

# Popularization of Science and Technology: what informal and nonformal education can do?

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## CONFERENCE REPORT

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### 1. Introduction

Science and technology have never played such an influential role in our lives. Rapid changes in science and technology have significantly changed the development prospects of all nations. Science and technology has affected food production, health care, industrial development, rural development, family planning, to name a few. The introduction of new technology has been identified as one of the critical factors which contribute to the emergence of the NIC's (Newly Industrialized Countries), but the rapid technological changes have created new gaps within and between countries in their development.

Meanwhile, adaptation to new developments in science and technology has become an important part of individual lives. In urban and rural areas alike, one can soon become dysfunctional

in one way or another if one cannot keep pace with modern science and new technology. Seen society: the "have-knowhows" and the "have-not-knowhows".

There is no assumption that technological development is good for individuals and the society by itself. Technological development must be directed towards peaceful applications, compatibility with human needs, the quality of life, and environmental needs. Popularization of science and technology should be directed towards enabling people to play not only a passive, but an active role in the process of development.

It is natural that education is instrumental in the acquisition of modern science and new technologies. In this connection, it is obvious that formal education has an important role to play. However, despite continuous efforts to revise the curricula and teaching strategies in formal schools in order to achieve greater relevance, it is yet to be proved that formal education can

cope with the dramatic scientific and technological changes which take place outside schools. Moreover develop an outreach to people who have already joined the economy but are facing new needs of science and technologies.

Therefore, while it is inappropriate to deny that formal education has a role to play in the popularization of science and technology, it is essential to explore the roles of other modes of education, viz nonformal and informal education, and the context in which such roles are significant.

The recent literature on technological transfer, technological developments and informal/nonformal education does not seem to help in this exercise. Much is said about the development of technologies in education and the importance of science and technology in national development, but few analyses are made to show such development in science and technology are related to or transmitted by education. What little is said is based more on theoretical assumptions rather than empirical evidence. Nevertheless, it is quite clear that there is never a shortage of practitioners in the field who are instrumental in the popularization of science and technology, although their efforts are seldom regarded as priority areas in policy considerations.

## 2. The Conference

It is in this context that the Faculty of Education at the University of Hong Kong, inspired and supported by UNESCO through its Division of Primary Education, Adult Education and Literacy programmes, hosted this Conference with theme of

“Popularization of Science and Technology : What Informal and Nonformal Education Can Do?”

Hong Kong is identified by UNESCO as the

venue for such a meeting, because it is seen as a social laboratory in respect of both the acquisition and adaptation of modern technologies for economic development of quality of life.

Conference took place on September 4-9, 1989 in the University of Hong Kong. Participants are invited experts in various aspects of nonformal and informal education, as well as formal education. They include adult educators, worker educators, vocational trainers, development of nonformal programmes, suppliers and promoters of technologies, science educators, teacher trainer, administrators of popular science institutions, educational planners, as well as scholars and researchers coming from both developed and developing countries.

The diverse background of the participants may have created some difficulties in arriving at consensual objectives, but the diversity has also provided unusually rich ground for a rather comprehensive review of this unexplored yet important dimension of education. Because of the general lack of co-ordination of nonformal and informal education, the conference also provided an almost unique educative opportunity for practitioners in particular fields and to draw their attention to the larger context in which they work and which affects their work.

The conference started with an opening speech from the Secretary for Education and Manpower of Hong Kong Government and a Key-note Paper by Dr Philip Coombs. The Secretary's speech went beyond a mere welcoming gesture and provided a detailed analysis of the general situation in Hong Kong of the acquisition of new technologies, its relationship to economic development, and its relations with training and education in general. Professor Philip Coombs' key-note speech provided a general framework for discussions with special emphasis on the policy issues involved in the provision and co-ordination of nonformal and

informal educational activities. It provided a general orientation of the conference.

The discussions started with country reports and case studies which helped the participants in visualizing a vivid picture which covered respect to the popularization of science and technology. At the same time, a framework was shaped with the input from other papers which were more theoretical in nature. The conference then moved into group discussions to discern the viable strategies and solutions in tackling the problems thus identified, and the policy implications of such strategies and solutions. The summary of these discussions forms the main body of this report.

During the course of the conference, participants took advantage of the conference venue and spent time studying the Hong Kong case. Professor Edward K. Y. Chen, Director of Center of Asian Studies, University of Hong Kong was invited to deliver a speech where he made an insightful in the development of an export-oriented economy such as Hong Kong, and the role of formal, nonformal as well as informal education in such a development. Brief visits were also paid to Chai Wan Technical Institute, the Kowloon Bay Training Center Complex and the industrial states in the New Towns.

### 3. Basic Concepts

#### 3.1 The meaning of "popularization"

"Popularization" carries one of two meanings. It means the spread of knowledge in science and technology to the masses, but it may also mean the acquisition of new science and technology for improving one's social and economic life. Examples of the formal are knowledge about clean water and environmental sanitation, or about astronauts and space ships usually provided in science museums. Examples of the latter are

the understanding of new fertilizers in the rural area or the ability to master a computer in an urban setting.

### 3.2 Definitions

The conference did not spend time defining nonformal and informal education, but there was a tacit consensus which was very much in line with the notions used by Philip Coombs in his key-note paper. They can be summarize as :

Formal education refers to the highly organized, hierarchically and chronologically structured "education system", ranging from kindergarten to the upper reaches of the university.

Nonformal education is a convenient generic label for a variety of educational activities, but are (a) consciously organized, (b) operated outside the formal structure of the formal education system and (c) designed to serve particular subgroups in the population.

Informal education is learning from exposure to one's environment and day-to-day experience.

### 4. Observations

The following is a summary of the observations made during the conference. Such observations form the foundation of the recommendations in the next section.

#### 4.1 The Cultural Context

First and foremost, it was observed that issue of popularization of science and technology anywhere were to be raised and resolutions developed in the context of a particular culture

and a set of economic conditions. Under one set of economic conditions (of a subsistence economy, for example), the problem of popularization of science and technology may be defined as creating a general scientific culture. In an NIC like H. K. or other developed countries, the problem of popularization of science and technology may be formulated as the continuous upgrading of manpower to cope with the ever changing technologies of production of both goods and services.

#### **4.2 The importance of nonformal education and informal education in the popularization of Science and Technology**

There was a basic assumption that acquisition of science and technology was essential to sound economic development. Discussions during the conference confirmed this assumption, although it was also believed that the concept of Science and Technology should be broadened to include context, formal education may play a very different role from nonformal education and informal education.

Professor Chen, in his paper elaborated on the notion of evolutionary technologies which were different from frontier technologies which were most sophisticated by world standard. This means that different nations should start with different technological levels appropriate to their respective traditions and cultures. Many of the country cases and papers echoed this point, in displaying experiences in the development of traditional and indigenous Science and Technology which contribute significantly to economic development.

There is therefore a need to distinguish evolutionary Science and Technology from frontier technologies, and modern technolo-

gies from modernization.

For any economy to take off, Prof. Chen, based on the Hong Kong experience, argued for the need of a trainable workforce, the precondition for which is basic literacy. This demonstrates the vital role of formal and nonformal education. Country cases seem to hint that basic formal education should aim at preparing the population for a readiness in acquiring for new Science and Technology. The latter is in all cases a lifelong, recurring process which takes place mostly in nonformal educational activities.

On the other hand, the country cases also that the adaptiveness and flexibility, which are essential to real population of Science and Technology, would require a science culture which is appropriate to the traditional culture of the society. Such a science culture can only be inculcated through informal education.

Hence, it should be an over-arching educational policy issue in every country of how best to strengthen all three modes of education—formal, informal and nonformal—and to harmonize them within the framework of a nationwide “lifelong learning network”.

#### **4.3 Ethical and Negative problems**

Although the conference in general recognized importance of Science and Technology to individual lives as well as national development, participants also urged educators to include in their responsibilities to inform people the ethical as well as environmental problems caused by modern Science and Technology.

#### **4.4 Clienteles**

While nonformal and informal education would be of concern to everyone, there is a need to adapt education delivery to particular needs of the receiving group. For example, the requirements of small farmers, young mothers, rural women, urban workers and the handicapped are all very different and education activities need to be individually tailored.

Nonformal education and informal education should include the entire population as its target group. Nonformal education and informal education are obviously important to the underprivileged groups in the society: the school drop-outs, the handicapped, the unemployed, minorities, and so on—who are losers and failures in the formal school system and are otherwise deprived of any opportunity for should apply to all walks of life, making sure that every one in the society has access to modern science and new technologies. Even administrators and professionals in very advanced countries are among the target groups of nonformal education and informal education for population of Science and Technology.

#### **4.5 Necessity for Integrated Effort**

Seen in this light, the lack of integrated effort between providers of nonformal education and informal education in most countries seems to be very undesirable. Although the state of affairs is intrinsic in the nonformal and informal nature of the activities, it may mean low priority or even invisibility on the policy agenda, shortage of resources and negligence of some important target areas.

### **5. Recommendations**

#### **5.1 To International Bodies**

##### **5.1 Urgent Message to UNESCO**

The participants of the conference, despite

the small number, have come from various areas of nonformal and informal education pertaining to Science and Technology. It is a rare opportunity where the issues pertaining to nonformal and informal were singled out and exclusively put under the microscope. Although the interests of the participants are primarily different, they have all come to the consensus that the issues identified and the recommendation therefore made should be disseminated to policy-makers and fellow education in other countries. There is some urgency in the matter, because it is realized during the conference that care given to nonformal and informal education is likely to further diminish if policy-makers are not alert of the danger. In this respect, UNESCO is seen as the most appropriate vehicle to convey the message to its member countries, to their relevant Ministers as well as the relevant non-governmental agencies.

In view of these, the following recommendations are addressed to UNESCO:

(1) UNESCO should suggest very strongly the commission of the "education for All" conference (Bangkok, 1990) to include in its agenda of popularization of science and technology. The on-going international efforts which concern the entire population is a helpful starting point: the International Literacy year (1990) is seen as an opportunity. In particular, the coming conference on "education for All" can provide an immediate and continuing vehicle for popularization of science and technology.

(2) UNESCO is urged to remedy the serious imbalance of emphases in its overall education programs, with the view of allocating proportionately adequate funds for nonformal education and informal education. Although UNESCO has published many statements and proc-

lasmtions about the importance of adult education and literacy (both being important forms of nonformal education) its actual budgeting allocations and programe activities in the whole field have been mostly directed towards formal education.

(3) UNESCO is asked to support the conduct of research in the general area of nonformal education, in particular the study of the status of nonformal education, in all countries; and the impact of TV, video programmes and mass media on children and the youth. The lack of attention on nonformal education and informal education in the post has resulted in the absence of useful research in this area. Little systematic study has been done on the actual activities pertinent lessons (both positive and negative) from this experiences that could be useful to other countries. Findings of such stduies could throw very useful light on the difficult issures of how best to handle the whole subject of nonformal education within a reaction of government. There is no lack of strong opinion for or against TV and video programmes. Unfortunately, the supply of strong opinions of these matters substantially exceed the supply of reliable facts. It would be of great interest to parents, education and boradcasters to get more reliable facts about the actual utilization and impact of both the "bad" and the "good" TV programs on the attitudes, interests, motivations and behaviours of young viewrs. Such research, we realize, would require information and evaluation evidence on the costs and effectiveness of these various programmes is readily available. It would encourage UNESCO to play a key role in promoting such an effort, though clearly the actual work would have to be farmed solicited from a variety of interested sources. If well done, the resutls could be of great value.

(4) It is strongly recommended for UNESCO to recreate interest in and refocus attention to the still valid insight, observations and recommendeds of the remarkable report of the UNESCO International commission on Education (The E. Faure Committee) Learning to Be, published in 1972. The committee emphasized the need to expand and strengthen out-of-school forms of education. A brief summary of the more significant and still valid insights, observations and recommendations can be distributed to practitioners of nonformal education.

(a) UNESCO is recommended to undertake strong efforts to involve all appropriate affiliates organisations of the UN family (international nonformal education associations accredited to or recognized by the UN agencies) and the national UNESCO commissions in member states in post as part of nonformal education and informal education programmes in different countries.

(b) To get the post started on the level of curriculum development and program designing UNESCO should support the creation of an inventory of promising and facilities all over the world. This "data bank has to be made accessible for designers from all countries by using the different possibilities of technology. In future a computer network of educational designers has to seep the train going, particularly when new technological developments need additional educational support.

(c) It is recommended that an International Commission should be established of research in nonformal education and informal education for the dissemination of science and technology. Due to the visible lack of research and information about the role of nonformal education and informal education in the post we recommend

that a research and technical experts commission be established and be empowered to conduct research and provide new dimensions and information in this field.

(d) We recommend that UNESCO should actively encourage NGOs such as the ICUA, ICAE and the IFWA to popularize Science and Technology as follows :

- through the exchange of scientific information among their members
- the organisations of programs to promote Science and Technology as the training of the trainers, research and publications
- the organisation of network among their members in Science and Technology
- the application of Science and Technology to improve the quality of life of communities in their programs

## 5.2 Recommendations at National Levels

(1) We recommend that in view of the crucial role of Science and Technology in our contemporary world, governments should be asked to consider ways and means of creating special financial resources for the promotion of Science and Technology more specifically

- that they consider contributing a sufficient percentage of their educational budgets to the promotion of Science and Technology in non-formal education and informal education programmes.
- that private institutions which are in a position to contribute to such a special fund for Science and Technology be given a tax concession on the fund to be contributed.

(2) We suggest that educational planners look at formal, non-formal education and informal education as components of one national educa-

tional system. The non-formal education support from the formal education structures in preparation of teachers and facilitators who, in turn, can prepare youth for service industries. Adults already in the world of work should service industries. Adults already in the world of work should be provided adequate orientation, information and educational programmes to assist in their adaptation to new technologies. The formal education; on the one hand, adapting the formal education system to cope with scientific and technological change, and, on the other hand, providing private and voluntary institutions guidance and subsidies without limiting their autonomy and freedom.

(3) We recommend that the technological areas to be diffused by non-formal activities and programmes not to be restricted to the new achievements of the western researches and developments, but be comprehended of those scientific dimension which exists in the cultural and traditional patrimony of numerous social groups living in all countries of the world being developed or developing and which have to be elicited from it by "ad hoc" directed investigations and studies.

(4) Governments and NGOs should approach and encourage commercial and private bodies to assist and sponsor programmes for to post. In this respect we would urge such private bodies to refrain from promoting harmful and misleading information meant to increase their visibility and profit.

(5) We recommend that governments establish networks of regional and local resource centers to support non-formal education programs resource centers should promote and assist locally planned and initial Science and Technology projects by

- making inventories of local Science and Technology activities
- assisting local groups to plan individual and cooperative activities
- support training of field staff to handle Science and Technology projects
- making surveys to access needs for vocational qualifications and counsel learners in life-long learning
- running model Science and Technology projects where necessary to fill gaps and to stimulate quality programs for diverse groups of clients.

### 5.3 To practitioners in the Fields

(1) We see that there is a need for professionals in educational management

- to give the needs of learners the greatest priority in nonformal education is not in contradiction to planning the learning processes.
- to find out the spectrum of needs for education in science and technology in a local community cannot be done by the teachers themselves.- to include full-time professionals to plan different forms of courses for different levels and particular groups of clients.
- to allow these professionals to do the quality control as well as they are responsible for adapting the programmes to new development.
- to launch teacher training and supplying courses with resources for education in Science and Technology (hardware, software, teachware, learnware) are equally important tasks for professionals in educational management.

(2) There is an urgent need for training of community development workers. They form a powerful force of motivations for adoption of innovations. They need knowledge and skills of

science and technology

(3) NEED for the including of non-formal and adult teaching methods in Teacher Training.

Recognizing the lack of non-formal and adult teaching methods in teacher training curricula, we opposed to pedagogical methods and these should be the promotion of Science and Technology.

(4) RESEARCH on methodology for effective delivery of nonformal education & informal education in Science and Technology

While there are a lot of publications on teaching methodology for the formal education system, it does not appear to be so for the non-formal education & informal education sectors perhaps because of their non-formal & informal natures. For subjects in science & technology, the theories of which are quite independent of culture & civilization, the methodology which is especially effective in disseminating them or the relative effectiveness of the various methods should be explored. The results of such work should be published and made widely known for consideration and adoption by practitioners of nonformal & informal education, in different countries and communities.

(5) Use of Distance Education for popularizing Science & Technology

Having carefully considered the importance of quick transmission of Science & Technology to the greatest numbers of people nationally and internally, we urge that distance teaching methods should be utilised. These methods include the use of audio, audiocassettes, audio visuals, TVs, satellite transmissions and printed science and technological materials.



## 5.4 MASS MEDIA / INFORMATION MEDIA

The mass media, e. g. newspaper, TV, radio, are widely accepted as effective means for disseminating science & technology. Since Science and Technology are considered important for social & economic development of a community. The mass media should share the obligatory responsibility for its promotion, it is suggested that a certain proportion of the prominent air-time/section of the media be mandatorily allocated to the promotion of Science and Technol-

ogy. Such programmes/software/publication should be made widely available and free of copyrights. Governments should make these possible by placing them as a condition for offering contracts/licences to the media. preparation of Scientific and Technological material

Learning and teaching materials with Science and Technology components appropriate to non-formal and informal education, should be made available, to enrich training delivered through non-formal education with scientific knowledge and technological applications.

## 요 약

# ‘과학 기술의 대중화’에 관한 국제 학술회의 참석 보고

## 채 광 표

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이 글은 1989년 9월 4일부터 9일까지 홍콩대학에서 있었던 국제회의의 결과 보고서이다. 유네스코가 후원한 이 회의에는 20여개국에서 28명이 참석하였으며, 모든 참석자가 country paper를 발표하고 주제에 관련된 토의를 거쳐 최종 보고서를 작성하였다. 학교교육 밖에서 과학기술의 대중화를 위한 방안을 모색해보는 새로운 내용이라서 그 전문을 소개한다.