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Proposal for an initiative to encourage and support the growth of popular scientific culture in the Commonwealth

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Introduction
In the realm of international cooperation, where the Commonwealth stands as an almost unique example of shared values, emphasis is often given to aspects of popular culture, such as sports and arts, which make up the basis of present day inter-country bonding. Underlying this there are considerations of political and economic cooperation and attempts to pacify interactions between nations. Sometimes education is also included in this bonding, but it is usually limited to exchange of persons and awards of scholarships. Even within this limited inclusion of education it seems that science is often neglected, especially that kind of science education which tries to inculcate a popular scientific culture which might be common to the different countries. We believe that the issue of scientific culture in the Commonwealth is every bit as fundamental as the other parameters of cultural cooperation mentioned above, and is likely to become even more significant in the future.

Bullivant (1981) regards culture as
"...the knowledge and conceptions, embodied in symbolic and non-symbolic communication modes, about technology and skills, customary behaviours, values, beliefs and attitudes a society has evolved from its historical past, and progressively modifies and augments to give meaning to and cope with the present and anticipated problems of the its existence" (p. 19).

Seen in this light, scientific culture consists of an aggregated knowledge, which combines all the communication, tools, technology and skills, behaviours, values and mores that govern the universal practice and use of science in all environments (Jegede, 1996). The connection between scientific education in school and that scientific culture which is the basis on which the general population builds up its understanding of science as a system of thought and a picture of the phenomena of the world, has recently been explored across many of the countries in the European Community (Gago and Solomon, 1996).

Scientific culture and local culture
Various Commonwealth countries have acquired a high reputation for scientific scholarship. Marine Biology in the University of the Caribbean is world famous, and there was a time when the University of Calcutta was called 'Cambridge on the Ganges' because of the outstanding quality of its theoretical physicists. Although these successes are a matter of great pride to the Commonwealth, they form no real part of the present proposal. They proved, if indeed it
needed proof, that gifted commonwealth citizens were second to none in their excellence within the domain of western science. But in this present initiative we are concerned with the ordinary students and citizens not just with the gifted, and with popular scientific culture in different countries rather than with the 'cutting edge' of western scientific research.

The questions facing us in this project are twofold:

1. What kind of science education should we encourage in order to develop a scientific culture across commonwealth countries which would cement existing cooperation without eroding different indigenous cultures?

2. How can we best educate our young people to build a common basis for understanding global issues in science and technology which could be accessible to all commonwealth citizens enabling them to act individually, and also within their communities?

Neither are easy questions to answer: what is troubling is the apparent lack of effort to address them.

Science education and the familiar world of the child

It was said by Malcolm Skilbeck (1984) that there were three purposes to education and, although this comment was made about education in general, it fits extraordinarily well with the theme of science.

- Education for cultural transmission.
- Education for vocational needs.
- Education for the reconstruction of society.
The first of these purposes ensures that the accomplishments of science, the theories, explanations, processes and accumulations of evidence are passed on to the most able of the next generation who will become the research scientists of tomorrow. It is what Isaac Newton referred to as 'standing on the shoulders of giants'. Such an education is not really problematic in the cultural sense since it exists within its own rarefied knowledge culture. Hence it is not the main substance of this proposal, although it is likely to benefit from the project.

The second purpose is clear enough in intention, but has often proved to be a sad disappointment to students in both the developed and developing countries during the last decade. In most cases at present an education in science does not lead to a secure job for life. There is not everywhere the great demand for scientists and technicians that was forecast a generation ago. Of course there is often an unsatisfied need for doctors and other medical workers, but often it is the funds to pay for them that is lacking rather than the personnel. In many countries scientific institutions and organisations may still have an unfilled need for support and technical staff who require some basic knowledge of science. Any lack of scientific education of this vocation kind not only slows down the work of science, but also distorts its image. What modern industry wants (CBI 1995) is a general education which includes science and leaves the potential employee with literacy, numeracy, enthusiasm for and familiarity with science, and the capacity to learn more science during a life-time of learning and retraining. This is a challenge to education which will not be met by rote learning with no understanding of concepts and processes, or relevance to local living and existing culture.

The third purpose for education, 'societal reconstruction', presents a deep challenge. Every generation of citizens has a hand in the rebuilding of their own society. It may be set in a traditional mould where little change is tolerated, or it could be locked into a sad lost time when change has out-run leadership and great courage is needed to mark out and follow a new path. For different communities the situation will be different, but of three things we may be sure. Firstly, that the pace of change will quicken. Secondly, that change will impinge on all citizens, young and old, rich and poor. Thirdly, that a great part of the change will involve new technologies and their impact on living conditions and on the environment. For all these reasons a new flexible science education will be required to enable the coming generations to deal with social decisions relating to issues concerned with technology and science. Citizens are faced, more than ever before, with decisions about issues of public policy which relate to science and technology. Nuclear energy and the disposal of wastes, invasive medical technologies, sex identification of embryos, care of the environment and public health, the irradiation of food, organ donation... the list is endless. Without some understanding, or at least familiarity with the scientific concepts which underlie such arguments, it is virtually impossible for citizens of a democratic regime to take any part in its decisions. Denying them this right to participate in government, and to determine the future developments of their country and that of the Commonwealth, negates the current plan of action on the Jomtien page 3.
declaration of education for all.

From these reflections we conclude that the problems this project faces are substantial. We need to help all our young people to be ready to engage with complex scientific and technological issues, some of which may not yet be even on the scientific agenda, and to make decisions about their use which pay due heed to their own local culture. This implies that it is not so much a new curriculum which is required as a new kind of teaching which inspires life-long interest in the processes and results of science, and also the capacity to relate this to their community's ways of living, with respect for and understanding of their own inherited values. We call this approach 'Education for scientific culture' because, as for any other culture, the citizen's knowledge and attitudes need to be strongly linked with the other significant features in their lives which have reality and meaning for them (Geertz 1977).

Those who have examined the learning of science which our Commonwealth students possess when they leave school have often found it thin or sadly distorted by the effects of local culture (see Jegede and Okebucola 1991 for the African perspective, Solomon 1993 for British students, and Pomeroy 1994 or Krugly-Smolska1996 for overviews). We suggest that this outcome is a direct result of the lack of contact between the science that these young people learn in school, and the culture, values and beliefs that they encounter in the community.

There is now sound empirical evidence for this conclusion. In Britain the research initiative to study the 'Public Understanding of Science' showed a serious schism between everyday knowledge and science knowledge, even though there is not the language or cultural barrier that might exist in some other Commonwealth countries. On the other hand research into how school students discuss science-based social issues which they have heard about on television in the classroom (Solomon 1992a), or how the youngest children talk with their parents about science investigations which they have been asked to carry out at home (Solomon 1992b) suggests that linking science to factors which involve the home or the community can be effective in making it familiar and usable knowledge. This linkage lies at the heart of 'education for popular scientific culture'. As John Ziman, who co-ordinated the Public Understanding of Science initiative wrote,

"...the general message of our research programme is that scientific knowledge is not received impersonally, as the product of disembodied expertise, but comes as part of life, among real people, with real interests, in a real world." Ziman 1991 p 104

Taking these findings as our starting point we see the only way of improving science education so that it becomes valuable to Commonwealth citizens, is to allow community culture and knowledge to contribute to its content and delivery.
Aims of this project:

(i) to improve scientific education in ways which would enable it to enrich the everyday living of citizens, without damaging local culture,

(ii) to use the new information technologies to reach schools in more distant communities and put them in touch with other Commonwealth schools, and

(iii) to stimulate the production of new resources which could provide a 'Commonwealth dimension' to school science education.

Method of working

Each stage the development of this initiative will involve the three elements of science education:- cultural transmission, vocational training, and the acquisition of scientific knowledge and transferable skills for everyday purposes. It will also involve local communities in ways which it has never done before. Communication technology has been said to have reduced the world to a 'global village'; we hope that it can also be used to connect village with village, and school with school. Its use in distance education is effective across page 5
borders as well as within countries. We have identified three stages in the project:-

a) Arranging a central meeting for scientists, technologists, science educators, science teachers, persons responsible for vocational & technical education, persons responsible for non-formal education who have science or technology background, in order to discuss state of science and technology education in member countries with a view to describing what scientific culture means for them. Each member country will give a report on how science is taught in their locality, and ways in which its links with the local culture could be improved.

b) Holding a series of workshops on country and regional bases to explain the results of (a) above and the aims of the project. Through these meetings, and otherwise, to make contacts between teachers which will be followed up by telematics, by teacher exchanges, and/or by exchanges of students or their work. Such workshops at the country level should include community leaders, parents and local government officials.

Periodic meetings of country/regional representatives will be encouraged to assess, on a formative basis, the progress of the initiative across the Commonwealth and within countries. (This is different from the evaluation of the whole project which may include assessments based on the new materials to be produced.)

c) Encourage the local production of new resource materials which will have the support of parents and community leaders and would prove invaluable for distance learning in more outlying areas.

An Internet discussion group, as well as a Web site for the initiative, will be developed. This will be run by the project leaders on a host site with large area network and computer storage to accommodate the electronic traffic. All resource materials will be available for inspection in this Web site and member countries will be encouraged to participate in the discussion.

Countries without access to the technology will be sent edited hard copies of all discussions and documentation on monthly basis for reproduction. It is hoped that the Commonwealth would solicit assistance from major multinationals especially telecommunication companies, computer companies, to support this initiative.

The objectives of these three working are interlinked. The meetings of Commonwealth science educators are required to make good working contacts before more remote forms of communication take over. Those attending local meetings should be drawn from local communities and from the ranks of good practising teachers. The meetings are for the purposes of comparison of teaching methods, and for the stimulation of new approaches to making science link with local culture. In different ways the three objectives address all the three major aims for this project which were stated at the beginning of this proposal.
and designed to produce a rich collaborative Commonwealth dimension to future science education.

**Monitoring and enabling**

Initiatives like this one which begin at the centre and then move out to the periphery all too easily peter out. There are two ways to combat this common process of decay. The first is to ensure that a pair of conferencees come from each location. Even when new ideas are found to be acceptable in principle, they almost always need to be reworked to make them appropriate for the location and the culture. Two delegates can do this by discussion based on common cultural understanding much better than one person alone, and can then support each other in getting new methods of teaching put into action. The second method of enabling progress is through continuous and fluent telematic communication.

This means that the Commonwealth Secretariat would be charged with appointing someone to up-date information on the project web site. *(It would be excellent if BT could be persuaded to help this endeavour through a page in their CAMPUS WORLD)*

**Evaluation**

We need an elaborate but economic plan for a comprehensive evaluation of the project using various groups of people within the Commonwealth and within countries. This should involve both qualitative and quantitative, electronic and face to face, within and outside of classrooms. This part will only be completed once the main parts of the proposal are in action, and the more vulnerable parts of the work can be recognised.

**References**


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Experts views
Need
Role

Formal

Vocational & Technical

Non-Formal

* From Science and Technology Education
* From local cultural environment