

Science Communication

Science is a branch of knowledge requiring systematic study and method, especially dealing with substances, life and natural laws. This systematic knowledge is used in many ways in order to improve the standard of living of the human being. More than six thousand million (6 billion) people are living on the earth today. All these are not enjoying their lives equally. Hunger, malnutrition, diseases, natural hazards like floods, eruption of volcanoes, droughts *etc.*, man made problems like civil wars, terrorism *etc.* do not allow people to enjoy their lives equally.

There are problems that can be solved by means of scientific knowledge. Science will help to find solutions to problems that are not solved yet. The best example is AIDS. There are more than 40 million people on the earth suffering from AIDS. Scientists in different countries do continuous research to find treatments for this lethal condition.

Country like Sri Lanka still belongs to the third world, is struggling to be a developed country in the world. Various indices are there to indicate the level of Development. GDP, life expectancy, adult literacy, infant mortality rate, maternal mortality rate, are some of the indices that we can use to interpret status of development of a country. In developed countries, these values are favourable, and not so in the poor countries. The developed countries use their knowledge on science and technology to get better results while the poor countries merely used these due to having less income and less interest. Poverty alleviation is the major objective, when a country is seeking to be a developed state. In doing so, use of scientific knowledge can play a major role in order to develop countries like Sri Lanka.

Science communication can be identified as the dissemination of scientific knowledge to the end users. In our country there are many ways and means to take scientific knowledge to the users/general public. Programmes are broadcast on radio and television, knowledge is disseminated through various printed media, such as periodicals, textbooks, newspapers *etc.*

The National Science Foundation publishes “**Vidurava Science Magazine**” since 1976 over a period of more than 25 years. It has addressed various scientific issues and has experience in disseminating scientific knowledge over the years to the general public.

This issue is important mainly for science communicators, budding scientists, and for school children. There are six articles in this issue, written by experts on this field explaining how a science communicator should reach to the general public through various modes in order to get a successful communication. Our attempt will be a successful one if the message on Science Communication reaches to the target group.

Editor

Basics of Effective Communication For Community Education

Prof. M .T. M. Jiffry

Introduction

Communication is an important and vital function carried out by all living beings. In this respect, the human beings have the unique ability to execute this function in a refined, orderly and effective way due to our supremacy of possessing inherent and acquired biological skills using modern technology. The ultimate object of communication is to transfer information and ideas from one individual or source to the other. Basically, communication could be carried out using several media, multiple modes and a variety of methods.

Amongst the primitive human beings, communication developed through using sign languages, which later took the form of permanent inscriptions on rocks. Thereafter, with the gradual advancement of technology the printed media came into popular usage. With the subsequent invent of the telephone system and wireless technology, the field of communication gained a very rapid advancement. This again was further boosted by satellite technology and the invention of computers and television. Here we are today in the world of Information Technology with the ever fast expanding and advancing systems of global communication with multiple technology and media.

In the light of the above advanced status, at present the delivery of communication encompasses several key aspects.

They are;

- nature
- purpose
- target group
- medium used
- mode utilized
- methods adopted
- time devoted and
- feedback obtained.

In this article, I shall address issues of basics of effective communication for educating the public on the fundamentals of scientific methods and elementary concepts involved in their daily work.

The Nature Of The Message

The message in this issue is concerned with simplified scientific principles involved in routine activities of the people in our society. Thus, it is imperative that any scientific concept should be simplified to a basic and clearly understood format. Therefore, it is necessary to plan the contents and present it in a logical and stepwise sequence. This is where, very often the personal creativity helps.

The communicator should first understand the nature of the message to be delivered, whether it is, (a) directly concerned with a routine experience, (b) an activity beneficial for a particular reason or (c) just a piece of knowledge which is good to know?

The Purpose of The Message

Before preparing the presentation, the communicator should have a clear understanding of the *objective* or *purpose* of the message. Thereafter, it should be spelt out in its simplest form before starting the actual presentation. This exercise would definitely clearly give to the receiver the main intention of the message.

In addition, along with defining the purpose prior to the presentation, the communicator also could have certain self-imposed restrictions, which would guard him against deviating from the topic addressed, and its purpose. Furthermore, such prior identification facilitates to limit the contents of the topic discussed at its required length and depth without confusing or overloading the receiver with unnecessary information.

The Target Group

The proper understanding of the target group aimed by the message is extremely important while preparing the manuscript. The type of language used, the examples cited, the depth of information presented, and the specific purpose spelt out, all depend on the nature of the target group. The main features of the target group to be considered are the (i) language they speak, (ii) age and gender, (iii) level of education, (iv) interests or common work pattern, and (v) religion and ethnicity.

It would be very effective if the communicator shows familiarity with the daily activities of the target group as well as their aspirations. Such an exercise would bring close the communicator to the receiver and both parties will be at ease. One must remember that a

communication definitely has a reactive component. That is, even though the receiver may not be able to respond to the communicator, we should remember that the receiver reacts to the message within him/herself.

The Medium Used

The medium of language used in the message is vital in the Sri Lankan context. It is although necessary on some occasions to refer to hard scientific technical jargon in order to introduce certain concepts, the basics should be explained in simple language familiar to the target group. The sentences should be very simple and short. Make an attempt to give explanations to highlight the relevance and applicability to day-to-day activities of life. Perhaps even repetition of key statements may be very beneficial to stress a point, especially in a verbal communication. It may be better that certain elementary technical words are identified in English rather than introducing complicated and unfamiliar Sinhala or Tamil words. Thus, a communicator is allowed to use a mix of languages to facilitate easier and more meaningful communication.

The choice of mixing of language and the extent of explanation, which needs to be given, should be determined by a careful pre-planning of the message, perhaps experimenting it on a 'pilot' presentation.

The Mode Utilised

The presentation has to be either through single or multiple modes, such as using print, verbal, electronic (audiovisual) and/or interactive facilities. The choice of the mode of presentation depends on the (i) nature of the

topic (ii) availability of facilities and (iii) preference of the communicator.

The Methods Adopted

Several methods or techniques could be adopted in the presentation. They are as a (i) one-way presentation (print media in particular), (ii) dialogue between an interviewer and presenter, (iii) discussion between several resource persons, or as a (iv) interactive session with an audience. Again, the choice of single or several methods depend on the resources available for communication and the time allowed.

Time Devoted

The availability of time is an important determinant in deciding on the content to be presented. Invariably the quality of the presentation also depends on the availability of a critical time period in verbal presentations.

Thus, it is imperative that at least a minimum period of time is essential in enabling the communicator to (i) introduce the issue (ii) spell out the objectives (iii) refer to existing prior knowledge, which the target group already possesses (iv) introduce new knowledge (v) stress the relevance and applicability, and (vi) summarise the salient points or key concepts.

Feedback Obtained

It is essential at the end of a presentation to summarise the important issues and recall them as to how the receiver has perceived the issues. Similarly, a feedback should be obtained on the whole message to ascertain the effectiveness of the exercise. A questionnaire could be used to methodically find out the response of the receiver or target population.

In this short article, I have tried to stress the basics of communication so as to make it more meaningful and effective.

Aspect of Science Communication

Percy Jayamanne

The greatest experience a man can obtain in his lifetime is that realization of that “**knowledge is attractive**”. A child who grows up in his house, spending time in playing hide and seek with his friends, would eventually understand that there is more to life.

“One day when he steps out of his home, he meets a bird. Another day he picks up a beautiful stone. Then he is inquisitive to know why one bird is different from another bird? Why one stone is different from another stone? He inquires the way a bird flies, the way in which a stone is made of. Subsequently he asks many questions in his thoughts. He tries to answer these questions alone. All of a sudden he realizes that knowledge is attractive. Now he is a person stepped into a new world. Now he wanders in a world of mystery things, where there is a connection between various things.”¹

One book, which compelled me to be a science communicator, illustrated the above paragraph at its beginning, and its still fresh in my mind. The name of the book is also ‘**Science**’. The above book, which is a translation, was published by the Department of Education, three decades ago. This book was published in order to introduce science in Sinhala. A large number of people who were influenced by this book became science communicators, working enthusiastically to give knowledge to the future generation. I particularly mention the above quotation for this very reason.

I see the above section as a good example on how to begin science communication. I think that is a very good introduction on how science

should be introduced to the ordinary reader. It contains the simplicity of science communication, its precision and the way it should be aimed at.

Science began with curiosity. Therefore, I think science communication also should begin with curiosity. **Dr Issac Asimov**, who is considered as the greatest science communicator, has drawn attention to this matter. He begins his book ‘**Guide to Science**’ thus.

“At the beginning curiosity prevailed almost entirely”. Inquisitiveness, which cannot be drowned, the desire to find out how, is not seen in a lifeless thing. It is also not seen in certain living things. This inquisitiveness is also the indication of the fact that we are living and are alive.

A tree is not inquisitive of its surroundings at least not in the way we are used to. A sponge, a shellfish, displays the same behaviour. The wind, rain and sea waves bring them their requirements (food *etc.*) almost to their doorstep. From them, these creatures absorb whatever they can. Yet if fire, poison, predators or parasites approach them, they accept death in silence, without any resistance.

“At the very beginning of life, certain living creatures tried to obtain free movement or mobility. It was a giant step to win the nature. The creature, which could move, no longer needed to wait until food came to it. It started searching for food. Exploration came into the world. Inquisitiveness was born.”²

This was how **Asimov** in his book tried to draw the attention of man to science.

In a similar way, the writer should be able to perform by drawing the attention of the reader. Whatever the subject the writer intends to write, he should prepare for it. He should know the subject matter is absolutely correct. He should have facts to present his thoughts in a strong manner. If diagrams are needed to clarify certain points he should find them. After that, he should pay more attention to the introduction of the article. He should think of the best way of introducing the article so as to get best attention of the receivers. For this, it is better to find out several alternative methods and use the best alternative method.

The Importance Of An Appropriate Introduction

Several examples can be given of good introductions. **Asimov** who writes an article on Botany starts it as a detective story. At the very beginning he brings the world famous detective character, Sherlock Holms. He inspects the murder that has taken place in the home garden using photographs. The dead person had cultivated flowers as his hobby. His severely beaten body was found in a flowerbed.

The wristwatch, the dead man was wearing has stopped owing to damage. Sherlock Holms sees a difference in time, the time the dead man was subjected to beating and the time the wristwatch stopped. He notices something odd in the flowerbed near the vicinity of the dead body. The flowers had been grown, to resemble the face of a clock. The flowers had been so arranged, that they were opening or blooming in sequence, as that of a moving clock. Sherlock Holms finds out that the

murderers have deliberately changed the time on the wristwatch. This he finds out by examining the time at which the flowers opened. Thus in his article, **Asimov** has first forward the fact that in Botany, there are flowers that bloom all 24 hours a day. Thereafter, **Asimov** writes an exploratory article on the wonders of the plant kingdom.³

Asimov writes a book on 'Words of Science and the History Behind Them'. In this book he explains how scientific words have been made and details behind them. Thus, he turns an ordinary reader who is not keen on scientific jargon, in to a reader of scientific articles. At the very beginning of the book he explains that the word 'alcohol' is used in science, as a thing used by ancient Arabic ladies as a perfume. He begins the article thus; for many centuries, ladies darkened their eyelashes using a dye, thus giving an impression of a brighter and more sparkling look. To make the dye, they used a finely powdered compound. The meaning of finely powdered is 'alkohl' and the powder got the name alcohol.⁴

The history of science can be written in various ways. One can start at the very beginning from the very first day man began to explore the world due to his curiosity. Otherwise, it can be written by dividing according to time periods or eras, describing what changes took place in each of them. Another way of writing this history is to begin from the Stone Age about 15,000 B.C. describing what instruments people used then, and describing what discoveries man has made up to now. But, **Isaac Asimov** does this in a completely different way. He begins his history with **Imhotep**, an Egyptian scientist who is believed to be the beginner of the scientific generation,

and who lived in Egypt between 2980-2950 B.C. Then he expands his writing to include, **Ahmoose, Thales, Anaximander, Pythagoras** and **Cyril Ponnamparuma** of Sri Lanka, **Neil Armstrong, Carl Sagan** and finally he, himself. In this book, **Asimov** has not given any attention to private lives of these scientists. Instead, he has given their scientific achievements, and there by arranged the scientific knowledge man has acquired so far. Where necessary, he has given some details of the private lives of scientists. This book has described the great scientists and their thoughts and the vast knowledge they have accumulated for the benefit of mankind. His book, **Asimov's Biographical Encyclopaedia of Science and Technology**⁵, has a special place among the hundreds of articles he has written. In this book, the information is given according to the time periods, in which scientists were born. Hence the progress of science can be read through their biographies.

Scientific matter written for the general public should be very simple and accurate. Not only that those should be facts that can be accepted based on standards. That is why the science communicator should take pains in science communication. He should obtain help from the experts in the field or else he should study the books and get the correct facts.

It should be understood that science is not a collection of facts, but something that binds all of us in our day-to-day lives. Facts should be supported not merely by words but also by relevant pictures and diagrams.

There are two main objectives in science teaching and learning. One objective is that by learning science, based on facts shown to be

correct by scientific experiments, one gets intellectual training on how to arrive at a solution to a problem. The other objective is that by scientific discoveries, one expands one's horizons. One also realizes that one's general knowledge is incomplete by not knowing the basic principles of science.

“For every branch of life, - in connection with health and prosperity, science has a great influence, every citizen should have a knowledge on science. The knowledge on scientists and scientific methods takes the first priority. For the general public it is sufficient to give training on one special branch. Every branch is not applicable, but a wide knowledge is essential. Therefore, it has been accepted without debate, that every man should be given a wide science education”⁶.

One cannot enumerate the benefits of science to everyday life. For example, one can show the requirement for knowledge on health and nutrition. Today both printed and electronic media have generated very attractive features on these subjects.

Scientific Method

For successful science communication, one should follow the scientific methods taught generally in science. A scientist looks at a particular work with a scientifically trained eye. He obtains the knowledge in a scientific method. To obtain knowledge according to a scientific method, the following methodology can be shown.

1. Observation
2. Inference
3. Expressing as a concept

4. Verifying the concepts by new observation
5. If the concept is further confirmed by later observation, then putting forward a more correct version of the concept

There is no limit to the amount of concepts and inferences required to gain knowledge. Scientists aware that a concept, which was correct yesterday, can be proven wrong today or tomorrow. Therefore, one should be alert on others' knowledge. If one comes to know of any change in the concept, he should update his knowledge.

I think that by following this principle, a science writer will be able to fulfil his objectives. Like a scientist, the science writer must also continuously update his knowledge. For this he needs a good style of writing and a clear language.

The Importance Of a Clear Language

Any science communicator can express his facts correctly and clearly only if he uses the words correctly. **Mr Elian de Silva** once gave a very good example. It is about the dates in the newspapers. Many daily newspaper editors make mistakes with regard to dates. It can be shown in the words of **Mr. De Silva**. "If 4th of January is a Wednesday, many write it as 'January 4th Wednesday'. Even though there could be 4 Wednesdays in January that the 4th day need not be a Wednesday. To mention that the 4th day of a month is a Wednesday is one thing, to say the 4th Wednesday of a month is another. It is important in science to express ideas clearly and precisely" (**Sinhala Sipiyuru Wadan – 1, page 18**).⁷

Here is an extract from a passage where a writer has expressed a technical matter written

in English into Sinhala. "After that, use the ignition switch and check whether the needle in the ammeter is pointing towards the discharger and also check whether the warning light is on. If it is motionless, then it indicates that one of the wires joining the distributor and condenser is loose". In the Sinhala text, the writer has used many technical terms directly as they appear in the text. Here one has to consider whether his objectives were satisfied. One could argue that these terms mentioned in the text are common technical words and that they could be understood by many people, and that therefore, it is not a grave mistake to write the English words in Sinhala. Yet it could be an insult to Sinhala, because Sinhala language is very rich in words and has its own technical terms to describe such situations.

For this, the writer should be familiar with the glossary of words. For this purpose, a book of glossary words has been published for every subject. Sometimes for the same word or term there could be two glossary words. Therefore, the writer should have the ability to choose the more appropriate glossary word. The writer should have access to very good glossary books. If the writer is writing in Sinhala, there should be a Sinhala Science Dictionary (Here it will be very useful to have, '**Modern Sinhala glossary dictionary**' written by **Dr Harischandra Wijayatunge**).⁸

Sometimes the writer will have to coin a glossary word at the time of writing. At times like this, it is not possible to look for an expert on glossary words. Even if one could reach such a person, he possibly would not have the glossary term or word at his fingertips. The writer should have the ability to coin up a glossary word (without depending on word

makers or experts) and carry on with his writing.

Chartered Engineer, **Mr Elian de Silva** has written a guidebook on making a glossary words, related to the subject. The book '**Sinhala glossary words**' has mentioned the following. "If the description is on some technique in words, or the features of the technique, it is known as a technology. This is the English term. When technology improves, the country as a whole improves. If the technology needs to improve or progress, there should be corresponding technical terms in our language. Special feature of such a language should be a one with clear, uncontroversial, meaningful, short but correct technical terms".

Science communication done in an expert manner and an attractive way provides two services. On one hand, good communicators are made. On the other hand, by disseminating successful knowledge, a generation with science knowledge is created. It may also lead to the creation of world famous scientists. This could be achieved by producing good science communicators.

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The Language used in Science Communication

Dr U.M. Senanayake

There are number of areas involved in science communication. One has to pay attention to various segments of society, which are targeted for science communication. With regard to media, there are daily newspapers, weekend newspapers, periodicals and special news bulletins.

Science communications, which are published in daily newspapers often, have only news value. For example, if a new technique was found for food preservation, a daily newspaper could only give of information of news values. Sometimes, a feature article could be published in the same newspapers giving more in depth information such as the principles involved in the technique, types of food that can be preserved using the new techniques, how the taste, colour and nutrient values are preserved by the new technique, and the social benefits obtained by the new invention. This information is sufficient for the ordinary newsreaders.

If the same news is published in a weekend newspaper, attention has to be placed on its special merit value. There are trained science writers employed by most weekend newspapers. Such a writer could write a detailed article, perhaps with relevant photographs and diagrams, based on the original newspaper article. There are not only readers for such articles, but also collectors.

Once again if we take for example the above discovery, a special science article would have

to contain more details on the technique, in addition to the basic principles. In describing such techniques, instead of using simple language, a more technical involving glossary terms, could be used.

There are readers in several age groups, and of different intellectual levels. There are children, ordinary school students, students in institutes of higher education, universities *etc.* There are also teachers and lectures. As such, there are special magazines, periodicals and even newspaper feature articles aimed at such segments of the society.

School students are a special segment receiving special attention. There are periodicals and other publications aimed at this sector. For such students, a simple language has to be used. The message is best understood by using lots of diagrams. In fact, there are some science magazines, which use cartoons to describe techniques and other features.

There is a special segment of readers in the adolescent age. These are the young boys and girls who may have finished their primary education. They may be either employed, seeking jobs or non-working. This segment of readers is seeking special knowledge. For these readers the language used should be not too simple or too hard. One will have to pay special attention to certain areas of knowledge, which they are seeking. Many girls like to read about beauty care, cookery, new fashions and styles, and health care. Many weekend newspapers

and periodicals carry special feature articles on these subjects. They also use a special language

in these articles. On the other hand, young men have different taste. They like to read about new techniques on motor mechanics, electronics, radio and television and similar fields. They seek this knowledge, not only to improve their knowledge but also to enhance their career opportunities.

There are professional journals and publications on science communications. There are trained journalists in this field. They perform two duties. They contact the relevant scientists and technologists for an interview. Such interviews are published as a professional article in these journals. The language used in these journals and periodical are of a high standard. There are scientists, researchers and technologists who write about their own discoveries. Often these articles are published as refereed journals with a special format. There are highly recognized journals of such category. Magazines like '**Discover**', '**New Scientist**' and '**Readers Digest**' and '**Scientific American**' are such examples. They are published in many languages.

In a recent '**Discover**' Magazine, the growth of grass leaves was described thus. "Unlike other leaves, a grass leaf grows from its bottom. Not from the top. When a leaf is cut by a machine or eaten by an animal from the top, the leaf achieves the original length by growing from the base of the leaf. The first grass cutting machine or the lawn mover was patented in England in 1830. Before this invention, lambs were employed to trim the lawn".

By using such a simple language any one with or without a science education can understand

the scientific message. In science communication, it is very important to use simple language and correct meanings.

Famous magazines such as '**Time**', '**Newsweek**' very often carry a science article. They are capable of describing a complicated or deep scientific or technical matter in a simple language that the layman can understand. The difference between reading and audio visual presentation is that, the reader will stop reading if he does not understand, but in the case of the audio visual presentation, even if the subject is unclear, one can continue to watch and listen.

There are specialized journals in science communication. Journals like, **Journal of Food Technology**, **Journal of Chemistry**, and **Journal of Phytochemistry** are such journals. Most of the science communication articles in these journals are of a research nature. There is a format for such articles. Often an article or paper describes the finding of a research project. The writer himself is the person who has carried out the research work. In such a scientific communication, the author himself describes the aim of the research project, the methodology used, the raw material used, the research, conclusions and summary. These journals, which could be monthly, quarterly or biannual, are for the science community. Even then such communications have to be written by trained journalists for the general public if they are to understand the scientific content. Such journalists will first have to understand the scientific content, and then use a simple language for the ordinary reader. Often, the first publication on a scientific discovery is published in a specialized journal. The science communicator will have to take the matter to the ordinary reader.

Communicating Science through Drama

Mrs C. Warakadeniya

Drama and performance are two of the most effective media of communication. These two are interlinked and are very close to people's heart, and their feelings. In fact, drama is the most effective medium of communication through which the message **"Science is not meant for a selected few but meant for every one"** could be conveyed to the people.

In the past, people had a close rapport with the nature and their performances were confined to worshipping evil spirits, devils and gods. The simple traditional dramas evolved later gave tremendous pleasure to the audience. The art of drama developed later through the Jathaka stories such as Kusapabawathie, Sinhabahu, Kada walalu and Maname, which are still in heavy demand. In short, the most effective and most impact oriented medium of communication today is drama, whether it comes as a stage drama, street drama, open air theatre drama, or a tele-drama. Drama could be effectively utilized to popularize science in a meaningful way.

In this exercise we have to first clearly understand the national goal of education and the basic competencies required to achieve such goals. At the same time we should not forget the fact that the school curriculum is the main tool behind such competencies.

Although the aims of education can be differ from country to country, the common objective of education is to produce good citizens. **According to the philosophy of Carl Marx, education should aim at producing a man**

who believes in communism. In the United States its main objective is to produce a democratic man enjoying the fullest benefits of science and technology, who is second to no other.

Various countries have adopted classroom teaching in a formal way in order to achieve their educational objectives. They have been very successful in their endeavour, which has helped in the development of their countries.

China has been successful in producing working intellectuals and intellectual workers through the implementation of their educational programme. Unfortunately, we do not have such specific objectives. **The examination oriented education system in Sri Lanka has failed miserably to produce creative intellectuals who can assist in the economic and social development of the country.**

The education system implemented under the British rule in their colonies created a situation where although the nationals of those countries looked national in their blood and colour they were really British in their culture and thinking. However, we have to accept the fact that those intellectuals produced by the free education system in our country are far behind in their thinking and culture than those who studied under the British rule.

The present educational objective includes many ideas of great philosophers and educationalists. **"Education is the life and the**

way of living” is the philosophy of **John Duvie**.

“Education should lead to the development of the head, hand and heart” was the thinking of **Mahatma Gandhi**. Neither of these ideas was given any consideration in the implementation of the educational objectives in our country. **This is the very reason we are producing intellectuals with only brains lacking any knowledge of the art of living.**

Although the educational reforms have been introduced and implemented in various occasions in our country, traditional examination oriented teaching continues as it is. As a result, only those who obtain higher marks in the public examinations are entitled to get admission to popular schools, win scholarships, enter universities, and finally get the chance to find better jobs.

If the school system is successful in providing the necessary skills required by the new educational reforms, then only it is possible to reduce the problems of unemployment among youth and graduates at least to some extent. In order to do this, it is imperative that there must be an attitudinal change in teachers and parents. Otherwise, everything we do in the form of projects or evaluations will be of no use.

According to the **Dallow** report there are four pillars supporting education,

1. Education for knowledge
2. Education for work
3. Education for living together
4. Education for education

Education methods in all countries are organized in such a way that they can achieve the above universal aims of education.

The following could be identified as the most important aspects leading to the development of a complete man.

1. Emotional
2. Virtuous
3. Sociological
4. Intellectual
5. Physical
6. Aesthetic

The skills needed to develop these aspects are:

1. Communication, which includes literary, calculation and drawing skills
2. Environment based; which include social, biological, physical attitudes and skills
3. Religion; moral development
4. Sports and leisure include cooperation, group activities, competitions and exercises
5. Education; to get to know something and knowledge should be a continues process

Students in advanced level classes are youth who have basic needs such as the need for security, freedom, group dedication, sexual desire, love and acceptance. **Science students in particular have creative abilities and they are able to create new things to the society. The projects and assignment recommended by the new educational reforms would be of great help in this process.**

If these projects and assignments include scientific drama as a group activity, it would help in the development of skills knowledge and attitudes of the students. Those who have a linking to the art of drama would select such

projects and would be tempted to gather more information on the subject through the various media (Figure1).



Figure 1

The followings are aspects, which come into play when staging a drama.

1. Group get together
2. Read scripts and plan together.
3. Divide the characters according to their own capabilities
4. Train during leisure
5. Take others help
6. Respect others ideas and criticisms
7. Look at the society with a more positive frame of mind
8. Aim at giving the best performance to the audience

The following are directly linked to the communication of science through drama. These are some of the objectives expected to be achieved through the projects meant for students of grades 12 and 13.

1. Ability to use the acquired knowledge and skills
2. Development of favourable attitudes towards life
3. Respecting others' ideas
4. Ability to convey ideas, experiences, and knowledge to others.

After passing grade 13 students step into the society as citizens. The skills and thinking they developed in school will then be started to penetrate in to the society.

It is not necessary to do a complete drama in order to communicate science. We can make use of the following stages to achieve this.

1. Detailing with imitations as a tree, part of the body etc
2. Detailing with interesting dialogues
3. Taking part in comedies
4. Taking part in creative dramas



Figure 2

Creative drama is the most suitable and is most effective in communicating science through drama (Figure 2).

Therefore, it is necessary to make use of creative drama in Advanced Level projects. This important and self-educative project would help the students become good citizens who look at the society with a positive frame of mind.

New educational reforms should aim at creating citizens capable of contributing effectively to the development of the country. Personality development is a prime objective of these reforms. The most fundamental and elementary exercise to develop a dynamic personality is to build up a positive frame of mind and to cultivate an optimistic outlook. This project would undoubtedly contribute in a big way to achieving these objectives.

Writing Health for the Masses

Thusitha Malalasekera

Health, whether it is health promotion, public health or patient care services, needs dissemination of information. Most of the information that the public receives on health comes from both printed material as well as the electronic media. The media acts as the vehicle of information, when we consider the new epidemics such as AIDS or 'mad cow' disease, and it is equally true for 'diseases of civilization' linked to unhealthy lifestyles on smoking, alcohol abuse, unhealthy food habits and lack of physical exercise etc.

The impact of disseminated information and knowledge on health through media has become a paramount importance and priority for health in the eyes of the general public. Health writers and the media have contributed immensely to the success of immunization, family planning, promotion of nutrition etc. As for those who hold key information about health matters, health experts and health communicators ought to make a greater effort to communicate thorough information to the public. **The health writer should be well aware that he is not writing a scientific publication or a research paper for a professional journal but a light reading material for his readers.** A general article on subject of health is not expected to contain and reflect in depth, detail and strict science.

The information gathered should be re-measured and only the material that could be assimilated by the public and is of importance to them should be disseminated. This is a

different process and most health writers lack the journalistic expertise to achieve this.

At the same time, it is something of a paradox that information about health, or writing on health to the general public is considered of secondary importance by writers and journalists when public interest is clearly so strong. One possible explanation of this situation is that 'medical' or 'health' information is often judged to be too specialized and that the writers themselves may suspect they don't have sufficient know how to discuss such topics without the risk of making mistakes. At the same time, many medical consultants and health experts complain that journalists and writers have distorted their statements regularly.

Before writing on health, the writer or the journalist should read whatever material is available on the subject. **He or she should be a 'mini-specialist' on the subject before the interview proper commences with the subject specialists.** He should know that the consultant might use a lot of words of medical jargon, which are alien to the public as well as to him. To overcome this situation, the writer should do his reference work early and find out the simple meanings for the medical or technical words that could come up at the interview or lecture.

It is important to have correct co-ordination and understanding between the health writer and the health specialist. Sometimes the writers take these matters too lightly, and do not pay necessary attention. At the same time, the

health specialists too are often ignorant of the ways in which health writers or journalists work, and the constraints they face. It is the responsibility of the health specialist to explain matters precisely to the writer as he or she has only limited ideas about the subject of the interview. Therefore, the specialists have to share the responsibility and take pains to ensure that what they say is very clear and simple. Medical jargon should be avoided as much as possible. The journalists in turn should not hesitate to say if they have not fully understood and to ask the person being interviewed to explain.

The health writer should keep in his mind that he is writing to a lay audience, and that they are at the mercy of the writer to understand an important but difficult subject, which affects them in their day-to-day life. Therefore, he should try to read more on the subject and using glossaries and dictionaries to make the facts as clear and simple as possible. Sometimes it may not be possible to avoid using technical words and phrases. But the writer should try to explain more words and phrases with words that are in use by the public, e.g. Dehydration - as drying up of the body. It can be further explained by taking uprooted **Balsam plant**, which will dry up immediately if sufficient water is not provided.

The health experts and the media are sometimes poles apart and have great trouble understanding each other. The health experts normally concentrate on long term, in-depth, vigorous examination of observations of statistics, while the journalists work at high speed and look for colourful, simplified and appropriate stories.

The need today is for health experts and the health writers to be driven to arrive to a mutual understanding. The health expert should understand that they can promote health only by keeping the public fully informed and the media should understand that the public insists on being better informed about health. Ideally, the information that is to be provided should consist of much more than the same old advice about hygiene, nutrition and diet, and should be deliberately aimed at developing fundamental health knowledge among the general public. This would not only help the community to protect their own health better and to avoid what might be harmful, but is also useful for better appreciation of the major health problems of our times and to support the efforts being undertaken to counteract them.

Journals in Science Communication

Dr W.R. Breckenridge

Scientific research is a social or community activity, although carried out by individuals or groups of individuals. Scientific research takes place "within a broad social and historical context". Inherent in this practice and vital to its survival is communication. **Communicating research findings, thoughts, and ideas is thus seen as essential for the progress of science.**

In earlier times, the proceedings of scientific societies, the discussions, readings and the circulation of notes and letters by post came to be replaced by more formal means of communication, and the first English language scientific journal was launched in 1665 as the Philosophical Transactions of the Royal Society, which continues to be published today. The regularly issued printed journal or periodical is very much a part of the scientific enterprise today.

As many as 50,000 journals are published in the world today with about 25,000 in Biomedical Science alone. The weekly Current Contents (Life Sciences) lists over 1,500 journals in English. In Sri Lanka, up to 50 or more journals are published – mainly in English, and the oldest journals are the Ceylon Journal of Science first published in 1924, and Spolia Zeylanica first issued by the Colombo Museum in the early nineteen hundreds (1904 or there about).

Journals in science cover a very wide range of disciplines, and many serve very narrow specialties as knowledge has increased enormously today. The general journals serving

a wide readership are few in number, and two such journals receiving the widest circulation in the world are **Nature** (published in England) and **Science** (published in the USA) and both of them appear weekly. Specialist journals have a narrower readership and serve the interests of a particular discipline. Most journals appear regularly every month, bimonthly or quarterly and are paid for by subscriptions.

The organization of a journal involves an Editor and Editorial Board, a panel of reviewers to review articles prior to publication, and every journal has its own set of instructions to authors, which should be followed if a submission is to be considered for publication. Most journals do not charge a fee for publication, but there are a few journals, which require payment for publication. Publishing, printing and distributing the journals are the responsibilities of a separate body.

Journals are published in a number of languages – English, French, Spanish, German, Russian, Chinese, Japanese and Italian to name the dominant languages. Arabic, a once dominant language in ancient science is still in use in countries of North Africa, and the Middle East. English has gradually taken over as the language in which the bulk of scientific findings are published today. No longer is it compulsory or essential for a practicing scientist today to be able to read French, German or even Russian, Japanese or Chinese to keep abreast of current work. Most scientists if they wish to have their work known, or recognized and rewarded, publish in English or

see that their written findings are translated into English. Some good and original work published in a language other than English has been tragically ignored or “discovered” too late to appropriately reward its author.

The expression of a Journal is universal. Many journals published in the so-called third world are not ‘recognized’ in the first world, but nevertheless serve an important function in the local scientific community. It is important that local or regional journals be recognized in their own countries, given support and encouraged to meet the usually expected standards of scientific validity. Breaking into the first world circuit as a journal or as an author will always be difficult for scientists in the third world, and this may be partly overcome by the new revolutionary use of computers, the internet and worldwide web, where one’s work could get immediate attention for whatever the worth of it.

Electronic publishing and printed journals will continue to exist side by side, and each system has its relative merits. A recent report in **Nature** focuses on the Journal of Young Investigators – an international web based journal, which encourages young scientists to publish their work done as undergraduate research projects. This provides “valuable experience in all aspects of scientific publishing for researchers, journal editors and science writers of tomorrow”.

A scientific paper, depending on the particular discipline and the journal it is published in, has a very traditional form or structure. In the biological sciences it generally follows the order summarized as follows: Title, names of authors, a short abstract, introduction, materials

and methods, results, discussion and summary of findings, followed by acknowledgements, and the reference literature cited.

The written article of publication lies at the very core of the scientific endeavour. Here, lies a big challenge to scientific progress – namely the question of misconduct or fraud in science, which has received much publicity during the past 10 to 15 years. Misconduct is outside the scope of this short essay, but briefly it assumes that scientists are truthful or honest in what they publish, follow all the established norms in conducting research and writing up their findings as indicated above in the structure of the scientific paper. Failure to meet these requirements constitutes misconduct, which is a punishable offence, and serves only to sully and inhibit the progress of science.

All scientists should enjoy reading journals, seeing progress and taking pleasure in their own achievements and the achievements of fellow scientists. We can only wish for the continued progress, usefulness, and good health of the scientific journal in whatever forms it may take in the future.

NSF Science Magazine

The National Science Foundation (NSF) has been involved in popularizing science among the people for a long time. It has organized lectures, demonstrations, and awareness workshops especially on school based scientific programmes, time to time in various places in the country. The NSF has published a series of books on the theme of Science Education. The NSF publishes “**Vidurava**” biannually, in three languages targeting the general public, especially school children.

These ways and means has a limited coverage of the population. Therefore, the NSF has embarked on a special programme of taking science to the nation through the medium of television, which provides a better coverage than any other methods followed by the NSF earlier. This programme is named as the “**NSF Science Magazine**” (in English), “**Sevilla**” (in Sinhala), and “**Vinnganakkural**” (in Tamil).

The main objective of this television programme is to create awareness among the nation’s children and the general public on recent developments in Science and Technology, and to make aware how these can be applied to develop life skills and improve their quality of life.

The **NSF Science Magazine** will be broadcast in all three languages Sinhala, Tamil and English hoping to send the message to all Sri Lankan citizens.

The **NSF Science Magazine** will be launched as a series of weekly Television programmes. There will be 52 programmes per year (in each language). Each of the programme will be of 24 minutes duration (totally 30 minutes when

include commercial advertisements for the Sponsors).

There are some specific objectives of this Science Magazine.

1. To educate children and families on the selected and topical scientific issue.
2. To expose children and families to ongoing scientific research on the country and elsewhere in the world in that topic.
3. To enable children, families and the general public to apply the contents of the programme to improve their environment, health etc., thereby impacting positively on the quality of life of the people of the country.
4. To develop in children the necessary life-skills to become useful and responsible citizens on a modern society.
5. To foster a liking for science and technology and scientific investigations among children by serving to transfer the enthusiasm of practicing scientists to them.
6. To develop a dialogue on science and technology with the viewers.

The NSF Special Committee on Science Communication bear the responsibility in order to identify, organize, produce and broadcast quality TV programmes for the **NSF Science**

Magazine. The topics for the programmes are selected based on the current needs and issues the general public is faced with. But, the important thing is that these programmes will highlight the scientific principles and methods underline these issues.

To produce and broadcast this series of TV programmes, the NSF has to spend a huge sum of money to a period of one year. The United Nations Children's Fund (UNICEF) is working in collaboration with the NSF regarding producing of the programmes. The Open University of Sri Lanka with UNICEF funds has already started production of the following programmes. The name of the scriptwriter is given along with the title of the Programme.

1. **"Is the Power Crisis Over?"** (Script: Dr Tilak Siyambalapitiya)
2. **"Human Impact on Biodiversity"** (Script: Dr Jeyantha Wattevidanage)
3. **"Biological Nitrogen fixation"** (Script: Prof. S.A. Kulasuriya)

4. **"Road Accidents and Traffic Managements"** (Script: Prof. Amal Kumarage)

5. **"AIDS can be prevented"** (Script: Dr Y.L.H. Yakandawala)

Scientists, technologists, and professionals on each area write the scripts. The NSF Special Committee on Science Communication is very keen on the format, materials and contents, production of the programmes in order to get quality programmes in terms of accuracy and ease of understanding.

There is no other programme at present similar to this **NSF Science Magazine** produced locally and addressing local needs, on television. To get the feedback from the viewers, it is expected to get written answers to the questions given at the end of each programme, and prizes will be awarded to the winners.

The ultimate goal of the **NSF Science Magazine** is to endeavour productive citizens to our country.

UNESCO World Science Day for Peace & Development Seminar & Press Conference

The United Nations Educational, Science and Cultural Organization (UNESCO) at its 31st Session, had proclaimed 10 November each year as World Science Day for Peace & Development (WSDPD).

The purpose of the WSDPD is to renew the national and international commitment to Science for Peace and Development and emphasize on responsible use of science for the benefit to the society. It also aims at raising public awareness of the importance of science, and to bridge the gap between science and the societies. Further is to sensitize the general public, especially young people, on the importance of science in every day life. This aim is in line with the objectives of the NSF Special Committee on Science Communication, which was newly created in order to popularize science amongst the general public, especially in a form of a **Science Magazine for television**.

The NSF organized a **Seminar on Science for Peace & Development, and a Press Conference on the NSF Science Communication Programme (NSF Science Magazine on TV)** to celebrate the WSDPD, on **09 November 2002** at the Committee Room C, BMICH, in collaboration with the Sri Lanka National Commission for UNESCO.

Hon. Minister Dr. Karunasena Kodituwakku, Minister of Human Resources Development, Education and Cultural Affairs participated to the seminar as the Chief Guest. Mr. Mahinda Abeywardena, the Secretary General of the Sri Lanka National Commission for UNESCO,

delivered the welcome address. Two Special lectures were delivered by Dr Janaka Ratnasiri, President, SLAAS and Dr Jehan Perera, Director/Media at the National Peace Council on **"Science for Sustainable Development"** and on **"Trail and Error Methodology in the Peace Process"** respectively. A lot of people in the audience, who were invited by the NSF representing various institutions and from different areas of the country, actively participated in discussions regarding the two speeches.

The Press Conference was held as the last session of the Programme, especially on the NSF Science Magazine. Before embarked on the Press Conference, two programmes produced for the Science Magazine were shown to the media personnel and to the audience. One was on **"Is the Power Crisis Over?"** written by Dr Tilak Siyambalapitiya and the other was on **"Human Impact on Biodiversity"** written by Dr Jeyantha Wattevidanage. Prof. Ranjan Ramasamy, the Chairman of NSF, Mr Mahinda Abeywardena, the Secretary-General of the Sri Lanka National Commission for UNESCO, Prof. M.T.M. Jiffry, the Chairman of the NSF Special Committee on Science Communication, Dr Jeyantha Wattevidanage, and Dr Gayathri Jayatilleke, (OUSL) were in the panel for the **Press Conference**. The Director, NSF, Mr. M. Watson expressed his gratitude on behalf of the NSF, and the Organizing Committee to the participants of the Seminar and the Press Conference.