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<td>Author(s)</td>
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CULTIVATING A POPULAR-SCIENCE-AND-TECHNOLOGY CULTURE IN NON-WESTERN SOCIETIES

CONCEPTS; ISSUES AND STRATEGIES

By
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Human Resource Development Division
Commonwealth Secretariat

Expert Group Meeting on
Training to Popularize

Scientific & Technological Culture

28-31 May 1997
Singapore
The Challenge of Popularisation

This paper addresses a growing worldwide concern about pragmatic strategies for initiating entire populations into the important forms of human understanding enshrined in science and technology. It is now widely acknowledged that science and technology exert a profound influence on such diverse areas as our interaction with the physical world; patterns of production and distribution of goods and services; socio-economic life style of communities; and even the value systems of some nations. An understanding of science and technology can therefore be regarded as one of the most essential pre-requisites for coping with the facts, principles, forces, gadgets and practices which shape the human world. These factors help to define the circumstances of individuals and communities, and eventually determine their possibilities and limitations for further development.

Generally, development theorists often cite orientation towards a scientific and technological way of life as one of the main indicators of sustainable modernisation. In this regard there is a profound sense in which non-western communities and societies tend to be less scientifically and technologically oriented than those in the West. This lies in the extent to which facets of science and technology inform and influence the "mind set", organising schema, thinking processes, operating strategies and routine practices/actions of individuals in a society. Formal education on its own has so far proved inadequate (some would even say inappropriate) to enable science and technology to take roots in the local culture of non-western societies and become an integral part of everyday thinking and action. This has given rise to experimentation with alternative ways of presenting science and technology which would resonate better with the way of life of the community at large.

The main challenge therefore is to develop strategies for promoting a kind of "sci-tech" acculturation that will enable many individuals to realise their own potential, whilst playing their diverse roles in the development of society. This challenge is not confined to non-western societies, but takes on a greater urgency for them in the quest to close the development gap.
Variations on a Theme

Popularisation of science and technology has now emerged as a worldwide concern, but the concept tends to be interpreted in fairly diverse terms. This is reflected in the wide range of practices which claim to popularise science and technology.

Firstly, it can be seen in efforts to encourage "disadvantaged" groups to participate more actively in science and technology. In some cases, this is not strictly a matter of popularisation, but rather an attempt to make careers in science and technology more accessible to (and more popular with) the disadvantaged. The Women into Science and Engineering (WISE) campaign, launched by the Engineering Council of the United Kingdom in 1984, is a prime example of this type of popularisation. There are variations of this at the school level, with such projects as Girls into Science and Technology (GIST). Generally this approach attempts to deal with what is perceived to be a deep-seated gender bias or socio-economic discrimination in science and technology.

Another important example of this type of popularisation, which is particularly relevant for non-western societies, can be seen in the whole Appropriate Technology movement. Through application of science and technology to everyday problems, appropriate solutions are developed which give disadvantaged rural populations greater control over their life activities. Often rural people have to stagnate with their traditional ways of doing things, or else become passive consumers of the products of others (which they cannot afford anyway!). Appropriate technology makes it possible to up-grade traditional technology and/or develop "compromise" technology, that improves ways of doing things without taking control away from the beneficiaries. This type of empowerment in science and technology is often an important component of many non-formal education and training programmes in non-western societies.

A second strand of the popularisation drive involves sensitising learners to the everyday manifestations and applications of science and technology. There are two important elements linked to this aspect of popularisation. First, there is the attempt to free science from its esoteric image, as involving some remote activities performed by white-coated persons working in strange and sophisticated settings. Learners are therefore encouraged to see science as down-to-earth, do-able in a variety of settings and relevant to everyday issues. Second, there is the attempt to make those involved in science and technology more aware of the implications of their fields for other areas of everyday life. Learners are thus made to see science and technology as having a profound impact on many aspects of society, and therefore implying an important sense of responsibility for those involved in these fields. Learners thus come to understand and appreciate their future roles better. An important example of this type of initiative is the Science and Technology in Society (SATIS) projects, which aim to introduce social and technological aspects into the science curriculum. These projects now operate in a wide range of countries, including U.K., Sweden, Italy, Holland, China, Hong Kong, and Zimbabwe.
A third version of popularisation can be seen in efforts which are designed to encourage a sense of science and technology as "fun"! This is especially pertinent to encouraging children's active participation, and getting them to see science and technology as a fun way of learning about their world and all its mysteries. This generally involves what has been described as a "hands-on" and "minds-on" approach, with much didactic teaching.

The African Primary Science Programme (APSP) is a major example of an initiative which transformed science learning in many African countries. With its emphasis on improvisation, use of local materials, and exploration of the local environment, it certainly promoted science as fun. The Science Curriculum Development Centre (SCDC) at Njala (University of Sierra Leone) was at the heart of these developments, and helped to prepare a whole generation of African science educators in novel ways of teaching science.

A fourth strand of popularisation involves using science and technology in addressing urgent issues of everyday concern. Prime examples of such issues and concerns include:

- Population Control (Family Planning);
- The AIDS Pandemic;
- Environmental Protection;
- Personal and Community Health

In such case, popularisation might involve incorporating these issues into the school science curriculum, so that pupils get to deal with such matters as a routine part of school work. Another approach might be to use less formal methods such as school clubs to engage children in activities related to these issues. A key example of this approach is the Child-to-Child programme through which personal and community health/environmental matters are dealt with by children helping each other to understand these issues and practice appropriate behaviours. On the other hand, this type of popularisation could be targeted at the general public rather than schools. This would involve using Sci-Tech messages relating to these issues in advocacy campaigns as well as in adult education or non-formal education programmes.

The above has been a brief attempt to show that popularisation of science and technology is a matter of world wide concern, and that there is a fairly wide spectrum of approaches and activities which can be grouped under this label. Undoubtedly many of these popularisation efforts in the West as well as in non-western societies, are having some impact on the population. It could be argued however, that in spite of such efforts the vast majority of the world’s population cannot lay claim to any really significant level of scientific and technological acculturation. In this regard, non-western societies are dis-advantaged by a wide range of factors which make it difficult for science and technology to take root and become an integral part of everyday life for the general population.
Understanding the Issues

Any attempt to understand the issues involved in popularising science and technology should start with an acknowledgement of current initiatives, their underlying assumptions, the impact they have on target groups and their perceived shortcomings. In this regard it should be emphasised that positive initiatives on popularisation are now fairly commonplace in many non-western societies. These can be readily seen in intervention activities and projects in such areas as:

- AIDS awareness and prevention campaigns;
- Water supply schemes in remote areas;
- Nutrition and basic healthcare programmes;
- Immunisation and disease prevention campaigns;
- Control of deforestation and desertification;
- Small scale industrial production schemes;
- Agriculture and food security programmes;
- Family planning and population control campaigns;
- Women in Development programmes;
- Informal sector employment training schemes;

In all these areas, science and technology are being used to empower individuals through greater awareness, new knowledge and improved skills. Consequently there is a discernable trend of some improvements in the quality of life of families, households and communities. What is not so discernable is the extent to which facets of science and technology are beginning to form part of the everyday thinking and actions of the general population. The issue therefore is whether these sorts of initiatives merely spread a veneer of science and technology over an underlying culture that is fundamentally different, or whether they can bring about change through a process of sci-tech acculturation.

As far as formal education is concerned, great progress has been made in curriculum reform and with innovative ways of presenting science and technology to learners. At the same time however, formal scientific and technological knowledge continues to be out of the public domain, and is still largely the preserve of an educated elite. Indeed the expansion of science and technology has been such that even amongst the educated elite, an inevitable degree of specialisation means they can only lay claim to certain facets of sci-tech knowledge. Consequently, the vast majority of human beings in the world continue to live in relative ignorance, as regards the forces, principles, phenomena, gadgets, etc, which shape their lives. The issue then is how far formal education in science and technology can influence the everyday thinking and actions of the general population. Can we cultivate a genuine popular scientific and technological culture by changing the school curriculum and the way in which we present science and technology to learners? Do we need to combine this approach with other strategies for success, or are we simply barking up the wrong tree?

A final issue is whether or not non-western societies can afford to cultivate a popular-scientific-and-technological culture. This issue has political, socio-economic
and cultural implications. It is sometimes argued that this type of acculturation carries
the risk of a people losing their own cultural identity in favour of a eulogistic aping of
western culture. Experience of the newly developed economies of South-East Asia
suggest that this need not be the case. Again, such major cultural changes in a
society are often deemed to require strong and sustained political leadership which
can sometimes appear to be anti-democratic. Finally in a situation of strong
competing demands for limited resources, it is pertinent to question the level of
resources which may need to be invested in popularising science and technology.

**Perceived Obstacles**

In the face of persistent efforts over the last two decades, it has proved extremely
difficult to cultivate a popular-science-and technology culture in most non-western
societies. This has led to an increased tendency to identify and tackle obstacles to
the acculturation process. These perceived obstacles tend to fall into one of three
categories of factors which are believed to account for the sci-tech gap between
western and non-western societies.

The first category of factors relates to deficiencies in formal education. These include
low participation rates (especially for girls and rural populations) which imply that the
majority of children do not have access to the science and technology prescribed in
the curriculum. If most of the citizens of the future do not have access to this
education, then there is little chance of success with sci-tech acculturation. On this
basis it can be argued that the solution lies in expansion of the formal education
system to provide access for all children, but it is far from clear that such universal
access in itself can promote acculturation. However there is some evidence that
where most children have the opportunity to attend school, progress towards making
science and technology a part of everyday life in society tends to be encouraging.

Another perceived obstacle within this category concerns the way in which science
and technology are treated in the formal school curriculum. Essentially this results in
learners treating these subjects as "school knowledge", which is useful for passing
exams and obtaining qualifications, but not to be integrated into their world view or
everyday practices.

Generally then, either through lack of access or because of the way in which subjects
are treated, most citizens are not in a position to claim science and technology as an
integral part of their everyday life. Whilst this is a universal predicament, there are
major differences in the way it affects western and non-western societies. The
average citizen in any western society is fairly ignorant of scientific principles and
technological practices. However, there is quite a wide range of "knowledge sources"
and everyday experiences in such societies, which help to ameliorate this problem.
Thus, whilst most individuals may not have any significant level of formal science and
technology education, many can claim to be "enlightened" consumers of the fruits of
science and technology, as well as being "intelligent" users of their man-made and
natural environments. All of this stems from a kind of "sci-tech" acculturation which
tends to be lacking in non-western societies, but may be emerging in some newly
industrialised economies.
A second category of perceived obstacles concern weakness in the non-formal sources of knowledge and information in non-western societies. This is not simply a matter of how much is available, but the nature of what is available, the manner in which it is made available, and the ability of various groups to make use of what is on offer. Because non-formal education is regarded as an alternative for those who do not have access to formal education it tends to be closely related in substance to what is offered in schools. This means that apart from some innovative programmes the opportunity to provide science and technology in radically different ways is rarely seized by non-formal educators. In the end, most learners may only get a watered-down version of formal science and technology through these non-formal programmes.

The third category of perceived obstacles deals with the extent to which conflicting forms of thought actively compete with science and technology to influence the outlook and actions of most individuals in non-western societies. It is still the case that for most non-westerners, the explanatory theories which dominate their attempts to understand and act on their world, do not stem from modern science and technology. Rather, their perceptions and actions are strongly influenced by magico-religious beliefs and theories, to a degree which far exceeds such influences on people in western societies. Some attempts at popularisation seek to replace these magico-religious beliefs and theories with science and technology, on the grounds that the latter represent superior/more rational forms of understanding. Other popularisation initiatives have been based on a quest for coexistence of the different forms of thought, in the belief that this offers a way for societies to inherit science and technology without losing their cultural souls.

Establishing Conceptual Benchmarks

One of the fundamental difficulties with attempts to cultivate a popular-science-and-technology culture, is that there are several critical assumptions which remain unexplored and so tend to create conceptual stagnation. It is often taken for granted that there is some shared understanding of what we mean when we talk of scientific and technological knowledge, so much attention is not given to unravelling the concept. Similarly the concepts of culture and knowledge, as well as the link between these two concepts, tend to be treated as nominal and un-problematic. In dealing with popularisation, it is important to re-visit many of the underlying assumptions and central concepts, in order to establish appropriate conceptual benchmarks. These are important for developing feasible strategies through which we can begin to cultivate a popular-science-and-technology culture.

An enduring controversy in the field of epistemology concerns the issue of knowledge and culture. To what extent can we talk of universal and absolute forms of knowledge? How far can different cultures assert a claim to their own peculiar forms of knowledge as equally valid as those of other cultures? These issues have been debated and researched for decades without final solutions. There are those who have argued for the validity of peculiarly non-western forms of thought. For instance the Negritude movement argued for a unique African form of thought that is more
emotional than rational. Others have asserted that non-western contributions to various fields of knowledge have been hi-jacked and marginalised over the years. In the more progressive schools of thought, there has been a simple claim that non-westerners are co-inheritors of all forms of knowledge, together with peoples of a western culture. On this basis, non-westerners can rightly claim science and technology as a common heritage of human achievement, rather than perceiving them as peculiarly Western forms of knowledge from which they are inherently estranged.

Against this epistemological background, it can be argued that although all societies have their own "forms of knowing" and "forms of making knowledge", science and technology occupy a natural place in every society. Broadly conceived, science and technology are simply those processes through which human beings have successfully interacted with their environment, and used natural resources to construct their world. Non-westerners have always had science and technology as an integral part of their survival and development. However there has been a critical failure to link up with, and keep abreast of rapid developments which can be labelled "modern" science and technology. Instead, people have continued with the old ways of "knowing" and ways of "making knowledge", in their everyday lives. This is one of the main reasons for the gap in science, technology and development. Ultimately, development is not simply about modern infrastructure and some luxury products; or extensive natural resources and financial wealth. Development is about people, and most importantly about how they perceive, understand and act on their world. Most non-western societies appear to have allowed science and technology to slip out of their grasp. They continue to think and operate in the old ways, whilst modern science and technology are treated as alien imports to be consumed by a small elite, for esoteric purposes like passing examinations.

To the extent then that modern science and technology have not yet permeated the mental schema and operating strategies of most individuals in non-western societies, there is an urgent need to "re-claim" science and technology for popular development. Modern science and technology cannot continue to be treated as alien transplants, to be handled only by special groups, for special purposes. If we are serious about genuine development, then modern science and technology must increasingly become the stuff with which whole populations in our societies think and act on their world in an everyday sense.

**Conditions for Popularisation**

The idea of popularisation entails that appropriate forms of science and technology should become a part of everyday life for individuals and communities. Obviously it would be a utopian dream to make such a prescription in terms of formal science and technology education. Hence the term appropriate is critical for the idea of popularisation.

There are at least three conditions which are important to the notion of popularisation. First, there should be significant expansion in the quantum and diversity of
knowledge/information available to the population. Second, there should be substantial re-packaging of knowledge and information, so that it becomes available in a variety of forms and useable for many different purposes. Third, it is essential that the context/mode of acquiring knowledge and information should be considerably liberalised, to promote much greater interaction with science and technology at all levels.

Stemming from these three conditions, it would appear that some fundamental changes are needed in approaches to popularisation. The most important of these is that popularisation must start with the intentions and purposes for which ordinary people may wish to make use of science and technology in their everyday lives. What counts as appropriate science and technology for popularisation should be determined by what people want to know and what they wish to do with that knowledge. Currently, most approaches to popularisation start from science and technology as given bodies of knowledge, or given processes, which need to be demystified or somehow made more accessible to ordinary people.

Another important and fundamental change needed in our approach to popularisation is in the use of the concept of knowledge when dealing with popular science and technology. There is a major constraint in dealing with the term "knowledge", since it carries with it strict conditions which help to define what counts as knowledge in a formal sense. This has often been an obstacle to developing flexible programmes in an area like science. Beyond a certain degree of adaptation, critics rightly tend to see such programmes as trivialising science.

When dealing with the everyday science and technology that most ordinary people would require to cope with their world, it is all but impossible to operate with formal definitions of knowledge. For a start, the everyday world does not oblige us with discrete presentations of the various forms of knowledge such as science, mathematics, literature, religion etc. Rather we are faced with a kaleidoscope of knowledge features, so that what we require often is not just science per se, but a package that suits the particular purpose or intention we have in mind. In an AIDS awareness and prevention campaign, people do not simply require science. They need a message which incorporates science (to help explain what AIDS is and how it occurs); condom technology (which offers one way of prevention); and sexual morality (which offers an alternative way)!

Against this background, it makes much more sense to talk of "information" rather than knowledge, when dealing with popular science and technology. This not only enables us to avoid the pitfalls of the knowledge concept, but also offers much greater flexibility in dealing with popularisation. Information, as a concept, is highly elastic in the scope of what it can encompass and highly flexible in the ways in which its contents can be packaged. Both of these features are particularly important in dealing with the kaleidoscopic nature of everyday science and technology. Popularisation should not therefore be confined to watered-down versions of science, or the addition of social elements to a science curriculum. It must involve new ways of packaging information to suit specific intentions and purposes where people have need for science and technology to cope with everyday life. One information package
might be mainly science and technology, with a sprinkling of other types of information. Another package might be mainly other types of information, laced with some amount of science and/or technology. It all depends on the intentions and purposes, and what the situation requires.

Conditions for Acculturation

If sci-tech popularisation should operate successfully with the concept of information, then it is imperative that attention be given to the issue of socio-cultural sensitivity. By definition information involves providers and receivers. Those who provide information must take account of the various social and cultural peculiarities of their target groups (the receivers). This often influences not only the content of information packages, but also the mode of provision and the medium through which information is provided. Many well-intentioned programmes and campaigns fail dismally in non-western societies, or only achieve superficial success, because of poor sensitivity to the socio-cultural peculiarities of the local population. Given the strength of competing alternative perceptions and world views amongst these populations, the supremacy of science and technology cannot simply be taken for granted in the provision of information. Strategies should therefore be devised to provide sci-tech information in a manner which does not simply dismiss existing traditional beliefs and practices out of hand. Whenever possible, such traditional beliefs and practices can be modified in line with modern sci-tech, or used as a stepping stone to gain acceptance of sci-tech information.

Again it is a serious miscalculation to simply assume that the local population does not know what is best for it in terms of sci-tech information. Every society has its own priorities, and can specify its information requirements accordingly. Often these may appear trivial misguided or irrelevant to outsiders, but they provide the most obvious entry point for genuine acculturation. Socio-cultural sensitivity in popularising science and technology therefore requires that the following three categories of needs must be appropriately catered for:–

(i) Felt information needs, which concern those needs expressed by the population in fairly explicit terms. These are usually based on their own assessment of what they have and what they aspire towards.

(ii) Perceived information needs, which concern other people's assessment of what a population needs to improve their situation or achieve certain goals. These are usually derived from a critical review of existing problems in relation to the desired goals set for the population.

(iii) Latent information needs, which are not prescribed by outsiders or expressed by the population. These are needs which simply become apparent once certain changes and developments begin to take place amongst the population.
Currently, far too many efforts at popularising science and technology concentrate only on what is prescribed by others as information needs of their target population.

Towards a Popularisation Menu

Substantial efforts continue to be invested in popularising science and technology through formal and non-formal education channels. Most of these efforts are concentrated in the North, where resources and expertise tend to be widely available for such purposes. However, there are also laudable efforts in non-western countries, sometimes facilitated by external agencies. In all these efforts, it is important to appreciate that there is not one correct formula or prescription for popularisation. Attention should in fact be devoted to developing a menu with appropriate options and choices available to meet the needs of different societies.

At one extreme, popularisation efforts through formal education channels may take such forms as:-

(a) Presenting watered-down versions of a formal science/technology curriculum, to encourage so-called low achievers to learn some science and technology.

(b) Orienting science and technology to deal with issues perceived as important areas of female interest in order to counter male domination in science, and encourage girls to participate more actively.

(c) Serving jazzed-up or "sexy" versions of science and technology, in order to capture the interest of "bored learners", who perceive science as being about esoteric matters which are far removed from their own everyday concerns.

At the other extreme, popularisation through non-formal education channels may involve:-

(a) Media presentations by expert practitioners who try to interpret scientific and technological aspects of some topical issues, for the consumption of the general public or some specialist group, or just the intelligent lay persons. E.g. health talks, farming broadcasts, televised space shuttle missions, etc.

(b) Messages for everyday living, which highlight the relevance of science and technology in many areas of routine thought and action. E.g. comic books dealing with safety and health hazards, leaflets and films on what causes AIDS and how to avoid infection, etc.
Exhibitions and Fairs, at which the public has the opportunity to view and ask questions about products and processes pertaining to science and technology, or simply to see how useful science and technology can be in many areas of life.

A telephone service or other "shop window", which enables members of the public to ask questions about science and technology, and have them answered by experts.

This range of formal and non-formal strategies for popularising science and technology is impressive by any standard. However it is fair to argue that there has been a relative lack of focus on the key issue of what constitutes popular science and technology. In other words, options and choices for popularisation have been evolving without adequate attention to what should be the driving force in a popularisation menu. Central to this issue is the question of purpose and intention. In an everyday or popular sense, why we want to know and what we intend to do with what we know, often determines what counts as knowledge and how we define/make knowledge. Knowing how to drive a car does not entail knowing the "thermodynamics of a 4-stroke petrol engine" or being exposed to some watered-down/jazzed-up version of it. Similarly, what mothers know about childcare does not extend to the esoteric knowledge which paediatricians have, but neither is it simply an inferior version of such knowledge.

In general then, there is a wide spectrum of ways of knowing and ways of making knowledge, as far as everyday living is concerned. This is what ought to be addressed in a structured and systematic manner by those who seek to popularise science and technology. As has already been argued however, the concept of knowledge is cumbersome to handle in this regard, because of its inherent strict conditions. In the sense of everyday living therefore, it is more pertinent to use the term information as distinct from knowledge. The challenge for popularisation then is to develop analytical strategies for dealing with science and technology in an everyday sense, without simply resorting to watering-down or jazzing-up formal science and technology. An important first step in this direction is to start with purpose and intention, rather than established bodies of knowledge. Also, by dealing with the term information rather than knowledge, we begin to develop the notion of identifying, selecting and organising various elements into packages of information to suit certain purposes and intentions. This provides a more secure platform on which to start building options and choices for popularisation.

**Toolkit for Popularisation**

If popularisation is to be addressed in a systematic manner that is comparable across different societies, it might be useful to develop appropriate toolkits for popularisation. An important and innovative breakthrough in this direction could be achieved by developing a broad taxonomy of popular-science-and-technology information. The principal "organisers" of this taxonomy should be the purposes/intentions which individuals and communities have, as they attempt to understand and act on their
world. In terms of scope, the taxonomy should cover a wide range of fields and products in science and technology, which impact on the everyday lives of individuals. Such a taxonomy will be an important new tool for conceptualising, identifying, categorising and analysing popular science and technology information as a basis for acculturation. The suggested taxonomy would categorise sci-tech information relating to a fairly wide range of facts, principles, theories, processes, practices, products and gadgets, according to a schema based on the "functional use" of such information. There are many different purposes for which sci-tech information can be used, including the following:

To improve one's competence as an enlightened consumer of certain products and gadgets.

To promote responsible behaviour/habits in relation to the natural environment.

To satisfy one's curiosity about certain phenomena and processes which are currently a source of puzzlement.

To improve performance in occupational tasks, through better understanding of the underlying principles and processes.

To promote a better lifestyle for individuals and their families, through better understanding of the rules for good health, etc.

To develop appropriate competence as a professional in some field of work, which involves major knowledge of science and technology.

Using this sort of categorisation by purpose, it is possible to document the genuine information needs of any target population in the area of popular science and technology.

Another important element that could form part of a toolkit for popularisation is a "sourcing" mechanism that would allow those engaged in popularisation to identify what is available where, in terms of popular science and technology information. The value of this is that it would document and constantly upgrade a wide range of information sources which many of those involved in popularisation may not be aware of. Such a mechanism will not only allow those involved with popularisation to make more efficient choices for their programmes, but would also help to refine the taxonomy of sci-tech information needs.
OPTIONS FOR POPULARISING SCIENTIFIC AND TECHNOLOGICAL CULTURE

A. WITHIN THE FORMAL EDUCATION SYSTEM

1. In the School Curriculum
   - At what stage or stages?
   - For all learners or just some?
   - As specialist subject area?
   - Integrated into broad fields of study?

2. Through Co-Curricula and Extra-Curricula Activities
   (Electives; Clubs; Camps; Competitions; Etc)
   - How to ensure interest and participation?
   - Finance; Organisation and Management!

3. Through Distance/Open Learning Programmes
   (Teacher Training; Adult Educ; Part-Time Study; Career Change; Vocational Training; Etc)
   - Providing motivation and support
   - Finance; Organisation and Management

How/When Are These Options Appropriate/Relevant

(a) Particularly relevant if almost all citizens have access to the formal education system (High Enrolment)

(b) Appropriate if the main intention is for the education system to prepare people for occupations related to science and technology.

(c) Is there a case for arguing that all education should include introduction to scientific and technological culture?
## B. OUTSIDE THE FORMAL EDUCATION SYSTEM

### 1. As Routine Information/Knowledge Source in Society
(Popular MEDIA; Elders; Priests; Authority Figures)
- How to attract target groups
- Making it relevant to target groups
- Communicating successfully
- Sustaining interest of target groups
- Financial sustainability

### 2. As Integral Part of National/Community Projects
(Campaigns; Mobilisation; Sensitisation; Awareness; Development Activities; Etc)
- Communicating successfully
- Ensuring practical implementation
- How do we ensure sustainability?
- Moving beyond "Facade Learning"

### 3. As Purpose-Designed Information/Knowledge Source
(Centres; Parks; Support Groups; Magazines; Journals; Comics; Web Sites; Etc)
- Defining Needs, Purpose and Priorities
- Communicating successfully
- How do we ensure sustainability?
- Finance; Organisation and Management

### 4. As Organised Promotion Events and Activities
(Competitions; Exhibitions; Celebrations; Etc)
- Motivation and incentives
- Generate and sustain interest
- Finance; Organisation and Management

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### How/When Are These Options Appropriate/Relevant

(a) Highly relevant in situations of low enrolment in the formal system, and where there are no second-chance opportunities for adults and youths who missed out on formal schooling.

(b) Also appropriate if the intention is to promote modern scientific and technological culture for all citizens.

(c) Does it also empower people to make informed choices and contribute constructively to national debates?
### SOME CONTEXTUAL MECHANISMS
FOR THE POPULARISATION OF
SCIENTIFIC AND TECHNOLOGICAL CULTURE

### Within The Formal Education System

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<th>LEARNER</th>
<th>SCIENCE &amp; TECH.</th>
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<tr>
<td>Build on learner’s world view.</td>
<td>Natural Curiosity</td>
<td>Select, Organise and structure with balance between:</td>
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<td>- esp. very young</td>
<td>- Learners ability</td>
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<td>Promote genuine understanding.</td>
<td>Other Motivation</td>
<td>- World view</td>
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<td>- career aspiration</td>
<td>- everyday life</td>
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<td>- solving problems</td>
<td>- Career needs</td>
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<td>- being &quot;with it&quot;</td>
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<td>Link with reality of everyday life</td>
<td>Existing World view</td>
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<td>- perceptions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- org. schemas</td>
<td></td>
</tr>
<tr>
<td>Help to promote self-learning</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Outside The Formal Education System:

<table>
<thead>
<tr>
<th>COMMUNICATION</th>
<th>TARGET GROUP</th>
<th>SCIENCE &amp; TECH.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailor message to fit needs.</td>
<td>Needs Assessment</td>
<td>Identify, select, organise / package elements in line</td>
</tr>
<tr>
<td>Use mode/medium in line with present sources</td>
<td>- felt needs</td>
<td>with needs.</td>
</tr>
<tr>
<td>Build on existing world view.</td>
<td>- perceived needs</td>
<td>Present in form</td>
</tr>
<tr>
<td></td>
<td>- latent needs</td>
<td>acceptable to the local norms</td>
</tr>
<tr>
<td>Raise Access level and interactivity</td>
<td>Existing world view</td>
<td></td>
</tr>
<tr>
<td>Pay attention to community norms and values</td>
<td>- belief system</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- perceptions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- org. schemas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Existing Sources</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- type of info.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- access patterns</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Purpose &amp; Intention</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- why need info</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- how will use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- in what form</td>
<td></td>
</tr>
<tr>
<td>Issue</td>
<td>Stakeholder</td>
<td>Strategy</td>
</tr>
<tr>
<td>---------------</td>
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<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Communication</td>
<td>Teachers</td>
<td>Resource materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adequate S&amp;T background including in-service training</td>
</tr>
<tr>
<td></td>
<td>Parents</td>
<td>Raise S&amp;T culture through everyday experiences</td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
<td>Scientists</td>
<td>Train scientists to communicate to the community</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Encourage continuous dialogue amongst scientists/govt. Leaders/science educators</td>
</tr>
<tr>
<td></td>
<td>Community leaders/Policy makers</td>
<td>Raise awareness, promote relevance of S&amp;T to sustainable development</td>
</tr>
<tr>
<td></td>
<td>Media</td>
<td>Training of media personnel in the nature of science</td>
</tr>
<tr>
<td></td>
<td>Students</td>
<td>Peer interaction; student/teacher interactions, out-of-classroom activities</td>
</tr>
<tr>
<td>Issue</td>
<td>Stakeholder</td>
<td>Strategy</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Research</td>
<td>Teachers, science educators, administrators, policy makers.</td>
<td>Research on aspects of S&amp;T that inform on practice Collaborative research framework on new pedagogical methods of S&amp;T teaching</td>
</tr>
<tr>
<td>Database</td>
<td>Teachers, science educators, administrators</td>
<td>Database of directory of initiatives</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Teachers, science educators, administrators</td>
<td>Evaluate effectiveness of initiatives</td>
</tr>
</tbody>
</table>