of KSSP channels for seeking science information as detailed in Table 4.24. Those who did, constituted an insignificant part of both the groups. The Chi- square analysis also showed the dependence on the Internet by the two groups was not statistically significant.

Figure 4.3: Regularity of the Use of Electronic Media



U=Users of KSSP Channels, N = Non-users of KSSP Channels

Science Information Sources: Non-Mass Media

As explained in Table 4.25, this study sought to find out the regularity of using non-mass media sources of science information such as public functions organized by socio-cultural organizations other than KSSP; extension workers belonging to health, agricultural and rural development agencies, and science exhibitions and science centres.

In understanding the dependence of users and non-users of KSSP channels, here too, they were asked to identify their nature of dependence on public functions, extension agents and science exhibitions/science centres in terms of four categories of use: regular, quite often, some times, and never.

The analysis revealed that as in the case of other media, the group that attended public functions 'regularly' was that of the users of KSSP channels. Nearly 31 per cent of the respondents of this group attended public function 'regularly' as against less than 6 per cent of non-users of KSSP channels. Among those who attended public functions 'quite often' and 'sometimes', non-users of KSSP channels constituted the majority–(52.22 per cent and 34.22 per cent respectively as against the users of KSSP channels (See Table 4.25).

Table 4.25: Use of Information Sources: Non-Mass Media

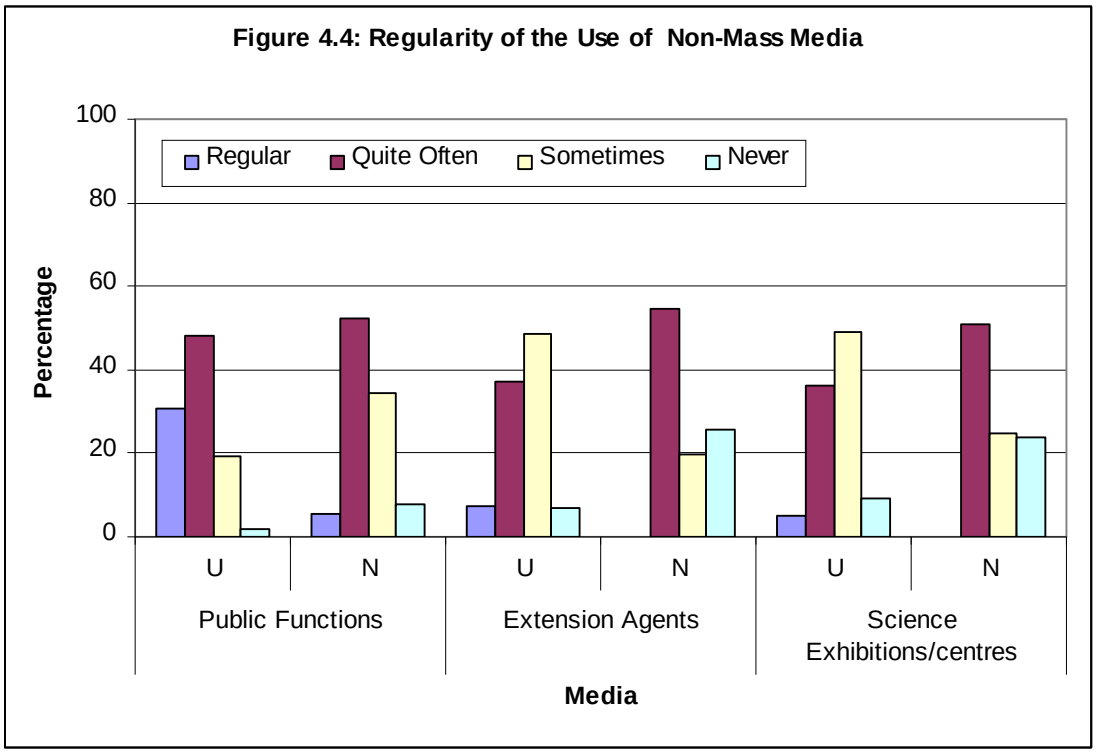
Media / Respondents' group	Regularity Nature				Total
	Regular	Quite Often	Sometimes	Never	
Public Functions					
Users of KSSP Channels	139 (30.89)	216 (48.00)	86 (19.11)	9 (2.00)	450 (100.00)
Non-users of KSSP Channels	25 (5.56)	235 (52.22)	154 (34.22)	36 (8.00)	450 (100.00)
Total	164 (18.22)	451 (50.11)	240 (26.67)	45 (5.00)	900 (100.00)
Pearson Chi-square: 115.511, df=3, p=.000000					
Extension Agents					
Users of KSSP Channels	34 (7.56)	168 (37.33)	218 (48.44)	30 (6.67)	450 (100.00)
Non-users of KSSP Channels	0 (0.00)	246 (54.67)	88 (19.56)	116 (25.78)	450 (100.00)
Total	34 (3.78)	414 (46.00)	306 (34.00)	146 (16.22)	900 (100.00)
Pearson Chi-square: 154.582, df=3, p=0.00000					
Science Exhibitions/Science centres					
Users of KSSP Channels	23 (5.11)	164 (36.44)	221 (49.11)	42 (9.33)	450 (100.00)
Non-users of KSSP Channels	1 (0.22)	230 (51.11)	112 (24.89)	107 (23.78)	450 (100.00)
Total	24 (2.67)	394 (43.78)	333 (37.00)	149 (16.56)	900 (100.00)
Pearson Chi-square: 95.2569, df=3, p=.000000					

Figures in parentheses denote percentage

The incidence of not attending public functions was also the highest among the non-users of KSSP channels as against the KSSP channels' users. The tendency of users of KSSP channels being more regular, and the incidence of non-users of KSSP channels being less frequent users of public functions was found to be statistically significant.

However, the case of extension agents as source of science information among the rural populace was found to be less encouraging as compared to public functions. Nearly 26 per cent of non-users of KSSP channels and 7 per cent of users of KSSP channels reported to have never used village extension agents as sources of science information (See Table 4.25). And those who did utilized the services of extension agents 'sometimes' or 'quite often' formed the bulk of the both the categories of the respondents. This kind of a dependence on extension agents was found to be statistically significant at a probability level of .00.

Figure 4.4: Regularity of the Use of Non-Mass Media



U=Users of KSSP Channels, N = Non-users of KSSP Channels

Among the non- mass media sources of science information; the least importance belonged to science exhibitions / science centres. Here too, there were statistically significant differences between two groups, in terms of their regularity of use.

From the above analysis, it can be deduced that among the print media, newspapers are the most depended sources of science information followed by books and magazines. And, among the electronic media, it was television which was being used as a major sources of science information in relation to radio, film and the Internet in that order.

In the case of non-mass media sources, it was public function that stood out as a major source of science information for the people in the villages. The other two non-mass media sources of extension agents and science exhibitions/science centres were being less frequently depended upon for science information by the rural masses.

In using the print, electronic and non-mass media sources, there were statistically significant differences between users and non-users of KSSP channels. Of these two groups, the users of KSSP channels were regular readers of print media – newspapers, books and magazines – in relation to non-users of KSSP channels. Similarly, in the case of electronic media, users of KSSP channels were found to use television and radio far more regular as compared to non-users of KSSP channels. But, in regularity of film watching, non-users KSSP channels outshined the users of KSSP channels. In terms of the use patterns, the use of the Internet by the two groups was, by and large, similar. Their dependence on this medium was quite insignificant.

The group-wise analysis of the use of non-mass media science information sources also revealed that public functions, extension agents and science exhibitions /science centres were being used more often by the users

of KSSP channels than the non-users of KSSP channels. Thus, it can be said with certainty that the users of KSSP channels are active seekers of information from various sources. Unlike the non-users of KSSP channels, they tend to attend print media, electronic media and non-mass media sources more regularly to gather science related information as well as information on other subjects.

This kind of information seeking behaviour, perhaps, emanates from their use of a variety of channels of science communication used by KSSP, which motivates and encourages people to seek science information and develop a scientific temperament essential for sustainable development both at individual and societal levels. A corollary arising out of such an information seeking behavior of KSSP channels' users is that they must have a better understanding of science compared to the non-users of KSSP channels of science communication. This will be explored in the succeeding sections of this chapter.

DIFFERENCES IN SCIENCE AWARENESS

As explained in previous chapter, one of the objectives of the study was to examine the level of understanding of science between users and non-users of KSSP channels. An assumption here is that the users of KSSP channels would have a higher level of science understanding than the non-users of KSSP channels. Such an assumption was not out of place because they seek information from KSSP channels as well as from other popular communication media. This kind of information behaviour is expected to create a better science information quotient in them.

A 13-statements Public Understanding of Science (PUS) scale developed by Miller and Pifer and used in American and European public understanding of science surveys was used to gauge the level of

understanding of science between the two sample groups Of the 13 statements, 8 were true and 5 were false. They covered a range of subjects like botany, biotechnology, astronomy, earth sciences, physics and biology. Each statement of the scale was followed by two choices of ‘true’ and ‘false’. The respondents were instructed to mark each of them either as ‘true’ or ‘false’. After collecting the data, each of the correct answers was given a score of one and the mean scores of both the groups were calculated.

Of the two groups, the users of KSSP channels had a higher Public Understanding of Science (PUS) mean score of 7.6267 as compared to the mean score of 5.6867 obtained by non-users of KSSP channels. This suggested that users of KSSP channels had a relatively better understanding of science than the non-users. This trend was also evident in each of the 13 PUS statements as could be noted in Table 4.26.

Table 4.26 : PUS Statement-wise Mean Score and SD of Users and Non-Users of KSSP Channels

PUS Statements	Mean Score and SD*	
	Users of KSSP Channels	Non-Users of KSSP Channels
1. The oxygen we breathe comes from plants.	0.671 (0.470)	0.491 (0.500)
2. Earth goes around the Sun.	0.664 (0.472)	0.506 (0.500)
3. Electrons are smaller than atoms.	0.624 (0.484)	0.462 (0.499)
4. Earliest humans lived at the same time as the dinosaurs.	0.624 (0.484)	0.484 (0.500)
5. Antibiotics kill viruses as well as bacteria	0.615 (0.487)	0.388 (0.488)
6. Earth takes one year to go around the Sun	0.613 (0.501)	0.366 (0.482)
7. Human beings, as we know them today, developed from earlier species of animals.	0.608 (0.488)	0.522 (0.500)
8. The centre of earth is very hot.	0.606 (0.489)	0.500 (0.500)
9. Lasers work by focusing sound waves.	0.560 (0.496)	0.402 (0.490)
10. All radio activity is man-made.	0.555 (0.497)	0.413 (0.492)
11. The continents are slightly moving their location for millions of years.	0.553 (0.497)	0.395 (0.489)
12. It is the father's gene, which decides whether baby is girl or boy.	0.542 (0.498)	0.428 (0.495)
13. Radioactive milk can be made safe by boiling it.	0.386 (0.487)	0.324 (0.468)

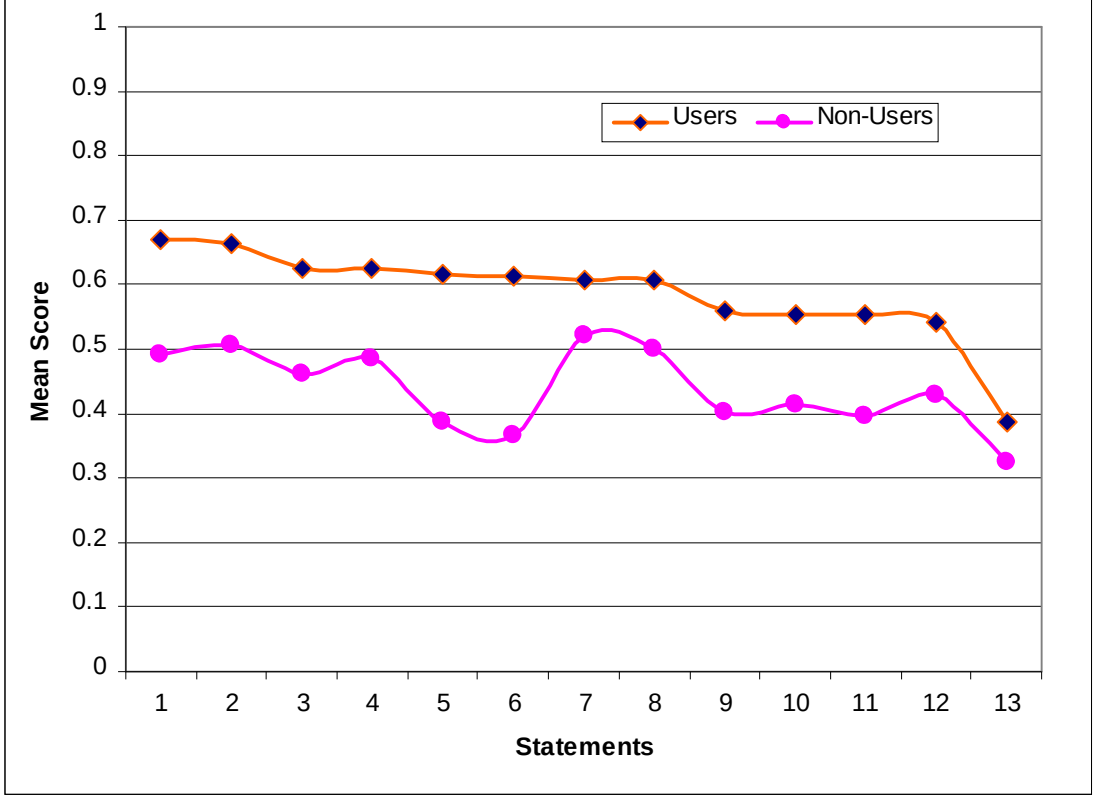
**Figures in parentheses denote standard deviation (SD)*

As noted in the Table 4.26, the item which had the highest mean score was 'the oxygen we breathe comes from plants' in the case of users of KSSP channels. And, the lowest score was for the item on making radioactive milk safe by boiling.

In the case of non-users of KSSP channels, the highest score was for the item relating to the development of human beings from earlier species of animals. The lowest score was in respect of the statement regarding the radioactive milk as was in the case of users of KSSP channels.

Though the users of KSSP channels had better mean score than the non-users of KSSP channels, there was a perceptible trend in the score of both the groups. This became explicit when the mean PUS score of the users and non-users of KSSP channels were plotted against the 13 statements (See Figure 4.5)

Figure 4.5: PUS Statement-wise Mean Score of Users and Non-Users of KSSP Channels



The items where the users of KSSP channels had a higher score, the non-users of KSSP channels also fared well, though not equally. Likewise,

they had fared poorly on items where even the users of KSSP channels had scored low. That being the case, there was a need to statistically determine the significance of the differences between the mean scores of the two groups. Therefore, the data was subjected to a t-test.

Table 4.27: T-Test Result of Category-wise PUS Mean Score and SD

Category	Mean	Standard Deviation	Std. Error Mean
Users of KSSP Channels (N=450)	7.6267	2.69259	.12693
Non-Users of KSSP Channels (N=450)	5.6867	2.61945	.12348

Mean Difference: 1.94000; Std. Error Difference: .17708; t: 10.955; df: 898

Significance (2-tailed): .000.

The analysis yielded a t-ratio of 10.955, which was found statistically significant at p level of .000. This clearly showed that the understanding of science between the two groups was different. The users of KSSP channels tended to have a better understanding of science, far greater than the non-users of KSSP channels.

The existence of such a scenario was not difficult to explain. Those involved in KSSP activities and thereby having access to a variety of KSSP science communication media would acquire far greater information than those who depended on popular media for science information.

If this were to be true as in the case of this study, it is certainly due to the access to KSSP channels which provided information on a wide variety of topics.The public meetings, seminars, symposia and workshops on contemporary science issues held periodically by KSSP enhanced science knowledge among those who attended them regularly. Participation in these and similar such activities would enhance science understanding and create a scientific temper among the public. Thus, KSSP activities, though carried out

on a voluntary basis, contributed to public understanding of science, a precondition for a sustainable and scientific development of the society.

SUMMARY OF FINDINGS

This study, which was conceived to explore various aspects of the communication strategy of a public science movement – *Kerala Sasthra Sahitya Parishath* (KSSP), has provided important insights into the process of science communication in the rural settings of a developing country. They are enumerated in the following five units each one relating to one of the five objectives.

KSSP MEDIA USE: *SASTHRA KALA JATHA* MORE POPULAR

The first objective of the study was to identify the use of KSSP's print (*Sasthragathi*, Pamphlets and Science Books) and traditional (*Sasthra Kala Jathas*) media of KSSP as science information sources. The analysis revealed that Sasthra *Kala Jatha,* the omnibus traditional media used by KSSP as an annual feature was far more popular than other media. This finding clearly assigns importance to the role of traditional media in popularising science in contemporary rural Kerala. It also indicates that the traditional art forms employed in *Sasthra Kala Jathas* have immense potential to increase people's participation because of their cultural proximity, entertaining content and traditional belongingness that go well with the cognitive competence of rural masses.

In contrast to such a popularity of *Sasthra Kala Jathas*, the popularity of other three print media such as *Sasthagathi,* science books and pamphlets was found to be less prominent. In terms of the nature of the regularity of the use of print channels, *Sasthragathi* is followed by pamphlets and science books in that order. The habit of regular reading of science books was low among the rural people. This tendency assumes importance in view of the fact that KSSP claims it to be the single largest science publisher in Kerala with about 30 to 40 new titles and reprints per year (KSSP, 2006).

VARYING RELATIONSHIP BETWEEN MEDIA USE AND DEMOGRAPHICS

The second objective of the study sought to determine the influence of socio-demographic variables such as gender, age, education and income of the audiences on their use of KSSP print and traditional media.

Gender and Media Use

Past studies have identified gender as an important variable that defines the nature of the use of media for science information. Kreighbaum (1959) found that more males than females used media for science information. Similarly, a study carried out by Vilanilam and Jayan (1988) on the use of *Sasthra Kala Jatha* detected the influence of gender in the pattern of the use of science information sources.

Contrary to these results, the present study found that gender had no role in defining the use pattern of KSSP science communication channels. This was true in the case *Sasthra Kala Jatha*, the traditional media and *Sasthragathi*, pamphlets and science books, the print media of KSSP. Though this result contradicts the findings of Kreighbaum and, Vilanilam and Jayan, it supports the result of a recent study conducted by Conradie and Grobler (2003) in South Africa, which found that gender had no bearing on peoples' use of science communication channels.

Dynamic Interplay between Age and Media Use

However, the respondents' age defined the way they used KSSP's science communication media. But, there was no set pattern in the relationship of age with media use. *Sasthra Kala Jatha,* the most popular of KSSP's media was being more frequently dependent by the middle-aged followed by the lower-aged and the elderly.

The relationship between users' age and regularity of reading *Sasthragathi,* which was poor in all age groups*,* was also significant. However, in contrast to *Sasthra Kala Jatha*, the habit of reading *Sasthragathi* 'rarely' was found to increase with an increase in age indicating its comparatively higher popularity among the youth.

Likewise, readers' age was a critical factor in defining their habit of reading pamphlets too. The habit of regular reading of pamphlets was

stronger among the eldest and the youngest age groups compared to the middle age groups.

The habit of reading science books published by KSSP for science communication was also found to be influenced by readers' age. Science books were being read more often by the lowest age group, followed by the higher age groups. Such a result which supports Kreighbaum's (1959) finding, further revealed that the bearing of age on science communication channels varied from one media to another. This is indicative of a dynamic interplay among age, type of media and usage pattern.

Education and Media Use

That sort of an interplay was also in evidence in the context of respondents' education, type of KSSP media and their usage pattern. However, there were subtle differences.

Those with educational attainment below graduation were far more regular in attending *Sasthra Kala Jatha.* The incidence of participating in *Sasthra Kala Jathas* was also high among those with highest qualification of PG and above.

In respect of *Sasthragathi*, KSSP's monthly publication, the variable of education had a bearing on its regularity of reading. It was the below SSLC group, the lowest educational category, that read *Sasthragathi* less frequently than other educational groups. Among them, the differences were not wide. This suggested that those with the minimum level of SSLC education tended to read *Sasthragathi* more or less in the same manner.

In contrast to *Sasthragathi* reading pattern, higher education was found to have a negative influence on the pamphlet reading habit. It was the highly educated group that read pamphlets far less frequently than other educational groups.

Irrespective of differences in educational attainments, the habit of reading science books regularly was abysmally low among rural people. The practice of reading it 'quite often;' increased with an increase in educational qualification. At the same time, the rare reading tendency decreased with increase in educational attainments. And, among them, the differences were

not wide. This trend suggested that those with the minimum level of SSLC education tended to read science books more or less in the same manner as in the case of *Sasthragathi*.

Income and Media Use

Like the earlier two socio-demographic variables of age and education, the economic status of the respondents was also found to be a determining factor in their regularity nature of the use of KSSP media. The study revealed that the highest income group was far less regular in attending *Sasthra Kala Jatha* as compared to other income groups. Those who attended *Sasthra Kala Jatha* more regularly belonged to the income group of Rs 5001-10000. Also, the incidence of attending *Sasthra Kala Jatha* 'rarely' increased with increase in the income level of the respondents.

However, in contrast to *Sasthra Kala Jatha,* reading *Sasthragathi* was not so common in the lowest income groups. A large majority of the lowest income group read it less frequently. A better reading regularity was found among the respondents with higher incomes.

The relationship between respondents' income and pamphlet reading habit was different from that of *Sasthragathi.* Though not regularly, all groups tend to read pamphlets 'quite often'. Among them, even the lower income groups fared better than the two higher income groups. As a result, the tendency of reading pamphlets either 'sometime' or 'rarely' was the lowest in the two lower income groups.

The economic status of respondents was positively linked to the regularity of reading science books, of course in varying ways. In that, the low-income respondents constituted the majority in reading books 'rarely'. As a result, they were less frequent in reading science books, which provided the serious exposition on all matters relating to science and society. Those with higher income had read science books far more frequently.

Thus, the demographic variables of income and education were seen to have an analogous tendency in usage pattern of KSSP print and traditional media. As in the case of higher education, higher income status positively influenced the use of print media and negatively influenced the use of

traditional channels. And, as in the case of age, the influence of education and income status of the audiences on their media usage was multidirectional. There was a dynamic interplay among the regularity nature, media type and these variables.

TRADITIONAL MEDIA FARE BETTER IN FORM AND CONTENT

It is a widely held that media do not bring about uniform effects as the audience tend to be selective, motivated and resistant to change. Thus the audiences' perceptive and assessment of the media assume salience in evaluating media use and effects. Based on these fundamental premises of active audience theory and reception analysis approach, the present study set the analysis of audiences' satisfaction with KSSP media as its third objective.

Data was collected and analysed to gauge audience's assessment of the KSSP channels of science popularisation on the basis of their form and content. For this, four form and content parameters were chosen. Those being (i) design/visual performance, (ii) understandability of content, (iii) simplicity of language and (iv) style of narration. Following are the major findings in this regard.

A large majority of the respondents reported to be satisfied with the *Sasthra Kala Jathas*' form and content. The visual performance of the *Jathas* satisfied more viewers, followed by the understandability of content, simplicity of language and style of narration.

The audience's evaluation of *Sasthragathi* revealed the poor performance of the medium in respect of its form and content parameters. Majority of the readers could not understand the content and grasp the language used. Similarly, the design and style of narration could satisfy only a little more than half of the readers. These results have made explicit the need to improve the form and content of *Sasthragathi* to the satisfaction of the readers.

The performance of pamphlets was also not so encouraging according to the readers' assessment. Only the language and design of the pamphlets satisfied more than half of the audience. And, the content comprehension and

understanding were problematic for a majority of the readers. This indicated that content selection and presentation should be improved.

A majority of the readers were satisfied with the design and content comprehension and simplicity of language of the science books published by KSSP. But, the style of narration was not satisfactory.

From the foregoing results, it became apparent that compared to traditional media, print media in aggregate do not seem to succeed in satisfying their users in terms of their form and content parameters, leaving room for a major overhauling.

POPULAR MEDIA ACCESS

In addition to KSSP media, there are a variety of popular media which the public depend upon to acquire information on science related events and topics. That being the case everywhere, it was essential to ascertain the dependence on popular media by the users and non-users of KSSP channels. Such an enquiry was pertinent from the present study's objective of gauging differences in science information seeking habits of those who use KSSP channels and those do not.

For this purpose, the media were categorized into the two groups: (i) mass media and (ii) non-mass media. Included in the mass media sources were newspapers, magazines, books, radio, television, film and the Internet. And the non-mass media sources are: public function, extension agents and science exhibitions/centres. The analysis revealed the following results.

Of all popular channels of communication available in rural Kerala, newspapers were the most depended sources of science information for both the users and non-users of KSSP channels. However, the habit of seeking science information from newspapers was stronger among the users of KSSP channels. Television was the second most depended source of science information for the rural people. Most users of KSSP channels tended to use television as compared to non-users of KSSP channels. After newspapers and television, public function was found to be as the major source of science

information in the rural settings. The tendency of attending public functions was more prevalent among the users of KSSP channels.

In general, books and magazines were not THE major sources of science information among the villagers. However, users of KSSP channels were found to use books and magazines more frequently than the non-users of KSSP channels. Similar was the case of the electronic media of radio and film. While the habit of using radio remained relatively stronger among the users of KSSP channels, the propensity of the use of film was intense among the non-users of KSSP channels.

The status of the Internet as a source of science information for rural people was poor. Only a small proportion of the rural people depended on this new sources for science information, that too less frequently. Both the users and non-users of KSSP channels were on an equal footing in the Internet usage.

The other non-mass media information sources such as extension agents and science exhibitions/centres were the least important of all information sources. The users of KSSP channels, however, tended to seek information from these sources more frequently than the non-users of KSSP channels.

It can be deduced from the above findings that the pattern of science information acquisition from non-KSSP sources was stronger among the KSSP channels' users as compared to those who do not use KSSP channels. This kind of an encouraging trend of seeking science information from a variety of sources flows from their exposure to KSSP sources, which cultivate in them an affinity to knowledge in general, and science information in particular.

SCIENCE UNDERSTANDING BETTER AMONG KSSP MEDIA USERS

The fifth objective of the study was to gauge the role of KSSP channels in creating a scientific temper among the rural population. For this purpose, the level of public understanding of science in respect of those who use and

do not use KSSP science information sources was measured using a 13-statements Public Understanding of Science (PUS) scale.

Of the two groups, the users of KSSP channels were found to have a higher PUS mean score as compared to the mean score than the non-users of KSSP channels. This suggested that the users of KSSP channels had a relatively better understanding of science than the non-users. And, what is interesting was that the users of KSSP channels had better performance in all the knowledge areas tested. The proportion of those who gave correct answers to each statement was higher among the users of KSSP channels indicating that their proficiency was consistent across the knowledge areas.

However, on items where the users of KSSP media had fared better, the non-users too had done well but to a lesser extent. Likewise, where the non-users of KSSP media had a poor showing, users too had faltered, but to lesser degree.

From the above-mentioned findings, it can be said that there is a reciprocal relationship between audiences' exposure to KSSP channels and their increased use of popular sources of science information. This reciprocity leads to their higher-level performance in science awareness. In short, the study reveals with certainty that, notwithstanding the limitations in their form and content, the communication channels of KSSP play an important role in cultivating a scientific temper among the rural people of Kerala.

Chapter V

CONCLUSIONS AND RECOMMENDATIONS

Science and technology influence the lives of all humans in many significant ways. Our collective economic security, social organization and technological innovations are all affected by the amount of public's understanding in science. Quantitative and qualitative studies of the public understanding of science conducted in many countries have provided important insights into the extent to which lay citizens understand important scientific concepts, and into the ways in which they seek and use scientific knowledge.

The report of the Royal Society in 1985 on the public understanding of science expressed concern that the public at large knew little science. In that context, the results of surveys in the US and Europe seem to make alarming reading. In Europe, for instance, 41 per cent of adults believed that astrology was a 'sort of scientific' inquiry (Van Deelen, 1990), while a British survey indicated that fewer than 30 per cent of respondents knew that antibiotics could not kill viruses (Durant *et al*., 1989).

Such results suggest that public understanding of science is largely dependent on the efficient communication of ideas and information as well as the amount and quality of interaction between the sources of science information and the public. Recognizing this aspect, governments in different countries have begun to focus on formulating policies for better communication of science.

Over the decades, science communication has undergone transformation caused by the changes in the society and its communication and pedagogic practices. For instance, the rapid growth in scientific and technology has resulted in an incremental expansion and increased complexity of the communication process. Similarly, the shifts in the nature and magnitude of the audience and as well as the emergence of new type of sources have affected the process of science communication. Questions thus have begun to come up relating to the efficacy of science communication

process as well as the methods employed in different times in different contexts.

Following the publication of Hurd's (1958) *"Science Literacy: Its Meaning for American Schools"* a number of studies have been carried out in science communication domain. Their focus has changed according to the changes in the nature of and approaches to science communication. While the first generation studies viewed the audiences as a powerless entity whose deficit in science knowledge should be filled, the second-generation studies followed 'the limited effects' approaches.

A majority of the studies focused on areas such as mass media coverage of science, expert-to-expert communication of science, public perception of science etc, ignoring the scope of informal sources of science information like public science movements and the alternative channels like traditional media. Likewise, science communication in less privileged cultural settings including India has remained unexplored. It is in this context that the present study was carried out.

The Study

The study attempted to reveal the nature of the interconnection between alternative sources of science information and the public in a less privileged social milieu. For this purpose, the present investigation was envisaged as a case study of Kerala Sasthra Sahitya Parishath (KSSP), a non-formal public science movement.

The study sought to identify the use of print and traditional media of KSSP as science information sources and to find out the socio-demographic variables that influence their use. It also analysed the audiences' perceived satisfaction with KSSP media in terms of their form and content. Moreover, it determined the pattern of the use of non-KSSP communication channels as science information sources by rural people. Assessing the level of Public Understanding of Science (PUS) of the users and non-users of KSSP communication channels was yet another important objective of the study.

Since KSSP, is a large organization spread across Kerala and it uses a variety of communication channels, necessary data for the study was

generated through a sample survey. Data was collected on the profile of the respondents, their general pattern of science information acquisition, public understanding of science, and use and evaluation of KSSP channels. The outcome of the interplay between the sources of science information and the rural public was determined with the help of the PUS scale.

Being an exploratory study, the present investigation did not seek to examine any hypothesis. However, it has explored a variety of internal factors that are important in determining the efficacy of science popularisation in rural settings in particular.

CONCLUSIONS

The findings indicate to a number of premises and propositions, whose tenability deserve to be examined in future studies. Given in the following units are conclusions based on the findings of the study.

Significance of Traditional Media in Rural Communication

The study revealed the higher popularity of *Sasthra Kala Jatha,* KSSP's traditional media as compared to its print media among the rural folk. The impressive popularity of traditional media emanates from their special features like cultural proximity, traditional belongingness, infotainment capability and cost-effectiveness.

The finding that traditional media are quite popular among the lower income groups and lower educational categories reaffirms the suitability of such channels for popularising science among rural population that is most often characterized by poverty and illiteracy.

It is also to be noted that the rural audiences assessed the traditional media used by KSSP as more satisfactory in respect of their form and content parameters as compared to that of KSSP print media. Such an assessment owes largely to the fact that KSSP does not modify the original format of traditional art forms when it incorporates new science content into them. Instead, it develops science content for traditional media imbibing the linguistic simplicity and textual comprehensibility of the folk art forms. This method helps the rural audiences to easily recognize and enjoy their familiar art forms and to comprehend the message presented through them.

For instance, KSSP in one of its presentations illustrated the life story of well-known scientist Galileo Galilei through the traditional art form of *Villupattu* (*Villadichanpattu)*. *Villupattu* is a folk skit performed in connection with temple festivals. Bows (*villu*) adorned with small musical devices are used to produce tunes to which artists perform their skits with satiric folk songs. KSSP kept all these features and paraphernalia of *Villupattu* while telling the story of Galileo. At the same time, it utilized the potential of the art form to satirically present the stupidity of the clergy which tried to swaddle the scientific truth by killing the scientist.

Using similar technique, KSSP presents many science related issues through arts forms like *Komaramthullal, Mappilapattu, Oppana, Chakyakoothu* and the like.

Audience's positive evaluation of the form and content of traditional media used in *Sasthra Kala Jathas* amply reflects the prospect of traditional art forms in rural communication in general and in science popularisation in particular.

Traditional Media Confluence Model

The most remarkable aspect of *Sasthra Kala Jatha* of KSSP is that it facilitated the confluence of traditional media representing diverse cultural and ethnic groups of Kerala. Before the introduction of *Sasthra Kala Jatha*, KSSP used to perform individual traditional art forms enriched with science messages as individual programmes. The confluence of art forms began with the innovation of *Sasthra Kala Jatha*. Folk art forms ranging from *Ottanthullal* to *Nadanpattu* are perfectly mixed in the *Jathas*. Each year the *Jathas* focus on a particular theme and the art forms featured in it are conceived to present each aspect of the theme. Moreover, the *Jatha* as one complete programme is set in a particular theatrical method like arena theatre (as in 2005) or pure street theatre model (as in 2007). Thus, KSSP preserves the identity of *Sasthra Kala Jatha* as a complete theatrical experience even when various traditional art forms are blended together without losing their original format.

Such a model of traditional media confluence introduced by KSSP through *Sasthra Kala Jatha* has the potential to satisfy different cultural and

ethnic groups in the audience. At the same time, the confluence model provides for all segments of the audience to enjoy the programme as a unique single theatrical experience focusing on a particular theme. Thus, to a certain extent, the model transcends the limitations of selective-exposure tendency of the audiences.

Socio-Demographic Variables and KSSP Media Access

An attempt was made to find out the varying influence of socio-demographic variables such as gender, age, education and income on the use of print and traditional media of KSSP. While gender had no bearing in the way the media are used, the variables of age, education and income tended to have varying influence on the regularity of media use.

The variables of education and income in particular defined the KSSP's media use with lower income and lower educational groups tending to read print media rarely. Here it is to be noted that, by and large, it is educational attainment that reflects on individuals economic status. That being the case, efforts should be made to make KSSP print and traditional media popular as well as readable among the less educated. Such an effort would go a long way in reducing the 'science information gap' between the well-educated and the less-educated.

KSSP Print Media Quality

The audiences' evaluation of KSSP print media clearly implies that there was an immediate need to improve the form and content of all KSSP print media. It is a fact that KSSP produces its print media using medium-level printing technology so as to make them cost-effective. On the other hand, the popular print media which are quite common among the rural audience are produced with high end-technology capable of creating a high visual impact. This perhaps is the cause for rural audience's dissatisfaction with the visual display of the KSSP print media. The only way to overcome the problem is to improve the visual impact utilizing improved technology and better creativity.

Audiences' assessment of KSSP print media indicated to several shortcomings in content too. KSSP print media content is generated by freelancers on a voluntary basis. Developing interesting and exciting science

content using talented resource persons as is done by popular media is not economically feasible for KSSP which lacks a professional marketing network and sound funding. Resultantly, the content of KSSP print media remains weak. KSSP is aware of this problem and has taken remedial measures to ferret out talents for the science content development. As the problem remaining unsolved, it is imperative to hire professional content writers.

In addition, the content satisfaction is dependent on the language used. Science popularisation involves simplification of complex science information using common vocabulary without losing the accuracy of basic ideas. But, generating science content in diverse genres, that too in a vernacular language like Malayalam which has a limited scientific vocabulary, is a daunting task. KSSP has translated a lengthy list of scientific terms into Malayalam. And, the contents of KSSP science publications are most often developed using this vocabulary. But, the audiences' dissatisfaction with the textual comprehension and linguistic simplicity of KSSP print media indicates that these efforts are yet to yield positive results. This finding indicates the urgency of framing policies to enrich Malayalam language with a simplified scientific terminology.

Differential Level of Public Understanding of Science

The present study is, perhaps, the first attempt to determine the level of public understanding of science in Kerala State. The primary focus of the study was to determine the role of KSSP communication channels in creating scientific temper among the rural people. Hence, it was necessary to find out the difference between the users and non-users of KSSP channels in terms of their level of public understanding of the science.

As evidenced from the data, those who use KSSP channels had higher level of public understanding of science as compared to the non-users of KSSP communication media. Though the difference in PUS between the two groups was statistically significant, there was certain consistency in their correct responses to the 13 items of the PUS scale. On items where the users had high mean score, the non-users also had a high score. Likewise, on items where users had fared badly, the non-users had also not performed well.

Such a relationship in the understanding of scientific concepts implies the existence of homogeneity in the cognitive competence relating to science and technology across different sections of the society. This also suggests the existence of some hitherto unknown independent variables contributing to understanding of science. Perhaps, it would be worthwhile to undertake studies to identify the various independent variables, which influence the understanding of science by laymen.

Active Information Seeking Behaviour

Another major finding of the study was KSSP media users who had a high quotient of science information were far more active in seeking science information from all possible sources including popular media. Such a behavioural feature can be attributed to KSSP's philosophy, which advocates and encourages people to become 'science information rich' without which social revolution cannot be actualized.

Prospective of Public Science Movements

Given this positive outcome of the KSSP's four-decade-old services in creating a rational society endowed with scientific temper, the potential of public science movements stands validated. KSSP's model can be emulated in all developing regions by adopting strategies and programmes to suit region-specific needs.

RECOMMENDATIONS

As indicated in the foregoing discussion, there are certain areas which deserve special attention to improve science communication with rural folk. In that context, the following recommendations are suggested in two areas:

i) Media Use for Science Communication

ii) Future Studies

Media Use for Science Communication

1. That rural people's cultural affinity is a predictor of their media experience has become evident from the study. This trend validates the significance of considering cultural values and elements of ethnic groups in rural areas in selecting media for science popularisation. It is

true that traditional media can properly represent the cultural values of the society. But, the multi-plural nature of Indian society makes the process of media selection, especially the selection of appropriate traditional media for science popularisation, a complex process. To reduce this complexity, a balanced representation of traditional art forms should be encouraged in all sorts of rural science communication, both at governmental and non-governmental levels.

2. Such a balanced use of several arts forms is the hallmark of the traditional media confluence model developed by KSSP for rural science communication. This technique can be used in development communication initiatives in rural and urban settings.

3. The rural readers' low satisfaction with the form and content parameters of KSSP print media calls for urgent steps to improve their overall quality.

4. The pattern of the use of KSSP print media by the rural audience suggests that a majority of the rural populace is not familiar with these science communication channels. Efforts should be made to enhance their reach in the rural areas by introducing promotional schemes and increasing the number of issues as well. Further, special efforts should be made to increase the use of KSSP print media among the less educated. At the same time, there is an urgency to develop scientific vocabulary in Malayalam language because it would help science communication even among the less educated.

Future Studies

The results of the present study are of tentative nature. This is to be ascertained by conducting similar studies in the coming periods. Only such efforts would provide certain answers to the efficacy of science popularisation initiatives like that of KSSP in enhancing science knowledge and building scientific temper among people. In addition, there are certain areas, which seek researchers' immediate attention so as to build a better knowledge base.

1. The probable relationship between socio-demographic variables and varying nature of attending to science communication media

deserves in-depth investigation. Therein, the influence of the variable of education and income on comprehension of science information needs to be specifically examined in both urban and rural settings. At the same time, studies should be carried out to assess the role of hitherto unexplored independent variables such as pre-knowledge in science, socio-religious beliefs and the like on the understanding of science.

2. The Public Understanding of Science (PUS) scale used in this exploratory study was developed in the USA and has been used in developed countries. Though the same scale has been used in this study, it is pertinent to examine its validity in developing countries. The researcher is aware of this need and hence, the recommendation that the PUS scale be validated at the earliest.

3. Though it is essential to understand science media access by people belonging to divergent socio-demographic groups, it is much more important to assess the science information quotient of the people at periodic intervals. In such investigations, PUS scale validated in Indian context would provide more dependable results.

4. Future studies should examine the correlation between the PUS-scale-generated science information quotient and various socio-demographic variables.

5. The existence of homogeneity in cognitive competence relating to science and technology across different sections of the society was evident in this study. This proposition requires validation through repeated testing of the hypothesis.

6. This study has detected ‘science information gap’ between two segments of the rural population. Is science information gap a *fait accompli*? This question deserves investigation, as communication scholars are yet to fathom the ‘gap’ phenomenon and evolve ways for bridging the gap.

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APPENDICES

Appendix I

INTERVIEW SCHEDULE

Study Topic: Role of Print and Traditional Media in Popularising Science in Rural Kerala: A Case Study of KSSP

I **Personal Data**

Name: (Optional) ----------

a) Gender Male Female

b) Age ----------

c) Education ----------

d) Family Income ----------

e) Location ----------

II **Use of Information sources**

(i) How often do you read newspapers?
(Regularly) (Quite often) (Sometimes) (Never)

(ii) How frequently do you read magazines other than that of KSSP?
(Regularly) (Quite often) (Sometimes) (Never)

(iii) How often do you read books other than that of KSSP?
(Regularly) (Quite often) (Sometimes) (Never)

(iv) How often do you listen to radio?
(Regularly) (Quite often) (Sometimes) (Never)

(v) How frequently do you watch television?
(Regularly) (Quite often) (Sometimes) (Never)

(vi) How often do you go for movie a month?
(Regularly) (Quite often) (Sometimes) (Never)

(vii) How frequently do you browse Internet?
(Regularly) (Quite often) (Sometimes) (Never)

(viii) How often do you attend public functions other than that of KSSP?
(Regularly) (Quite often) (Sometimes) (Never)

(ix) How often do you meet extension agents for consultation?
(Regularly) (Quite often) (Sometimes) (Never)

(x) How frequently do you visit science exhibitions/science centers etc.?
(Regularly) (Quite often) (Sometimes) (Never)

III Public Understanding of Science

Kindly answer to the following. Each statement has two response options - 'true' or 'false'.

(i) The centre of earth is very hot.	True	False
(ii) All radio activity is man-made.	True	False
(iii) The oxygen we breathe comes from plants.	True	False
(iv) It is the father's gene that decides whether baby is girl or boy.	True	False
(v) Lasers work by focusing sound waves.	True	False
(vi) Electrons are smaller than atoms.	True	False
(vii) Antibiotics kill viruses as well as bacteria.	True	False
(viii) The continents are slightly moving their location for millions of years.	True	False
(ix) Human beings, as we know them today, developed from earlier species of animals.	True	False
(x) Earliest humans lived at the same time as the dinosaurs.	True	False
(xi) Radioactive milk can be made safe by boiling it.	True	False
(xii) Earth goes around the Sun.	True	False
(xiii) Earth takes one year to go around the Sun.	True	False

Questions to the users of KSSP Channels

IV Exposure to and satisfaction with KSSP Channels

(i) How often do you read *Sasthragathi* magazine?

a. Regularly (12 issues a year)
b. Quite often (11-7 issues a year)
c. Sometimes (6-2 issues a year)
d. Rarely (less than two issues a year)

(ii) If you are a reader, kindly mark (√) against the response of your choice regarding the following statements about *Sasthragathi*

a) The design is attractive.

Agree Neither Agree Nor Disagree Disagree

b) It is easy to understand the content.

Agree Neither Agree Nor Disagree Disagree

b) The language is simple.

Agree Neither Agree Nor Disagree Disagree

c) The narration (style of presentation of information) contributes to understanding.

Agree Neither Agree Nor Disagree Disagree

(iii) How often do you read pamphlets published by KSSP?

a. Regularly (6 or more a year)
b. Quite often (5-4 a year)
c. Sometimes (3-2 a year)
d. Rarely (less than 2 a year)

(iv) If you are a reader, kindly mark (√) against the response of your choice regarding the following statements about the pamphlets of KSSP.

a) The design is attractive.

Agree Neither Agree Nor Disagree Disagree

b) It is easy to understand the content.

Agree Neither Agree Nor Disagree Disagree

c) The language is simple.

Agree Neither Agree Nor Disagree Disagree

d) The narration (style of presentation of information) contributes to understanding.

Agree Neither Agree Nor Disagree Disagree

(v) How often do you read popular science books of KSSP?

a. Regularly (4 or more a month)
b. Quite often (3 a month)
c. Sometimes (2 a month)
d. Rarely (one a month)

(vi) If you are a reader, kindly mark (√) against the response of your choice regarding the following statements about the science books of KSSP.

a) The design is attractive.

Agree Neither Agree Nor Disagree Disagree

b) It is easy to understand the content.

Agree Neither Agree Nor Disagree. Disagree

c) The language is simple.

Agree Neither Agree Nor Disagree. Disagree

d) The narration (style of presentation of information) contributes to understanding.

Agree Neither Agree Nor Disagree Disagree

(vii) How frequently do you attend the annual *Sasthra Kala Jathas* of KSSP?

a. Regularly (Every year)
b. Quite often (Once in two years)
c. Sometimes (Once in three or four years)
d. Rarely (Once in more than four years)

(viii) If you attend, kindly mark (√) against the response of your choice regarding the following statements about the traditional media used in *Sasthra Kala Jathas*.

a. The visual performance is attractive.
Agree Neither Agree Nor Disagree Disagree
b. It is easy to understand the content.
Agree Neither Agree Nor Disagree Disagree
c. The language used is simple.
Agree Neither Agree Nor Disagree Disagree
d. The narration (style of presentation of information) contributes to understanding.
Agree Neither Agree Nor Disagree Disagree

Appendix II

NOTES ON FOLK ART FORMS

Chakyarkooth

Chakyarkooth is one of the oldest classical solo dance forms of Kerala, traditionally practiced by the *Chakyar* community. The word *'Chakyarkooth'* itself implies that it is the dance (*kooth*) of *Chakyars*. *Chakyarkooth* is presented in temple threatres to the accompaniment of *mizhavu* (drum in the shape of a large spherical copper pot) and e*lathalam* (small cymbals). During the performance, the *Chakyar* uses satiristic narrative, gestures and wit. Normally, themes of the performance are taken from Indian epics. However, *Chakyar* is free to blend contemprary issues in sarcastic style into his performance to attract and amuse the audience.

Kolkali

Kolkali is a circular group dance of rural communities in Kerala. Twelve to twenty four dancers move rhythmically in a circle. They beat wooden sticks in their hands while moving around the ceremonial lamp in the center of the circle. There are different versions of *Kolkali*. Mappilas, the Muslims of Malabar, developed their own version which is extensively performed in northern part of Kerala.

Komaramthullal

Komaramthullal is a ritual dance form performed in temple premises by *'Komarams'*, the divine performers who belong to a lower stratum of the Hindu society in Kerala. During the performance, acting as a mediatory between the deity and the audience, *Komaram* pronounces admonitory revelations about various aspects of village life. Those who adapt this ritual form for artistic expression utilize its potential of pronouncing revelations during performance.

Kurathiyattam

Kurathiyatam is a traditional theatric form performed by *Kurava* tribes in Kerala. Localized versions of stories from Indian epics are enacted in this art form. Flexibility in adapting and presenting stories in an amusing way is the potential of this form of artistic expression.

Mappilappattu

Mappilappattu is songs of ethnic Muslims in Malabar, Northern Kerala. It is a perfect blend of Indian and Arabian music and poetry streams. For its captivating rythm and potential to adopt social themes, *Mappilappattu* gained wide popularity in Kerala society.

Nadanpattu

Nadanpattu means folk song. It is one of the important streams of folk art tradition in Kerala. They are characterized by repeated wordings, local dialect and conventional rhythm and theme. There are region-centric, community-centric as well as occupation -centric folk songs. While *Vadakkanpattu*, represents north Kerala's folk song tradition, *Pananpattu. Kuravanpattu* and *Mapplipattu* are attached to the respective communities and, *Koithupattu* and *Krishipatthu* to harvesting and farming respectively.

Oppana

Oppana is a bridal group dance of Muslims in Kerala. The well-dressed bride sits in the center and her friends round her dancing, singing and clapping hands rhythmically and systematically to *Mappilapattus* sung by the accompanying singers.

Ottamthullal

Ottamthullal is a widely performed traditional popular art form of Kerala. Simplicity in the presentation, critical use of humour and wit form the structure of this art form invented by famous Malayalam poet Kunjan Nambiar to criticise social evils persisted during his time. Mostly the themes are of contemporary issues. Though this satirical art form does not require any stage arrangements, the performer wears colourful costume.

Padayani

Padayani is a colourful ritual art symbolizes the victory march of goddess *Kali* after defeating the demon *Darika*. This region-centric art form is usually performed in the southern part of the Kerala. The art form requires elaborate costume and intricate physical movements.

Pananpattu

Pananpattu is folk song sungs by *Pana* community of Kerala. *Panas* are supposed to wander from village to village informing the rural folk about the noteworthy events in neighboring places through their songs. They use handcrafted music instruments for their performance.

Villupattu

Villupattu is folk skit performed in connection with temple festivals. Bows (*Villu*) adorned with small musical devices are used to produce tunes to which artists perform their skits with folk songs. Unique feature of this art form is its potential to present contemporary issues in a satiric way.