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UNESCO's role, vision and challenges for the UN Decade of Education for Sustainable Development (2005-2014)

The United Nations Decade of Education for Sustainable Development (2005-2014, DESD) was proclaimed by the General Assembly of the United Nations in December 2002 in resolution 57/254. In the following year, UNESCO, designated coordinator of the Decade, initiated wide ranging consultations in order to prepare an international implementation scheme for the Decade (v. *Connect*, vol. xxx, no. 1-2 and vol.xxviii, no. 1-2)

Guiding the Decade: the DESD International Implementation Scheme

Given the scale of implementation of the Decade - local, national, regional and international, as well as the large number of stakeholders involved, in order to ensure success, a framework had to be devised enabling all stakeholders to make their contribution. The International Implementation Scheme is thus designed not only to facilitate collective ownership of the Decade, it also invites us to build bridges between various global initiatives to promote education.

The Scheme also meets two concerns of the United Nations General Assembly, namely how to encour-

age governments to give life to the Decade and to build public awareness so that everyone will contribute to the Decade.

Vision of the Decade of Education for Sustainable Development

The basic vision of the Decade is a world where everyone has the opportunity to benefit from education and learn the values, behaviours and lifestyles required for a sustainable future and for positive societal transformation. This translates into four objectives:

- facilitate networking, linkages, exchange and interaction among stakeholders in Education for Sustainable Development (ESD);
- foster an increased quality of teaching and learning in ESD;
- help countries to make progress towards and attain the Millennium Development Goals (MDGs);
- provide countries with new opportunities to incorporate ESD into education reform efforts.

This vision is reinforced by the 2003 General Conference 32 C/Resolution 17 reaffirming UNESCO's support to the Earth Charter and recognizing it

as an important ethical framework for sustainable development.

Creating synergies with other earlier international initiatives is also an important feature of the Decade because the DESD; MDGs, which are geared to poverty reduction; Education for All (EFA), which focuses on universal access to education; and the United Nations Literacy Decade (UNLD), which is devoted to adult education, all share a common vision: education is the key to **sustainable development**.

Meeting the objectives of the Decade: Quality education

To meet the objectives of the UN Decade of Education for Sustainable Development, quality education is a crucial element. It is a prerequisite for education for sustainable development. ESD has come to be seen as a process of learning how to make decisions that consider the long-term future of the economy, ecology and equity of all communities. Building the capacity for such futures-oriented thinking is a key task of education. UNESCO believes that key to the success of the Decade is the acceptance

of a wider vision of what is meant by quality education. For it is through the application of learnt knowledge, skills, values and behaviours - all outcomes of quality education, that we can change the way we and others live to ensure a sustainable present and future. The understanding of what constitutes a quality education is evolving. There is a demand, however, for education to reflect upon its relevance to the modern world. While in the past much of the emphasis on education related to cognitive understanding and development, now there is a need to also address the social and other dimensions of learning. Education is expected to make a contribution to addressing sustainable human development, peace and security, and the quality of life at individual, family, societal and global levels.

UNESCO promotes quality education as a human right and supports a rights based approach to the implementation of all educational activities. Its work is based on a number of international instruments that identify education as a human right. Several of these international instruments indicate the desired nature or quality of this education. When we look at these instruments together and interpret them we go far beyond single articles to a web of commitments that speak to the depth and breadth of how we must begin to understand educational quality.

Linking the Decade to other global education objectives

As the UN agency with the education mandate, UNESCO is committed to ensuring that the three key global education movements — EFA, UNLD and DESD, work in concert in support of the MDGs. It will do this with the following understanding of the purposes of each. The eight goals and eighteen targets of the MDG provide a framework for

international development cooperation. Both developing and industrialised countries have committed themselves to the MDGs, and the focus is on tackling poverty in its many aspects. Provision of primary education, and gender equality in education are the two areas where the MDGs overlap with the EFA agenda. Other aspects of education, such as literacy, quality, or non-formal education, are not an explicit part of the MDGs.

The six EFA goals* are concerned with extending basic education to every child and adult – it should be available to both females and males, to learners of all ages, offering relevant learning and life skills and striving to increase quality. Basic education should have a positive impact on the quality of life and on poverty, but the goals do not specify the underlying purposes of education.

The UNLD contributes directly to EFA and DESD as a thread through all the six EFA goals. It is a key instrument of learning and must be part of all forms and stages of education. In some respects, UNLD goes beyond education, by demonstrating strategic links to other aspects of life – learning and using literacy has an impact on mother and child health, on fertility rates, on income levels, as well as increasing self-confidence, initiative, participatory citizenship and cultural self-esteem.

What is the place of the DESD in relation to these significant international initiatives? ESD is a vision of education that seeks to balance human and economic well-being with cultural traditions and respect for the earth's natural resources. It emphasises aspects of learning that enhance the transition towards sustainability including futures education; citizenship education; education for a culture of peace; gender equality and respect for human rights; health education; population education; education for protecting and managing natural

resources; and education for sustainable consumption. Pursuing sustainable development through education requires educators and learners to reflect critically on their own communities. DESD promotes a set of basic values, processes and behaviours that should be part of learning in all circumstances.

Contributing to the Millennium Development Goals

UNESCO is committed to environmental sustainability as a key element in attaining the MDGs. It does this primarily through the work of its Science Sector and through its leadership of the DESD.

The DESD is one of the outcomes of the World Summit on Sustainable Development (Johannesburg, 2002) and it is a world programme to reorient education around the three pillars of sustainable development - economic, social, and environmental. It is clear that there can be no long-term economic or social development on a depleted planet. Education to develop the widespread understanding of the interdependence and fragility of planetary life support systems, and the natural resource base upon which human well-being depends lies at the core of education for sustainable development.

Building on more than 30 years of experience in environmental education, ESD must continue to highlight the importance of addressing the issues of natural resources (water, energy, agriculture, housing, biodiversity, for example) as part of its broad agenda. In particular, the links with social and economic considerations will enable learners to adopt new behaviours in the protection and use of the world's natural resources, which are essential for human development, and, indeed, survival.

* 1. Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children;
 2. Ensuring that by 2015 all children, particularly girls, children in difficult circumstances and those belonging to ethnic minorities, have access to a complete free and compulsory primary education of good quality;
 3. Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programmes;
 4. Achieving a 50 per cent improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for all adults;
 5. Eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality;
 6. Improving all aspects of the quality of education, and ensuring excellence of all so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy, and essential life skill



A key challenge, however, is to ensure that the emphasis on environmental sustainability is no longer limited to environmental concepts alone - we have learned that it is the complex interactions among environment, society, and economy that have brought us to this unsustainable state in the world and we must work from an understanding of these interactions to learn how to live sustainably.

To learn to ensure environmental sustainability, within this larger framework, will require a reorientation of education systems, defined broadly. UNESCO is promoting educational reforms in all modalities of education, including formal and nonformal approaches, the media, teacher education, and at all levels from early childhood through higher education and lifelong learning. UNESCO also recognizes that this reorientation is essentially about the content, processes, and environments of education - about the quality of education.

Building the Decade on partnerships and synergies

The Decade of Education for Sustainable Development proposes to promote values education at all levels and in all forms to ensure that the concept is amalgamated into existing work and education becomes part of an essential ethos for sustainable human development.

ESD requires the active participation and support of all governments to engage civil society if we are to meet the challenge of ensuring the development of thriving, inclusive and sustainable communities in all parts of the world. Education, broadly understood, is therefore inextricably linked to well-balanced development, which takes into consideration the social, environmental and economic dimensions of an improved quality of life for present and future generations. Of vital importance, therefore, is the involvement of people themselves. Our various partners are well positioned to play a major role in encouraging and facilitating this participation through capacity building and outreach conducted through information, education and communication (IEC) activities.

The Decade will be a success if and only if all of us – governments, international organizations, associations, communities, educators, the private sector and

citizens – contribute to it together, for no institution, no organization, no government will succeed on its own in making sustainable development a reality.

Each of us therefore has responsibility at the local, national, regional or international level for the implementation of the Decade. Throughout the Decade, ESD will contribute to enabling citizens to face the challenges of the present and future and leaders to make relevant decisions for a viable world.

UNESCO's role

As lead agency, UNESCO will be proactive, and all parts of the Organization will work together in an intersectoral manner to ensure the success of the Decade. UNESCO's role, through its offices, institutes, National Commissions and other bodies, is more specifically to:

- catalyse new partnerships with the private sector, youth and media groups;
- promote monitoring and evaluation;
- encourage a research programme and serve as a forum for ESD research;
- serve as forum for bringing together key stakeholders, such as multinationals, faith-based institutions, youth associations, indigenous people, etc.;
- share good ESD practices;
- link its Member States that have put in place ESD curricula, policies and research with the States requesting help;
- convene flexible working groups on particular subjects.

UNESCO's role and, in fact, the task of its Member States are defined by the four major thrusts of ESD:

1. promote and improve the quality of education: the aim will be to refocus lifelong education on the acquisition of knowledge, skills and values needed by citizens to improve their quality of life;
2. reorient the curricula: from pre-school to university, education must be rethought and reformed to be a vehicle of knowledge, thought patterns and values needed to build a sustainable world;

3. raise public awareness of the concept of sustainable development: raising awareness will make it possible to develop enlightened, active and responsible citizenship locally, nationally and internationally;

4. train the workforce: continuing technical and vocational education of directors and workers, particularly those in trade and industry, will be enriched to enable them to adopt sustainable modes of production and consumption.

To facilitate the implementation of the Decade at the level of the Member States, the following actions may be adopted:

- implementation of plans and/or clearly identifiable activities in the Member States;
- designation in Member States of focal points responsible for reporting;
- formulation of regional, and possibly subregional, plans or strategies;
- definition of indicators on progress accomplished and of mechanisms to monitor such progress;
- identification of sources of technical assistance and of examples of good practices;
- sharing of information on relevant research and development and innovations;
- means of fostering partnerships;
- provision of advice in key areas;

Implementing the Decade: seven interlinked strategies

The implementation of the Decade can also draw on the seven strategies set out in the International Implementation Scheme.

1. Formulation of a common vision and mobilization: The success of the Decade rests on the formulation and sharing of a common vision of ESD and general mobilization in support of ESD. The media are a partner of choice for achieving such large-scale mobilization.
2. Consultation and ownership: Once defined, the common vision will be owned by all stakeholders - broad participation of stakeholders in defining the vision, formulating policies and planning their implementation will ensure such ownership. This

process will be the responsibility of governments.

3. Partnerships and networks: ESD is intended to be multidisciplinary and intersectoral. The establishment of partnerships and networks to create synergy and disseminate information on the implementation of the Decade is essential.
4. Capacity-building and training: All the skills of the partners will be needed to attain the goals of the Decade. Pooling such skills on the one hand and making them available for the training of stakeholders, in particular teacher trainers and pre-service and in-service teachers, on the other are challenges to be taken up.
5. Research, development and innovation: The application of research findings will make it possible to speed up the implementation of the Decade and ongoing activities must also be guided by research. Imagination is required to adapt ESD to the local context and to the wide variety of learning situations. Here is where innovation plays a part.
6. Use of information and communication technologies: During the Decade, information and communication technologies (ICTs) will be used to link up distant partners, store data and share information quickly.
7. Monitoring and evaluation: A key monitoring and evaluation feature will be the definition of adequate and relevant indicators at all levels – local, national, regional and international – and for each initiative and each programme.

Challenges

The DESD will be a success if we collectively manage to take up the following challenges:

One of the hardest challenges is to keep the focus on ESD – this decade is about education for sustainable development, not on just sustainable development. Hence, all stakeholders need to keep focusing on education because what needs to be done is to learn our way out of where we are.

It is important to work on the integration of the 3 pillars of sustainable development (environment, economy, society). Stakeholders of the Decade all come from different places and points of views.

Some are educators, others are environmentalists, or economists. It is much easier to work on one single area, but from experience, it has been shown that all the pillars have to be brought together for a more just and decent life for everybody. Thus all these varied pieces must be pulled together to integrate them into a holistic vision for the future.

Once the focus is on education, and the 3 pillars are put together, how does one actually change education? All stakeholders must really become partners in education. Collectively, they have to expand education and take advantage of what is in the EFA movement, which is an expanded vision of education. It is not just about schools and schooling, but more important, learning. The big challenge is ultimately how to reorient education.

One must go beyond environmental education to reach ESD. The concept of sustainable development has been closely related to environmental protection. The Decade is not limited to environmental education, but also encompasses social and economic pillars. Developing adequate teaching approaches are, thus, an immediate challenge.

There is a need to learn from what already exists and build on it. Many countries have carried out ESD programmes or activities. Identifying these, evaluating the results, and disseminating information about them will allow for quicker integration of this new vision of education into national plans.

The media represent a powerful means of awareness-raising and dissemination. It has to be mobilized. Making the media an ally for transmitting quality information to citizens is a pledge of success.

Last but not least, partnerships have to be established and synergies created among initiatives and programmes. No institution, even at a global scale, can manage to achieve the goals of the DESD on its own. Only united, can stakeholders be sure to build a viable world for present and future generations.

Principles and ideas that UNESCO brings to the Decade

UNESCO understands that ESD is about values, principles and behaviours that we have to know, share and practice whenever and wherever. It is actually

about different types of learning, skills, competences, values and attitudes. It is about the kind of things that normally do not get measured in education, so ways to start to learn how to measure these have to be established. UNESCO is concerned about the quality of education, and more particularly about what, where, when, why and how learners learn.

Sustainable development is not a fixed goal, but an ever-changing concept and horizon, a mechanism for balancing different values, priorities and opinions. Thus, ESD must achieve several things:

- Develop an awareness of the concept of sustainability;
- Ensure that the system is clear in its objectives by according to the question of why we learn (that is, what are the expected learning outcomes) the same importance as what we learn, how we learn, where we learn, and who learns;
- Enable learners to understand the importance of integrating disciplines and the nature of inter-disciplinarity;
- Allow students to develop the skills to understand both the global and local nature of the wide range of issues that are included in sustainable development and act on them;
- Instil in learners the ability and will to integrate sustainable living practices, for themselves and others, in their daily lives.

To achieve these goals, the Decade will promote five fundamental types of learning :

- Learning to know, so as to acquire a taste for learning throughout life and for understanding the world. This concerns cognitive skills and reasoning.
- Learning to do, so as to be able to deal with many situations, and be an actor as well as a thinker. This focuses on practical skills and knowing how to act.
- Learning to be, so as to better develop one's personality and be able to act with greater autonomy, judgment and personal responsibility. This relates to personal skills and dignity.
- Learning to live together, so as to develop an understanding of other



people and their history, traditions and spirituality, in order to participate and co-operate with others in all human activities. This has to do with social skills and social capital.

- Learning to transform oneself and society, so as to develop respect for the environment, for social solidarity and for a non-discriminatory, gender-sensitive world. This reflects a synergy of cognitive, practical, personal and social skills to bring about sustainability.

For anybody, even for the UN system, ESD is too big to do on one's own. UNESCO recognizes the importance of partnerships and synergies in which each of the stakeholders has something to offer. In line with the concept of partnership, UNESCO believes that its role is to be a shepherd. UNESCO hopes to

provide intellectual leadership/guidance, but UNESCO sees itself in many ways as being a partner with various stakeholders and helping provide guidance. What is hoped from the Decade is a growing movement that enables everybody in the world to live a decent good life where their rights are honoured and fulfilled without putting the life and the rights of future generations at risk.

Conclusion

What all stakeholders need is to work together and create dynamic synergies. Learning is seeing the connections, discovering the interconnections between issues and items. The Decade requires everyone to work on this, all stakeholders need to dialogue in and out of their respective fields of competence. Stakeholders have to put principles and

values in practice in all education and learning settings (schools, companies, communities, etc).

Of course, ESD must be more than just a logo or a slogan. It must be a concrete reality for all of us – individuals, organizations, governments – in all of our daily decisions and actions, so as to promise a sustainable planet and a safer world to our children, our grandchildren and their descendants. (Koichiro Matsuura, Director-General of UNESCO, at the International launch of the UN DESD in New York, 1 March 2005).

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Even Science Lovers do not want to become Scientists or Engineers:

Conclusions of a ROSE study in Japan

Based on the preliminary results of the international survey carried out under the ROSE project, Dr Svein Sjöberg reported in *Connect, Vol.xxx, No.1-2, 2005*, that many students in 'rich' countries neither want to become scientists nor work in technology related jobs. He also expressed serious concern about Japanese students' negative responses on those points.

In the analyses of Japanese data set of ROSE, we identified three major groups (Science Lovers, Science Haters and Hidden Science Lovers) categorized by their school science preference. Through the process of comparative analysis we have recently obtained simple but quite interesting findings: namely, that even within the Science Lovers category about two thirds do not want to become scientists or technology related professionals.

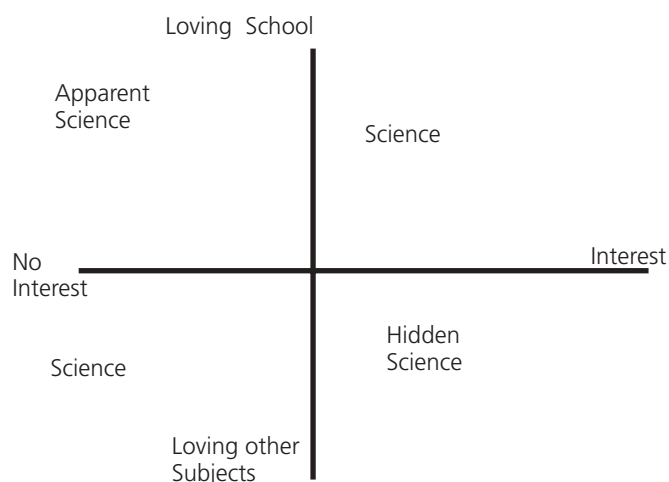
ROSE Survey and Data Analysis: The Japanese Case

Following the guidelines of the ROSE survey instrument which was translated into Japanese, 50 schools were selected randomly from among 11,203 lower secondary schools in Japan. Nineteen of those that accepted formed the Japanese sample comprising a total of 560 ninth graders (268 girls, 291 boys, and one unknown).

An original analytical framework was developed in which students' 'absolute preference of school science' and 'relative preference of school science' were cross-tabulated (Figure 1). This enabled us to classify students into four homogenous groups in terms of their school science preference:

1. **Science Lovers** showing positive attitudes towards school science in terms of both absolute and relative preference perspectives
2. **Hidden Science Lovers** showing positive attitudes toward school science from an absolute preference perspective, but negative attitudes from a relative preference perspective
3. **Science Haters** showing negative attitudes from both absolute and relative perspectives, and lastly
4. **Apparent Science Lovers** showing a rather unusual attitude, that is, negative absolute preference but positive relative preference.

Figure 1: Framework for 'School Science Preference'



After cross-tabulation between items F2 and F5 (see Table 1), the response groups 'disagree' and 'slightly disagree,' and 'agree' and 'slightly agree' were collapsed respectively (Table 2). The category **Apparent Science Lovers** was excluded from further analysis since the total number of students was found to be too small to be relevant. Thus the Japanese sample was

effectively classified by three major groups whose relative ratios are quite similar to one another. That is, one third in each group.

This study focuses on describing patterns of response among the **Science Lovers** group because we assume that they have the greatest likelihood of choosing a career in science or technology.

Table 1: Cross-Tabulation between F2 and F5 among Japanese Students

Sex			F5: I like school science better than most other subjects				
			disagree	slightly disagree	slightly agree	agree	Total
Girls	F2. School science is interesting	disagree slightly	34	3	0	0	37
		disagree	46	26	5	1	78
		slightly agree	28	23	16	2	69
		agree	13	18	21	31	83
		Total	121	70	42	34	267
Boys	F2. School science is interesting	disagree slightly	24	3	1	0	28
		disagree	29	16	5	1	51
		slightly agree	25	44	19	2	90
		agree	5	18	42	48	113
		Total	83	81	67	51	282

Table 2: Classification of Japanese Students in terms of School Science Preference (Total in 'Apparent Science Lovers' includes one unknown student.)

	Science Lovers	Hidden Science Lovers	Science Haters	Apparent Science Lovers	Total
Girls	70	82	109	6	267
	26.2%	30.7%	40.8%	2.2%	100%
Boys	111	92	72	7	282
	39.4%	32.6%	25.5%	2.5%	100%
Total	181	174 (5)	181	13	549
	33.0%	31.7%	33.0%	2.4%	100%

Findings and Discussion

From the viewpoint of self-realization, most Science Lovers were very positive in their responses about their future jobs. They wanted to have jobs 'using their talents and

abilities' (Table 3), 'working with something they find important and meaningful' (Table 4), and 'with something that fits their attitudes and values' (Table 5).

**Table 3: Using my talents and abilities**

B9. Using my talents abilities						
		not important	less important	impotrant	very important	Total
sex	girl	2.9	4.3	17.1	75.7	100.0
	boy	1.8	6.3	22.5	69.4	100.0
Total		2.2	5.5	20.4	71.8	100.0

Table 4: Working with something I find important and meaningful

B15. Working with something I find important and meaningful						
		not important	less important	impotrant	very important	Total
sex	girl	1.4	5.8	30.4	62.3	100.0
	boy	4.6	11.9	30.3	53.2	100.0
Total		3.4	9.6	30.3	56.7	100.0

Table 5: Working with something that fits my attitudes and values

B16. Working with something that fits my attitudes and values						
		not important	less important	important	very important	Total
sex	girl	2.9	5.8	37.7	53.6	100.0
	boy	1.8	14.5	29.1	54.5	100.0
Total		2.2	11.2	32.4	54.2	100.0

The majority of Science Lovers also seemed to appreciate the importance of science and technology as shown in Tables 6 and 7.

Table 6: Science and technology are important for society

G1. Science and technology are important for society						
		disagree	disagree somewhat	agree somewhat	agree	Total
sex	girl	5.8	11.6	40.6	42.0	100.0
	boy	2.8	7.3	32.1	57.8	100.0
Total		3.9	9.0	35.4	51.7	100.0

Table 7: Thanks to science and technology, there will be greater opportunities for future generations

G3. Thanks to science and technology, there will be greater opportunities for future generations						
		disagree	disagree somewhat	agree somewhat	agree	Total
sex	girl	4.3	17.4	42.0	36.2	100.0
	boy	3.7	18.3	30.3	47.7	100.0
Total		3.9	18.0	34.8	43.3	100.0

However, as shown in Tables 8 to 10, Science Lovers' view of scientists and their activities seemed to be less positive. Another interpretation could be that the Science Lovers are skeptical about the role of scientists in society.

Table 8: Scientists follow the scientific method that always leads them to correct answers

G13. Scientists follow the scientific method that always leads them to correct answers						
		disagree	disagree somewhat	agree somewhat	agree	Total
sex	girl	23.0	50.8	21.3	4.9	100.0
	boy	7.5	43.9	29.9	18.7	100.0
Total		13.1	46.4	26.8	13.7	100.0

Table 9: We should always trust what scientists have to say

G14. We should always trust what scientists have to say						
		disagree	disagree somewhat	agree somewhat	agree	Total
sex	girl	60.3	36.8	2.9	0	100.0
	boy	38.0	38.9	14.8	8.3	100.0
Total		46.6	38.1	10.2	5.1	100.0

Table 10: Scientists are neutral and objective

G15. Scientists are neutral and objective						
		disagree	disagree somewhat	agree somewhat	agree	Total
sex	girl	22.2	47.6	20.6	9.5	100.0
	boy	17.8	38.3	31.8	12.1	100.0
Total		19.4	41.8	27.2	11.2	100.0

Even among the Science Lovers, as many as 66% (girls: 81% and boys: 56%) responded that they did not want to become scientists (Table 11), and 63 % (girls: 85%, and boys: 48%) did not want a job in technology (Table 12).

Table 11: I would like to become a scientist

F14. I would like to become a scientist						
		disagree	disagree somewhat	agree somewhat	agree	Total
sex	girl	59.4	21.7	7.2	11.6	100.0
	boy	30.9	25.5	24.5	19.1	100.0
Total		41.9	24.0	17.9	16.2	100.0

Table 12: I would like to get a job in technology

F16. I would like to get a job in technology						
		disagree	disagree somewhat	agree somewhat	agree	Total
sex	girl	55.9	29.4	5.9	8.8	100.0
	boy	21.3	26.9	27.8	18.2	100.0
Total		34.1	27.8	19.3	18.2	100.0



The conclusion is very clear. While Japanese Science Lovers seem to have positive attitudes towards self-realization in their future working life and also have a strong appreciation of the role of science and technology in contemporary society in general, they have rather negative attitudes towards scientists. Finally, fully two thirds of the Science Lovers do not want to become scientists or engineers.

The finding should be striking for Japanese science policy makers as well as science educators, because many campaigns to promote science and technology among youngsters have undoubtedly been based upon the naïve assumption that increasing the percentage of science lovers among youngsters would automatically contribute to an increase in student recruitment within science and technology. The results suggest that 'liking science' does not necessarily mean wanting to become scientists or engineers. If we want to encourage youngsters to become interested in pursuing science-related careers, we must develop new educational activities in science classes and new strategies to promote science and technology.

Further analysis is required to see whether or not this tendency is reflected in other countries participating in the ROSE survey. I would like to encourage other researchers participating in ROSE to apply the analytical framework presented here in their analysis as the results may uncover more important information about Science Lovers.

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Multicultural Science Teaching: A Student Teacher and Science Teacher Survey conducted in India

In the West, developments in science curriculum during the 1960s and 1970s brought about a major shift of emphasis from stressing acquisition of scientific knowledge toward ensuring an understanding of the structure of scientific theories and the process of scientific inquiry. During the 1980s and early 1990s, science educators worked towards another shift of emphasis, namely, making science more society-oriented and science education more learner centred, which have particular relevance to the issue of multicultural science education. These changes are echoed in curriculum developments in Indian science as well¹.

This shift in emphasis towards multicultural science education is a reflection of

a post-modernist viewpoint which has increasingly started to view modern science as a reflection of western culture and a section of science educationists question science teaching practices that aim at assimilating students from other cultures into the western culture. Multicultural science education has been envisaged as an alternative to this "assimilationist" approach.

Multicultural education was originally conceived to help improve the academic achievement of ethnic and immigrant populations in nations such as the United States, United Kingdom, Canada and Australia, which have diverse immigrant and ethnic groups. However, the term has now acquired a wider connotation and no longer

pertains exclusively to multi-ethnic or multi-racial education.

At present multicultural science education deals with three contexts:

1. Western science education occurring in a non-western cultural context;
2. Western science education in a western context but with populations of predominantly non-western origin;
3. Western science education in a western context with populations of varied cultural origin, both western and non-western.

Hence, by its very nature there can be no straightforward, unified and unambiguous perception of multicultural science education as it can mean many things to many different people. Relative emphases will need to vary

from country to country, region to region and even from school to school. However, on a broad functional basis the following definition can be used: *"Multicultural science education is a construct, a process and an educational reform movement with the goal of providing equitable opportunities for culturally diverse student populations to learn quality science in schools, colleges and universities"* ².

The concern for culturally relevant science teaching is being viewed in the light of the concern for scientific and technological literacy (STL) for all. In 1993, UNESCO's Director-General stated: *"In a world increasingly shaped by science and technology, scientific and technological literacy is a universal requirement, if people are not to be alienated in some degree from the society in which they live, if they are not to be overwhelmed and demoralized by change, if they are to have the basic knowledge and understanding to make those multifarious political, environmental and ethical choices with which scientific discoveries and their consequences are confronting us all"* ³.

But in this quest, it is essential that STL for all should be related to local culture and values and to the social and economic needs and aspirations of each country and its peoples. This view is in consonance with research which has shown that developing science literacy

can be successful only if it is socio-culturally relevant to the student.

In the Indian case, achieving Scientific Literacy was put forward as an explicit goal of science education by the National Council of Educational Research (NCERT) recently although a need for socially and culturally relevant science education had been recognized much earlier.

Research has shown that developing scientific literacy can be successful only to the extent that science finds a niche in the cognitive and cultural milieu of students⁴. Since there has been very little research in this field in India, it was felt that ascertaining the present as well as future science teachers' preference for multicultural science teaching could help us evolve improved science teaching practices in order to achieve the national goal of STL for all. Thus, the objectives of this study were:

- To find out what percentage of the respondents prefer multicultural science teaching.
- To identify the respondents' choice of approaches to science teaching.
- To ascertain if preference for multicultural science teaching is influenced by: Gender; Religion; Caste; and Locality.

Preference for multicultural science teaching was ascertained on the basis of the respondents' option for culture free or culture fair science teaching. The

study was conceptualized on the basis of the following:

1. Science for all is an internationally recognized, contemporary educational goal.
2. Science for all can be achieved through STL.
3. Formal education has a significant influence on the achievement of scientific and technological literacy.
4. Developing STL through science teaching can be successful only if it is socio-culturally relevant to the students.
5. Before making any attempts to introduce socio-culturally relevant science teaching, it is important to clarify and ascertain teachers' opinion on culture vis-à-vis science teaching since their teaching will be effective only if they believe in what they are doing.

The study targeted science student teachers and practicing science teachers. All science student teachers (totaling 465) from six teacher training institutes in the state of Tamilnadu were administered the questionnaire during a one-hour class period.

As far as science teachers are concerned, a proportionate quota sampling was used to ensure that teachers from CBSE, Matriculation and State Board schools (the 3 predominant streams of syllabi in Tamilnadu schools) were adequately represented. A total of 250 science teachers responded to the questionnaire.

Table 1: Profile of the Sample

Variables	Categories	Student Teachers (N=434)	Teachers (N=243)	% of Total (N=677)
Gender	Male	146	62	30.7
	Female	287	181	69.1
Religion	Hindu	282	168	66.5
	Muslim	17	5	3.2
	Christian	135	70	30.3
Caste	Forward	30	107	20.2

Four of the five teacher training colleges in Chennai are exclusively for women. This is reflected in the sample as well, where women outnumber men. Hindus form the majority of the population in India, followed by Muslims and Christians. However as there is a predominance of Christian-run teacher training institutes in Chennai, the Christian sample tends to outnumber the Muslim.

Though the age-old caste system is losing its hold in Indian society, polarization along caste lines is still fairly common. For purposes of reservation in educational institutions, job placement, etc., the Indian government recognises 4 categories of castes: Forward Caste, Backward Caste, Most Backward Caste and Scheduled Caste & Tribe. Due to time and resource constraints only two

semi-urban localities close to Chennai were chosen for study.

To ascertain the preference of the respondents for multicultural science teaching, a questionnaire on the "Role of Culture in Science Teaching" was developed on the basis of interviews conducted by the researcher with 28 leading scientists, science educators and experienced science teachers in Chennai



city. A semi-structured format was used for the interviews, which were recorded. The interviewees were questioned about their opinion on culture and science in general and science teaching in particular. They were also asked to give, wherever possible, specific contextual examples from their teaching experience. Their responses were categorized using Ogawa's categories (1996) of researchers in the field of culture studies of science education:

- a) Those who see traditional culture as a barrier.
- b) Those who are interested in alternative knowledge systems that explain the world.
- c) Those who address the contributions of various cultures to western science.
- d) Those whose interest lies in the "culturality" of science itself.

A few illustrative approaches to science teaching (generated through the interviews), pertaining to the above four

categories were also included in the questionnaire. Information on the background variables was obtained through another questionnaire. The background variables for this survey were identified from relevant contemporary literature in this area⁵.

The basic objective of this study was to ascertain the future and present science teachers' preference for multicultural science teaching.

Given the complexity of the concept of multicultural science teaching, it is unlikely that all the respondents would have understood multicultural science teaching in all its ramifications while responding to the questionnaire, in spite of being briefed by the researcher. However, the results do indicate that given a choice between culture fair and culture free science teaching, the respondents of this study would prefer culture fair science teaching (65% of the respondents opted for multicultural science teaching). There was no significant

difference between the two sub-samples of student teachers and teachers.

Preference for multicultural science teaching was corroborated by the respondents' choice of approaches to science teaching. Multicultural science teaching approaches ranked first, followed by the historical approach and then the teaching approaches that make use of indigenous knowledge and belief systems. Less than one-third of the respondents opted for teaching approaches that ignore the students' culture.

Here again, it should be noted that merely choosing multicultural teaching approaches does not mean that the respondents may actually adopt them in classroom teaching. This can only be ascertained through further probing using qualitative methods.

The results of the analysis of data with respect to the background variables chosen are summarized in the following table.

Comparison of means of the dependent variable (Preference for Multicultural Science Teaching) with the chosen independent variables.

Background Variables	Preference for multicultural science teaching		
	Student teachers	Teachers	Entire Sample
Gender	O	O	O
Religion	O	P	O
Caste	O	P	P
Locality	O	P	P

[P represents statistically significant difference ($p > 0.01$)].

The table shows that the student teachers' preference for multicultural science teaching is not influenced by any of the basic variables chosen. This could mean that novice teachers are more amenable to the rather novel concept (in India) of multicultural scientific teaching, irrespective of their socio-cultural background.

Among the teachers, while there was no significant difference among the different religious groups, caste does seem to play a role in the teachers' preference for multicultural science teaching. Also,

a greater number of the semi-urban population prefers multicultural science teaching as against the urban population. One possible reason for this could be that the urban classrooms are much more heterogeneous than semi-urban ones. A practicing teacher may well feel bogged down by the myriad cultures he/she will have to address by opting for culture fair science teaching.

Conclusion

This study is only a base-line survey in that it stops with identifying if the future

and present science teachers are willing to address the diverse needs of their students. The results indicate that a majority of the students and teachers are indeed willing to opt for culture fair science teaching. However, suggestions for the actual modalities of introducing multicultural science teaching in classrooms can only come from further research.

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STEE Activities worldwide

L'ORÉAL-UNESCO for Women in Science Programme

Created in 1998, the L'ORÉAL-UNESCO For Women in Science partnership is the fruit of an exemplary collaboration, illustrating the way that the private sector and an intergovernmental institution can pursue joint projects to support women of science, encourage the advancement of knowledge, and enhance development on a global scale.

The L'ORÉAL-UNESCO For Women in Science programme focuses on three main actions:

1. Celebrating excellence through five **L'ORÉAL-UNESCO Awards**, which constitute the cornerstone of the programme. These prestigious annual distinctions, awarded to five leading women researchers, one per continent (Africa, Asia and the Pacific, Europe, Latin America and North America), identify exceptional women as role models for generations to come.
2. Encouraging talent through the **UNESCO-L'ORÉAL International Fellowships**. Granted annually since 2000 to 15 promising young women scientists, doctorate or post-doctorate researchers, they reinforce international scientific cooperation and foster cross-cultural networks.
3. Developing diversity through the **L'ORÉAL National Fellowships** with the support of UNESCO's National Commissions, which anchor the UNESCO-L'ORÉAL For Women in Science programme in countries around the world, while respecting their particularities and specific needs. Every year, nearly 60 fellowships are allocated in some 20 countries.

The laureates of the 2006 L'ORÉAL-UNESCO Awards – each worth

\$100,000 - were selected by the international Jury of the 2006 L'ORÉAL-UNESCO Awards in Life Sciences, 15 eminent scientists presided by Professor Gunter Blobel, Nobel Prize in Medicine, and in the presence of Professor Christian de Duve, Nobel Prize in Medicine and Founding President of the L'ORÉAL-UNESCO Awards. The laureates for 2006 were:

- Habiba Bouhamed Chaabouni, Tunisia, (Africa): Analysis and prevention of hereditary disorders.
- Jennifer Graves, Australia, (Asia/Pacific): Evolution of mammalian genomes.
- Christine van Broeckhoven, Belgium, (Europe): Genetic analyses of Alzheimer's and other neurodegenerative disorders.
- Esther Orozco, Mexico, (Latin America): Mechanism and control of infections by amoebae in the tropics.
- Pamela Bjorkman, USA, (North America): How the immune system recognizes targets.

The L'ORÉAL-UNESCO Tribute for UNESCO's 60th anniversary was awarded to Christiane Nüsslein-Volhard, 1995 Nobel Prize in Medicine.

The 2006 UNESCO-L'ORÉAL Fellowships For Women in Science were awarded to 15 young women researchers from around the world. During the 2006 fellowship ceremony at UNESCO in Paris, it was announced that the duration of the fellowships would be doubled (a maximum of two years) and would be worth up to \$40,000.

Three winners each for Africa, the Arab States, Asia and the Pacific, Europe (including Canada and the U.S.A.), Latin America and the Caribbean were announced. The work of the beneficiaries can be grouped under 4 themes :

I. Preserving Biodiversity

- Priyadharshini Madhou (Mauritius - Africa)
- Sabah Ben Fredj (Tunisia - Arab States)
- Ghada Ahmed Mohamed Abu El-Heba (Egypt - Arab States)

II. Decoding Life in the Extreme:

- Prudence Mutowo (Zimbabwe - Africa)
- Mun Peak Nyon (Malaysia - Asia/Pacific)
- Anita Krisko (Croatia - Europe)
- Zeina Daher (Lebanon - Arab States)

III. Detection for Improved Targeting:

- Ruchi Singh (India - Asia)
- Juana Del Valle Mendoza (Peru - Latin America)
- Andréa Mantesso (Brazil - Latin America)
- Valérie Gbonon (Côte d'Ivoire - Africa)
- Irene Maier (Austria - Europe)

IV. Ecosystem Sentinels:

- Diana Perez Staples (Mexico – Latin America/Caribbean)
- Dilfuza Egamberdiyeva (Uzbekistan – Asia/Pacific)
- Stéphanie Jenouvrier (France -Europe)

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Two Regional Workshops for the Arab States

Two Regional Workshops, on Education for Sustainable Development and on STE, were organised by

UNESCO/Beirut in collaboration with various partners in September 2005. The first, on the **Role of Education**

and Training in Sustainable Development, was held in Manama, **Bahrain**, from **19-21 September 2005**.



The workshop was a joint effort of UNESCO Field Offices in Beirut and Doha, UNESCO-UNEVOC International Centre for TVET-Bonn, and the Ministry of Education in Bahrain (UNEVOC Centre). It was attended by 32 key education and training sector officials from 13 Arab countries. The aim was to discuss areas and mechanisms of cooperation and to highlight the role of education and training in social, economic, and environmental dimensions of sustainable developments.

Discussions and recommendations of the workshop focused on:

- a) Bonn Declaration (October 2004) applications in the Arab Region, and workplan development (2006-2007); and
- b) Development of regional and national plans of actions for the UN Decade on Education for Sustainable

Development (2005-2014), with focus on TVET-UNEVOC Centres and Institutions.

A notable feature of the workshop was the percentage of women's participation: 32%, which is a good indicator of Arab women's participation in socio-economic development.

The second regional workshop was on the **Application of the Arabic version of the UNESCO Resource Kit in developing STE in the Arab States** and was held in Kuwait from **25-28 September 2005**.

The UNESCO Resource Kit on STE for the 21st Century, recently translated into Arabic and adapted for the Arab region had earlier been disseminated to most Ministries of Education in the region.

This training workshop organised jointly by UNESCO/Beirut, UNESCO/

Doha and the Ministry of Education of Kuwait, focused on the usage of the ten modules (26 Units) of the kit in the learning and teaching of science and technology. The participants were divided into three Working Groups to discuss main issues, priorities and areas of cooperation in using the Resource Kit to develop STE in the region, notably Curricula, Training of Teachers, and Resources.

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Regional Workshop for the Arab States on Bridging the Gap between Scientists and Science Educators

Cairo, Egypt, 29 January – 1 February 2006

This regional workshop for the Arab States was the last of the four UNESCO regional workshops on Bridging the Gap between Scientists and Science Educators (v. **Connect**, vol. xxx, No.3-4). It was organised by UNESCO's Science and Technology Education Section and the Basic and Engineering Sciences Division in cooperation with UNESCO/Cairo and was held in Cairo, Egypt, from 29 January to 1 February 2006.

The workshop had initially been scheduled to take place at the end of 2005 but was postponed due to the celebration of Ramadan. It marked the final phase of a process that would allow UNESCO to have a worldwide view of the situation regarding the existing gap between scientists and science educators. Based on this knowledge, it would allow UNESCO to formulate a global strategy and action plan on bridging this gap at an inter-regional consultation of specialists scheduled for 2007.

The workshop aimed to provide a venue for scientists and science educators of the region to interact and address issues of concern both to scientists and science educators: issues that were specifically regional as well as global. The basic objectives and expected outcomes were the same as in the other regional workshops of this series (v. **Connect**, vol.xxx, no.3-4, 2005).

The workshop comprised keynote presentations, country reports, roundtables, working groups as well as poster and materials presentation. It was attended by specialists and experts from the following countries: Algeria, Egypt, Jordan, Kuwait, Lebanon, Morocco, Oman, Palestine, Qatar, Sudan, Syria, Tunisia and Yemen as well as the Arab League for Education, Culture and Science Organisation (ALECSO), UNESCO/Cairo and UNESCO/Paris.

The participants belonged chiefly to two categories:

- key representatives from the scientific community involved in the planning of science policies, programmes, teacher training and teaching of sciences; science academies; specialized institutions and universities; and
- key representatives from the STE community involved in decision/policy-making, curriculum planning/development, teacher training and teaching from ministries of education, science education research and teacher training institutions and schools.

The two keynote presentations focused on *The power of science and technology in today's world* by Dr Ali A. Hebeish, Emeritus Research Professor, National Research Center, Cairo, Egypt, and *The status of science and technology in the Arab region* by Dr Saouma BouJaoude, Chairperson, Department of Education, Faculty of Arts and Sciences, American University of Beirut, Lebanon. Each presentation

was followed by a lively discussion among the participants, highlighting numerous similarities together with certain subtle differences in the situation of each of the countries represented at the workshop.

The two roundtables focused respectively on the following themes:

1. Preparation of future scientists and science educators and
2. Preparation of future science teachers

In the first roundtable the following major points were made:

- There was a need to develop research on scientific as well as educational aspects with compulsory training courses in the matter for obtaining science degrees.
- A quality and accreditation council should be established for university and pre-university education to ensure the quality of the educational objectives, programme mechanisms and quality networking of education technology and science research in an integrated manner.
- An Arab academy for distance training needed to be established in order to improve skills of scientists and universities in S&T and to link up these universities.
- Universities of excellence in technologies focusing on S&T should be established with government support. They would specialize in modern technological applications in applied sciences and ensure interrelationship between all types of sciences.

Another aspect brought out during the discussion was the importance of qualified teacher trainers. Two examples were cited in this respect: Syria and Jordan. In Syria, teachers of specific science disciplines received training at the university to teach that particular discipline from both scientists and educators. In Jordan, on the other hand, science educators needed to possess a Masters degree or a PhD. Although provision was made for learning, research and methodology in pedagogy including science, history and contemporary issues in science teaching as well as how one should teach, the role of teachers in developing student abilities was not included.

In the second roundtable focusing on the preparation of future science teachers, the participants stressed the neces-

sity to ensure notably that:

- priorities of countries be changed in the pedagogical fields in order to give priority to science teaching
- well defined, measurable criteria be established in the selection of science teachers: whether graduates of science faculties or teacher training institutes
- a system of continuous education and training for science teachers be adopted
- an Arab cyber university be established to train S&T teachers and cross-border qualification be set up for teachers crossing frontiers
- certified pedagogical training be made available and compulsory for all science teachers in order to ensure quality science education
- education development be made a priority for students and teachers with regular and continuous evaluation and assessment of educational systems
- exchange of information and knowledge be promoted among science teachers through periodic meetings as well as local and regional Arab networks
- the financial status of science teachers be reviewed in order to give them the social status they deserve

The six working groups, organised on the same principle as the other regional workshops on Bridging the Gap between Scientists and Science Educators (v. *Connect*, vol. xxx, No-3-4, 2005), made the following major recommendations:

1. Concerning Policy and Curriculum Planning and Development

- Involving scientists in the preparation and supervision of text books
- Designing school syllabi and curricula that respond to local needs for development, promoting the knowledge component at all levels
- Introducing syllabi and curricula that keep pace with scientific and technological developments
- Laying down systems for quality control with regard to syllabi, teachers and students
- Encouraging UNESCO Member States to have clear-cut national policies that encourage the devel-

opment of sciences and with corresponding budgets

2. Concerning Teacher Training and Capacity Building

- Setting up a coordination committee between the Ministry of Education (MinEd) and the university as represented by the science and teacher training faculties
- Organising joint training courses and workshops between MinEd (experts in the field of S&T) and the faculties of education and teacher training institutions
- Calling upon experienced university specialists in S&T and teaching to contribute to these training programmes
- Making use of new technologies, e-learning, remote training and closed circuit T.V. with the participation of university professors and concerned MinEd staff

3. Concerning Development of Educational Materials

- Adopting clear cut policies for establishment of centres for educational resources with quality material
- Establishment of a basis for contact between scientists, technologists, academia, teachers of science and materials producers for designing educational materials
- Establishing continuous training centres for users of educational materials
- Conducting more research on the efficiency and effectiveness of educational materials (information technology)
- Setting up electronic sites for exchange of information among scientists and teachers

4. Concerning Teaching and Learning Methods and Activities

- Concentrating on learner centred methods and giving incentives to teachers to use modern methods such as use of computers
- Providing sufficient funds to improve quality of education and establishing laboratories and multimedia methods of learning



- Raising awareness of school administrations on requirements of scientific learning
- Establishing teacher training centres
- Setting up relevant portals and websites with modern teaching methods, periodicals, journals, etc.

5. Concerning Exchange of Information and Networking

- Providing moral and financial support to science clubs
- Establishing a common website and database affiliated to UNESCO/Cairo providing data and information on scientists and science educators in the Arab region.
- Publishing non-specialized science periodicals and bulletins in collaboration with concerned scientists to meet the needs of educators concerning the latest scientific and technological knowledge

- Relaying new developments in science in a simplified manner through TV programmes for the benefit of science educators of the Arab region
- Increasing social and cultural scientific activities in which scientists and educators can participate, such as museums, workshops, exhibitions, etc.

6. Concerning Non-Formal Education

- Formal and non-formal education institutions need to cooperate in order to coordinate development of educational programmes that enhance application of technology in university and non-formal institutions
- Technology, distance education and networking should be used in non-formal education
- The role of university and private

institutions in the service of non-formal education should be promoted

- Non-formal education institutions, whether public or private, should be supported so that they may develop their services to keep pace with technological developments
- Instead of setting up new institutes existing ones, such as museums, galleries, etc., should be utilised for non-formal educational activities.

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Connect (Address last page)

Science Builds Bridges

A joint UNHCR-UNESCO-WESC initiative

In Egypt, refugee children face many barriers including access to education. Although a special ministerial decree, passed in 1992, entitles refugee children to attend Egyptian national schools, its practical implementation has yet to be put into practice. As a result, refugee children in Cairo mostly attend informal schools run by non-governmental organisations and religious groups.

Two innovative projects supported by the United Nations High Commissioner for Refugees (UNHCR) and UNESCO/Cairo in 2005 have shown how out-of-classroom environmental education (EE) can empower Sudanese refugee children and Egyptian students and teachers, and provide fertile ground for dialogue between two national groups with a history of troubled relations. These projects were partially funded by the Public Affairs Section of the American Embassy in Cairo.

The projects were implemented by the Wadi Environmental Science Centre (WESC), a unique learning

facility with a hands-on teaching approach to environmental outdoor field study. Combining EE with social, recreational and cultural activities they worked to foster attitude and behaviour changes not only between the two groups, but also with respect to the environment.

The first pilot project targeted 200 Grade 4 and 5 students from refugee and Egyptian schools located in marginalized areas of Cairo. At WESC, in keeping with Egypt's national curricula, Grade 4 students studied earth sciences – rocks, soils and the animal kingdom, using examples native to Egypt and Sudan. Grade 5 students focused on earth energy sources – how weather stations work, how solar energy is harnessed and how carbon dioxide functions in the atmosphere.

The second project was part of a year-long cultural diversity programme to raise awareness among Sudanese and Egyptian girls attending two different schools run by the same organisation. During field exploration at WESC, the

girls focused on plants (their composition, chemical properties and medicinal uses) and desert ecosystems (their balance, complexity and value). Female teachers and role models working on the project served to challenge pre-conceived negative notions about women in science careers.

Using hands-on experiments and collaborative problem-solving methods, the learning conditions conveyed by WESC began breaking down social and cultural barriers between refugee and Egyptian students. Thus, the projects allowed UNESCO and UNHCR to achieve the two goals of increasing students' exposure to science-based learning and promoting understanding and acceptance between Egyptian and Sudanese refugee children.

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UNESCO STEE activities in Latin America & the Caribbean

In the context of its STEE programme, UNESCO's Regional Office for Education in Latin America and the Caribbean (OREALC), has taken up the major challenge of making science knowledge a major factor in the formation of fully aware citizens, by means of improving teaching/learning of science.

The major strategy employed for this purpose was to bring together all the concerned actors of the region in order to achieve consensus at the regional and national levels.

A key factor in this process was the Regional Science Education Network comprising 16 countries: Argentina, Bolivia, Brazil, Chile, Cuba, Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela. The Network, being the appropriate venue for planning qualitative progress at the regional level, serves as a source of reflection on and analysis of issues related to fostering a culture that gives its due value to science and technology. It is also a venue for broad participation, exchange and communication for all those involved in teaching science at the national, sub-regional and regional levels.

Under the four major axes on which OREALC focused its action, the following notable activities were carried out in the final semester of 2005 and beginning of 2006:

I. Fostering New Curricular Proposals, Materials and Innovative Practices within the Framework of Quality Education for All

Objectives:

- Achieving changes in science teaching content and methods within the framework of «Science for All» through identification, analysis, and dissemination of «best practices».
- Strengthening national capacities in curricular design and development by creating venues for reflection among relevant persons - decision makers, teachers, and teacher trainers.

Seminars:

- *Ibero-American Science Education Congress* organised by OREALC and the UNESCO Science Education Chair of the Universidad San Carlos de Guatemala and the Universidad de Alcalá, Spain (Guatemala, June 2005). This meeting focused on discussion and reflection on science teaching in Ibero- and especially Central America. Various innovative science education-related experiences were discussed. Lines of science education research were presented, as well as their influence on teaching and learning. New requirements for science curriculum structures were outlined. Participants included regional specialists, classroom teachers and experts in education.
- *International Seminar: Education for Sustainable Development: a Contribution from Science Education*. OREALC/UNESCO-Santiago, Ministry of Science and Technology of Argentina, the National Natural Science Teaching Network of Argentina, and the Universidad de Buenos Aires de Argentina (Buenos Aires, Argentina, July 2005). The participants included researchers, teachers, school principals and teacher trainers from Argentina, Chile, Cuba, Peru and Uruguay, as well as specialists from Argentina, Chile, Cuba, France, Spain and Uruguay. Discussions focused on the problems of science education in guaranteeing high quality and equitable training for children and youths and sustainable development.
- *Meeting on Science Education Exchange and Training*, (Santiago, Chile, October 2005). The conceptual framework of this meeting grew out of ideas presented in the document *The Contributions of Science Education to Sustainable Development*. The purpose was to strengthen links and to establish common working lines between teachers and local authorities in order to achieve recognition of the value of such venues as a way to

stimulate the development of such activities.

- *International Seminar, Quality Science for ALL*, organised by OREALC, UNESCO-Brasilia, in cooperation with the Brazilian Ministries of Education and of Science and Technology (Brasilia, Brazil, November 2005). The event sought to demonstrate the impact of science education on development, strengthening the commitment of all actors to the definition and establishment of comprehensive education, science and technology policies. It also provided an opportunity for exchange and reflection, identifying links for building consensus necessary for contributing to the development of public policies that can assure the beginning of an innovative, permanent, committed and long-term process in Brazil. Seminar participants included academics, specialists, and researchers interested in public policies related to the formal and non-formal teaching of science, its dissemination and increasing accessibility.
 - Two meetings of UNESCO Santiago and the Sangari Institute in São Paulo and in Santiago for the planning and development of a project entitled: *Science in Schools*.
 - Development and assessment of science tests for 6th grade students in collaboration with members of the Latin American Laboratory for Assessment of the Quality of Education (LLECE) during the final months of 2005.
- Publications in digital format and dissemination of innovative experiences included notably:
- A sustainable development experiment. *Stones: what do they teach us?*
 - An experiment in sustainable development. *The problem of energy. An interdisciplinary perspective toward ourselves.*
 - *A Perspective of Science Education in Argentina: Buenos Aires a century ago* (the natural sciences from a social perspective).



- *Up-dating teaching skills in scientific and technology literacy in Las Varillas, Argentina.*
- *Reflections on teaching genetics.*
- *Life skills: A contribution from science education within the framework of the Decade for Sustainable Development.*
- *Scientific and Technology literacy: Contributions for Reflection.*

II. Fostering Equitable Science and Technology Literacy

Objectives:

- Preparing students to make decisions and to live in a society that is increasingly dependent on science and technology.
- Stimulating creative and critical thinking, practical and technical skills, the ability to inquire, solve problems and experiment in the field of technology.
- Promulgating the importance of science and technology literacy for achieving democratic development and economic growth.
- Fostering acquisition of science literacy without discrimination, paying special attention to the situation of girls and women.

Three types of activities were carried out under this heading:

1) Research

- Life skills development through science and technology literacy, in collaboration with the Centro de Estudios Multidisciplinarios CEM-Argentina.
- Development of a conceptual document on science literacy.

2) Seminars/Workshops:

- *Scientific and Technological Literacy* organised in collaboration with the Ministry of Education of Argentina (Buenos Aires, Argentina, July 2005). This event resulted in the adoption of strategies directed at developing a solid, permanent, and systematic scientific and technological literacy proposal that, within the framework of Education for All (EFA), deals with the problem of gender as well as that of the social and economic status of children. Participants highlighted the importance of:

- producing documents that bring together current innovative practices
- collecting information as well as suggesting training methods based on what are understood to be «best practices»
- defining indicators for more precisely conceptualizing what is and what is not science literacy.

- *Experiences in Science and Technology Literacy* organised with the National Network of Researchers in Natural Science Teaching (Argentina), Universidad de Buenos Aires and Universidad Nacional del General San Martín (Buenos Aires, Argentina November, 2005). The main purpose of this seminar was to analyze discuss in-depth proposals to guarantee quality science and technology literacy without discrimination. The meeting facilitated the exchange and dissemination of science and technology literacy experiences, focusing the discussion on new models of science teaching in both school and non-school settings.

III. Fostering Changes in Pre- and In-service Science Teacher Training

Objectives:

- Up-dating science teacher training for the benefit of future science teachers and to foster changes in classroom practices within the framework of Science for All.
- Training groups of teacher trainers to take the lead in the in-service training of science teachers
- Reviewing contents and methodologies of different science teacher training programmes

Seminars:

- *Science Education Today, Citizenship for Tomorrow* organised in collaboration with the Universidad Católica Silva Henríquez (Santiago, Chile, July 2005). The purpose of this seminar was to reflect on the vital role of science education in forming competitive citizens in a world led by scientific and technological progress. It was directed at

school principals, teacher support branches of various training institutions and teachers in general. The event also brought together representatives of the Latin American Science Education Network.

- *Science education, citizenship, and values: challenges of new models of knowledge* organised in collaboration with the Pontificia Universidad Católica de Chile. Directed at school teachers and principals as well as teacher training institutions, the objective of this seminar was to consider the contribution of science teaching to the development and consolidation of a democratic culture. In addition, participants discussed innovation and research strategies in science teaching in the face of new knowledge models. Participants included specialists from Argentina, Chile and Spain.
- Round tables on *Research on science teaching methodology in Ibero-America* within the framework of the VII International Congress on Science Teaching Methods: Science Education for Citizenship (Granada, Spain, September 2005). During these round tables, representatives from different Ibero-American countries had the opportunity to report on the situation of their countries in this area. Participants included representatives from Argentina, Brazil, Chile, Portugal, Spain, and Uruguay.
- International Workshop of Specialists: *ICTs in Environmental Education and Communication for Sustainable Development* (Bonn, Germany, November 2005). Organised by the German Federal Agency for Environmental Conservation (BfN), this workshop aimed to identify best practices and innovative methods in the use of ICTs for EE communication, and to form a network of schools across the world which would effectively make use of the methods and practices identified at the workshop. Apart from the representative from Uruguay, nominated by UNESCO/Santiago, participants included representatives from Canada, China, France, Germany, Kenya and Palau.

Publication of teaching guides:

- OREALC and the UNESCO Science Education Chair for Latin America and the Caribbean have begun publication of a series of books directed at teacher trainers in the area of science. These texts follow two well-defined lines: one places in discussion different arguments related to up-dating Science Teaching Practices; the second treats problems involving up-dating of science content. The first two books of the series – in both areas – were presented at the Universidad de Alcalá in Spain and at the UNESCO Science Education Chair III Ibero-American Congress.

IV. Promotion and Development of Networks

National, Sub-Regional and Regional Science Education Network:
The primary objective of this network is to foster access to the kind of science-focused culture that individuals need in order to succeed in a world

imbued with scientific and technological progress and that permits them to make informed decisions in solving every-day problems.

Other objectives include:

- Creating joint working interfaces between academics, trainers, science education researchers, and teachers.
- Promoting Quality Science for ALL approach which takes into account different dimensions of the subject in a comprehensive and systematic manner in:
 - Curriculum development
 - Teacher training
 - Research that supports science education reform
 - Development of materials
 - Systematization of innovative experiences
 - Modes of science literacy to integrate the entire population
 - Establishing contact and dialogue between different actors and authors

Activities:

- Creation of a national network of science education researchers in Chile (August 2005)
- Production of knowledge with the help of ten groups of researchers from different Ibero-American and Caribbean countries to foster changes in classroom science teaching
- Network of innovative schools that «do» science associated with networks in different countries in the region
- Publication of two-phase development of the Latin American Science Education Network.

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Workshop on Science and Technology Education Policy and Programme

Kathmandu, Nepal, 29-30 August 2005

This workshop was organized in Kathmandu by the Nepal National Commission for UNESCO, Kathmandu, in cooperation with UNESCO's Science and Technology Education Section, from 29 - 30 August 2005. The rationale of the workshop was the pressing need to improve the quality and relevance of STE policies and programmes in accordance with the progress, application and impact of science and technology in the society. To cope with the changing needs of society and individuals, there is a need to update and strengthen science and technology. This can best be achieved by means of a process starting with policy formulation, going on to curriculum/textbook revision and adaptation to lead up finally to teachers - for it is they who, through the effective use of text books, implement the curriculum in the classroom.

Workshop participants included STE policy-makers, curriculum planners/ developers and trainers, researchers, experienced educators and secondary school science teachers as well as representatives from the Ministry of Education and Sports, Nepal National Commission for UNESCO and UNESCO/Kathmandu. The objectives of the workshop were:

- 1) To oversee, review and analyze the existing National Policy of Science and Technology
- 2) To assess the existing secondary level curriculum, textbook, and teacher training
- 3) To recommend measures to be taken by the Ministry of Education and Sports and concerned authorities in improving the quality and relevance of national STE policies and programmes, curriculum, textbooks and training and assessment.

Four distinguished experts presented papers - followed by intensive discussions - on the following themes:

- STE Policies and Programmes
- STE Curriculum and Textbook
- Training in STE
- Evaluation and assessment in STE

Three working groups were then formed on the following topics to discuss the present situation and the country's needs together with recommendations for the future:

- Policy and programme
- Curriculum and textbooks
- Training, assessment and evaluation

The work of the three groups resulted in the following major recommendations:

- Technology should also be included as an introductory part in the science curriculum up to secondary



- level and integrated with other subjects as well, with local or indigenous technology being given priority
- Changes in science curriculum policy should match the rapid development of science.
 - A central, coordinating body should be established in order to coordinate the various bodies dealing with science education.
 - A fund should be created to allow teachers, academicians or other researchers to carry out research in science education and training programmes organized according to the need and demand of the teachers and the job market.
 - Science and technology should be taught from grade 1 to 12: as a general subject till grade 10 and additionally, optional science should be included in grades 9 and 10.
 - An activity based (result oriented) curriculum should be developed rather than just a content based one emphasising meaningful teaching/ learning activities such as interactive learning, investigation, validation process, skills based learning, etc.
 - Proper assessment methods should be used, like Continuous Assessment System (CAS), Portfolio, Question Grading System, etc.
 - A 'science and technology bridge course' should be devised for students who cannot continue to higher education. They should also be provided with employment opportunities to make them self-dependent.
 - Teachers should be provided with a manual and kit for designing basic teaching materials which can be used locally
 - Project work and portfolio should be used as a tool of assessment and Research and Development (R&D) should be used for improving assessment.
 - The STL awareness programme should be taken to the masses.

For further information contact:

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Science and Technology Education for Primary & Secondary Schools and Colleges of Education

A UNESCO-Government of Nigeria Biennial Project (2005-2007)

This Project on Science and Technology Education for Primary & Secondary Schools and Colleges of Education originated from the Nigeria Presidential Initiative aiming at achieving national economic and human development of the country using mathematics, science and technology education. In order to help achieve the objectives and resource mobilisation, Nigeria requested the collaboration of UNESCO for the execution and implementation of the self-benefiting trust fund.

In its first phase, the project addressed the following issues:

- supplying micro-science kits to selected primary & secondary schools
- training teachers in innovative ways of teaching science
- strengthening Federal and State inspectorates in effective monitoring and evaluation of science teaching
- promoting scientific culture in the country, particularly among the young generations and their parents.

During the first semester of project implementation (September 2005 – March 2006), the following major activities were performed in collaboration with the Project Implementation Committee:

- i. Review of Work-plan 2005 – 2006 and organisation of first Steering Committee meeting to validate the reviewed work-plan and set up a Project Team
- ii. Training of 94 Federal and State inspectors on monitoring and evaluation of Science Teaching (December 2005)
- iii. Preparation of a base line documentary film on the present status of Science and Technology Education in Nigeria, to serve as an advocacy tool
- iv. Consultations with Kit Suppliers : National Mathematical Centre (NMC); NASENI and Skill G Nigeria for preparing Zonal Training workshops on the kits and modalities of effective delivery to the schools
- v. Extension of partnership to additional

key stakeholders: National Television Authority (NTA) and Mathematical Association of Nigeria (MAN)

- vi. Organisation of a national workshop on Active Learning Techniques focusing on Primary Education (March 2006)
 - vii. Organisation of workshops for 12 States and Federal Capital Territory (FCT) on: (a) the use of Primary Mathematics Kits and Primary Science Kits, (b) the use of Secondary Science Kits, (c) Active Learning Techniques
 - viii. Distribution of Primary Science and Primary Mathematics kits to selected schools in 12 States + FCT
- On the basis of the activities performed, their outputs and immediate outcomes, the results obtained were:

- Strengthened institutional capacity of Federal Inspectorate Services Division and State Inspectorates in monitoring and evaluation of science teaching at Primary Education Level

- In addition to the training of inspectors at the workshop, development of a Monitoring and Evaluation Instrument for Primary Science Teaching, which is being put together by the Federal Inspectorate Services Division in the form of a Manual and which will be used by all inspectorates throughout the country.
- Preparation of the baseline documentary film, in collaboration with all project stakeholders, which will be an important advocacy tool for sensitization and awareness creation. It will be used at all levels: Federal, State and decentralised entities.
- Improved Project Implementation Strategy through innovations such as:
 - a ceremony with media coverage and relevant supporting documents at the end of each Zonal training on the use of kits
 - obligation for each teacher trained on the use of the kits to organize training sessions for his/her colleagues at school level. These sessions will be supervised by the Federal Inspectorate and State Inspectorate which will award a Resource Teacher certificate to successful teachers and call upon them to help in the second phase of the project
 - a competition among Project participating schools. The most creative primary and secondary school will receive an award from the President of Nigeria.
- 520 Mathematics and Science Teachers trained in the use of Primary Mathematics and micro-science kits and in Active Learning Techniques.
- 130 selected schools equipped with Primary Mathematics and Micro-Science kits.
- 140 lecturers of both Federal and State Colleges of education trained in Active Learning Techniques focusing on Primary education.
- Additional 240 Mathematics and Science Teachers being trained on the use of Primary Mathematics and Science Kits and a further 120 kits to be distributed at workshops being organised for North West Zone at Kano and Sokoto.

Further information from:

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Project Coordinator

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National Conference on Environmental Education for a Sustainable Lifestyle

Patna, India, 10-11 February 2006

This national conference on Environmental Education for a Sustainable Lifestyle was organized by the Department of Zoology of the Patna Women's College, Bihar, India, to re-emphasize the vital role of education in achieving a sustainable lifestyle. Following the launch of the United Nations Decade of Education for Sustainable Development (DESD) 2005-2014, this meeting was planned to help educators meet and share their experiences on best practices in creating sustainable lifestyles and bring about behavioural changes in the youth and society. It was targeted at teachers, students, researchers, environmental educators, decision makers, civil servants and the media.

The objectives of the conference were:

- To discuss the role of EE in empowering youth to analyze problems and acquire sustainable lifestyles
- To develop a list of ideas and strategies that can help educators bring about attitudinal change, research and extension activities related to the environment

- To discuss and demonstrate how age-old Indian cultural values and religious principles can help in understanding ethics and inculcating a sustainable lifestyle
- To exchange education and communication experiences and identify available best practices that can be replicated
- To form a network of educators, students, locals and practitioners to discuss ways of learning and sharing at different levels and the means to maximize awareness and participation

The conference comprised keynote addresses, plenary and technical sessions, poster presentations as well as a visit to an eco-farm. It was attended by high officials from the Bihar State government, 300 teachers, students, and representatives from media and NGOs.

The themes of the conference were the following:

- Sustainable lifestyle measures or indicators as well as its environmental, social and economic aspects

- Role of schools, colleges/universities and NGOs in developing sustainable lifestyles
- Constraints faced by educational institutions in imparting EE
- Innovative practices and lessons in achieving sustainable lifestyles
- Role of values, ethics and religion as well as scientists and women in developing sustainable lifestyles
- EE and Biodiversity Conservation

The major recommendations to emerge at the end of the two-day conference were:

- It is necessary to encourage and strive for value based living through judicious use of resources and adopt an eco-friendly life style at the socio-personal level.
- EE should be made compulsory in the school and college curriculum, the concept of sustainable development explained and legal aspects of the environment emphasised at the post-graduate level.
- The concept of 'Glocalization' (i.e. think globally but act locally) should be introduced in the place of globalization.



- Conservation of natural resources and use of alternative resources should be promoted together with adoption of organic farming, use of renewable energies, plantation and afforestation, etc.
- Awareness spreading on sustainable lifestyles should be promoted among all sections of society including villagers, women, the poor, school and college students, the media, corporate houses and the public sector.
- GOs, NGOs and other institutions should undertake to encourage all sections of the society to adopt an eco-friendly lifestyle.
- Policies and laws should be formulated in favour of sustainable management of natural resources.
- Eco-clubs and Local Task Forces should be formed to encourage sustainable lifestyles and watch on environmental degradation.
- Cultural heritage, eco-friendly cus-

toms and biodiversity should be preserved.

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Centres, Associations, Networks...

The Vega Science Trust

U.K.

Vega is a not-for-profit organisation set up by Nobel Laureate Sir Harry Kroto that streams for free over 90 science programmes and offers free educational resources for teachers, students and the general public.

Vega was set up in 1994 and was probably one of the first Internet sites dedicated to science to offer free-viewing of science programmes - perhaps the first Science TV channel.

Vega programmes range from discussions on current issues, lectures, careers programmes, interviews with eminent scientists, teacher resources in the form of power-point downloads and worksheets.

- Snapshot programmes are short 15 minute career programmes featuring young scientists (aged under 35) to encourage school students to think about studying/working in science

- Discussion programmes : 'The Next Big Thing', concentrate on in-depth discussion of topics of current importance, e.g. GM Foods, Avian Flu, Cancer, TB or AIDS

- Issues series, started lately, discusses malaria control

- Face-to-Face series features interviews with eminent scientists such as C.N.R. (Ram) Rao, President of the Third World Academy of Science or Max Perutz, the father of molecular biology

- School's section aims to aid teachers with downloadable modules to explain Euler's Law, watch a workshop in Mexico, etc.

The Vega Trust is currently experimenting with video conferencing and those fortunate to have broadband will be able to link to Harry Kroto in Florida or Jonathan Hare (Rough Science TV presenter and Creative Science Centre,

Sussex) to participate in live workshops or on-line mentoring. However, Vega also intends to stream all programmes as audio files (Vega Radio) to make the site content accessible for those with lower bandwidth.

The site records visits from over 165 countries world-wide and has received wonderful reviews and feedback from people working in education and careers advisers.

Any feedback or interest in a collaboration would be very much welcomed.

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ARKive:

Wildlife films and images for the classroom

ARKive is the world's centralised collection of wildlife films and images that can be used free-of-charge for educational purposes in lessons, activities and for general interest. Launched by Sir David Attenborough in 2003, it is a fantastic set of educational award

winning resources for teachers and pupils alike available to anyone with an internet connection.

The materials (e.g. film clips and images) can be easily and quickly downloaded and integrated into lessons while pupils can use the site in

their project work for a number of subjects, like science, geography, ICT, English, citizenship, art and design, history, drama and sports.

The emphasis of the sites is on encouraging pupils and educators to take an interest in the natural world - which

perfectly fits the new international guidelines on Education for Sustainable Development. Most importantly **they are all free.**

- www.arkive.org – the main website is full of useful wildlife/biology/geography/citizenship/general interest resources for Grades 3/4/5 and beyond. ARKive covers Globally Endangered Wildlife plus some

of the more common species. It has 1,800 species, 2500 film clips, and 12,000 photos/images.

- www.planetarkive.org – for 7-11 year olds, interactive games, quizzes and activities linked into the schoolwork on Living things, Citizenship and Habitats.
- www.arkiveeducation.org – for teachers and educators- it has les-

son plans, activities and curriculum links to help teachers use ARKive whatever their subject.

For more information contact:

*Bruce Phillips-ARKive
Education Officer (bruce.phillips@wildscreen.org.uk)*

Flying Chemists Program (FCP)

The Flying Chemists Program (FCP) was launched in January 2005 by the Committee on Chemistry Education (CCE) of the International Union of Pure and Applied Chemistry (IUPAC).

The overall aim of the programme is to help economically disadvantaged countries improve the teaching and learning of chemistry at the primary, secondary and tertiary levels. Concretely, FCP aims to provide countries with the expertise needed to strengthen and assist in the development of their chemistry education programmes.

Among the specific aims of the FCP are:

- To assist in the development of curricula as well as in the establishment of partnerships among universities, industries, and governments.

- To help develop or recommend new tools of assessment.
- To help recommend implementation of hand-on experiences at all levels of chemistry education.
- To help develop different approaches to the teaching of chemistry and implement teacher training and preparation programs.
- To hold successful international conferences to obtain expert advice on a particular aspect of chemistry education.
- To help identify and approach sources of funding.

Under this programme, the host country is expected to provide local costs (boarding and lodging) for the experts with CCE providing the airfare. In order to be functional, as a general rule, CCE should receive invitations from a

National Society, a Ministry of Education or Technology, or another comparable substantial organization.

The host country is expected to make thorough preparations for the visit and coordinate all activities in order to achieve the specific goals and objectives of the visit. In addition, the requester should plan for meetings with the academics, industrialists, and government agencies in order to identify future viable strategies. This might help achieve the country a self-sustainable model.

In general, the programme is scheduled to last one week.

For more information contact:

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Educational Programmes of Cefic (the European Chemical Industry Council)

Cefic, the European Chemical Industry Council, representing about 27,000 large, medium and small chemical companies which employ about 1.3 million people, accounts for nearly a third of world chemical production.

Cefic was incorporated in 1972 as an international association with scientific objectives. It is constantly reviewing its priorities, its structures and its ways of operating in order to adapt to new circumstances and challenges.

Through its educational programmes, Cefic helps schoolchildren, students and the general public to understand

scientific principles and the importance of technology in today's society. For 200 years, science - and particularly chemistry - has made a huge impact on people's lives. In the future, society will increasingly look to scientists to invent new materials and new, sustainable ways to make, use and dispose of them.

It is therefore essential that the general public have a grounding in science. Cefic supports moves to provide appropriate, high quality science education in the classroom and to help more people to appreciate the impact of technology on everyday life.

Through a number of Europe-wide projects, Cefic brings together schools, colleges and industry to create a better understanding of the role of science and particularly chemistry.

Chemistry and You: A Portal for Chemistry Education is a website based on the assumption that chemistry is present in every aspect of our life – from the colours that surround us to the electronic devices that simplify our daily tasks. The site thus treats a number of topics like nanotechnology, elements of life, scale of things, the Periodic table, chemistry for life, etc. as well as a Chemistry and You section in



English, French, German, Dutch, Spanish and Italian explaining the chemistry in our daily lives through exploration and interactive games. It also features a variety of interesting links to websites in different languages such as *Chemistry for Kids (French)*; *Biotechnology made Easy (English, French, Dutch)*; *Living Science*; *Chemistry for Everyone (French, Dutch)*; *The Chemistry of Life (German)*; *Everything is Chemistry (Spanish)*; and *Just curious (English, German)*.

Other Cefic projects include:

- conferences on education-industry partnerships
- the *CHEMistry For Life project* with Europe's science museums and guidelines for companies on how best to arrange educational site visits for schools
- a network of representatives of Cefic member federations and companies to evaluate and encourage good practice in future education-indus-

try partnerships - at both national and European levels

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www.chemistryandyou.org

Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA)

SEARCA is the regional centre for Excellence in agriculture of the Southeast Asian Ministers of Education Organization (SEAMEO). Through its core programs of Graduate Scholarship, Short-Term Training, R&D, and Knowledge Exchange, SEARCA works to alleviate poverty and promote food security in Southeast Asia. It is hosted by the Philippine Government on the campus of the University of the Philippines Los Baños (UPLB).

Its Biotechnology Information Center (BIC) conducts research, organises conferences, seminars and training courses and publishes articles and information kits on biotechnology related topics (www.bic.searca.org). It also has a Biodiversity Research Programme focusing on the region of Mindanao (Philippines)

which aims to undertake and promote collaborative, participatory and interdisciplinary research that will promote sustainable use of biological resources, and effective decision-making on biodiversity conservation to improve livelihood and cultural opportunities.

SEARCA is set to launch five new short-term training courses in: 1) Executive Course on Natural Resource Use Negotiation and Decision-making for Rural Development in Southeast Asian Countries; 2) Executive Course on Integrated and Intersectoral Management of Natural Resources; 3) Training of Trainers on ICT-based Extension Management and Delivery; 4) Training of Trainers in Post-harvest Technology and Policy Management for the Globalized Market; and 5) Training of Trainers on Safe Transfer and

Sustainable Use of Agrobiotechnology. The first two courses fall within the natural resource management thrust of the Center while the last three on agricultural competitiveness.

The fee-based courses will adopt participatory and peer-based learning approaches and will be implemented through classroom- and field-based activities.

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News & Publications

On the occasion of the World Science Day for Peace and Development (10 November 2005), Mr Koïchiro Matsuura, Director-General of UNESCO, calls for greater South-South cooperation

In his message on the occasion of the World Science Day for Peace and Development, Mr Koïchiro Matsuura, Director-General of UNESCO, emphasised the importance of the relationship between science and society and the need for science to relate to the changing social context. More particularly, he emphasised "*the crucial importance of South-South cooperation in science and technology*" which "*can help to develop a professional culture of scientific excellence among scientists who remain at home where their contributions are most needed*".

He maintained that "*Scientific dialogue and collaboration (...) are vital mechanisms for building reciprocal interests and mutual understanding between peoples*" and that UNESCO has long been promoting international cooperation in science for the cause of peace notably through South-South cooperation.

On this World Science Day for Peace and Development, he called more particularly upon all those engaged in the scientific enterprise "to re-affirm their commitment to building a peaceful, prosperous and equitable world through science and to express this commitment through international cooperation and collaborative action. Through South-South cooperation in particular, let scientists develop relations of solidarity and mutual support that generate practical benefits and also serve as models for others to follow".

Avicenna Prize for Ethics in Science* awarded

On 14 April 2006, the Avicenna Prize for Ethics in Science was awarded by UNESCO Director-General Koichiro Matsuura to Abdallah S. Daar, from the Sultanate of Oman, at UNESCO Hq in the presence of the Iranian Minister of Science, Research and Technology.

Dr Daar, previously held the Chair of Surgery at Sultan Qaboos University, Sultanate of Oman. He is currently Professor of Public Health Sciences and of Surgery at the University of Toronto, where he is also Director of the Program in Applied Ethics and Biotechnology and Co-Director of the Canadian Program on Genomics and Global Health at the University of Toronto Joint Centre for Bioethics, and Director of Ethics and Policy at the McLaughlin Centre for Molecular Medicine.

His significant contribution to research in the ethics of science and technology does not only cover a wide range of topics, but engages in depth with issues at the crossing point of science and ethics, technology and society, ranging from living donor transplantation to the use of stem cells, genomics and xenotransplantation.

* Established by the Executive Board of UNESCO at its 166th session on the initiative of the Islamic Republic of Iran, this Prize, awarded every two years, is intended to reward the activities of individuals and groups in the field of ethics in science. The Prize owes its name to the renowned 11th-century physician and philosopher of medieval Islam Abu Ali al-Husain Ibn Abdallah Ibn Sina (980-1038), known in Europe as Avicenna. A healer and a humanist, Avicenna developed an exemplary holistic approach that captures the essence of ethics in science and has thus come to serve as a source of inspiration for the promotion of this concern, which is of central importance to UNESCO.

The Prize consists of a gold medal of Avicenna along with a certificate, the sum of \$10,000, and a one-week academic visit to the Islamic Republic of Iran. Governments of Member States of UNESCO and international non-governmental organizations maintaining official relations with UNESCO may each nominate one individual or group for the Prize.

For further information contact: *Mr Henk ten Have, Secretary of the Avicenna Prize for Ethics in Science, UNESCO, 1, rue Miollis, 75732 Paris Cedex 15, France. E-mail: comest2004@unesco.org*

AGORA: interactive forum on science education for girls and women

UNESCO and L'OREAL are celebrating the International Women's Day through four online fora starting 8 March. Named AGORA, these fora will focus on science education for girls and women.

Agora is open to all members of the For Women in Science community around the world, which includes the L'OREAL-UNESCO Laureates, UNESCO-L'OREAL Fellows, International Jury Members, the network of nominators for the Awards, L'OREAL Researchers, the national Com-

missions for UNESCO, and the jury members and fellows from the national fellowship programmes launched by L'Oréal with the support of the National Commissions for UNESCO.

The site is accessible to the general public, but only community members can post comments.

Further information from: <http://www.agora.forwomenin-science.com/agoral/index.php> E-mail: agorafwis@loreal.com

Children and youth plant trees and network

On 22 March 2006, World Water Day, a special website was opened by the ENO Programme. This service encourages children and youth around the world to plant trees.

On the website they can register the date and place of their events, the number of trees and their species. They can also add photos with information. All the material is easily browsed by different categories on the website. Trees can be registered especially around UN thematic

days like World Environment Day or Peace Day but they can be registered any time during the year. A special focus is laid on developing countries, especially Africa.

ENO-Environment Online is a global virtual school for sustainable development administrated by the city of Joensuu, Finland in which currently 200 schools from 75 countries take part. It works in co-operation with UNEP.

More information from: <http://eno.joensuu.fi/treedata-base.htm>



Forthcoming conferences, meetings, seminars...

18th Symposium on Chemical Education: Towards Research-based *Science Teacher Education*, Bremen, Germany, **15-17 June 2006**. Further information from: Dept of Biology & Chemistry, Institute for Science Education, University of Bremen, Löbenerstr. NW2, 28334 Bremen, Germany or Dept of Chemistry, Didactics of Chemistry I, University of Dortmund, Otto-Hahnstr. 6, 44227 Dortmund, Germany. <http://www.chemiedidaktik.uni-bremen.de/>

International Scientific Conference on Desertification and Drylands Research. Tunis, Tunisia, **19-21 June 2006**. This conference will focus on drylands research, conservation, policy and sustainable drylands development. Organized by UNESCO in partnership with several international organizations, the conference is held within the context of the United Nations International Year of Deserts and Desertification (2006) as part of our collective efforts to reach the Millennium Development Goals. The major objective of this Conference is to review the current state-of-knowledge of dryland ecosystems and the socio-economics of dryland development in order to provide scientific and technical advice to decision-makers and for the implementation of the United Nations Convention to Combat Desertification (UNCCD). The conference will also mark 50 years of drylands research within the UN System.

For further information contact: *Thomas Schaaf, SC/EESS-MAB Secrétariat, UNESCO, 4 Rue Francois Bonvin, 75015 Paris, France. E-mail: t.schaaf@unesco.org* <http://www.unesco.org/mab/ecosyst/futureDrylands.shtml>

Ist Iberoamerican Congress on Science, Technology, Society and Innovation: *Ciencia, Tecnología e Innovación para el desarrollo en Iberoamérica* organised by the Organización de Estados Iberoamericanos para la Educación, la Ciencia y la Cultura (OEI), the Agencia Española de Cooperación, Internacional (AECI) and the Universidad Nacional Autónoma de México (UNAM) will be held in México City, México, from **19-23 June 2006**. Further information from: <http://www.oei.es/congresoactil/index.html>

Euroscience Open Forum 2006 (ESOF2006) - *Highlighting new research, new technology, new thinking*, is the second pan-European General Science Meeting to be held in Munich from **15-19 July 2006**. Euroscience Open Forum was brought to life by Euroscience, a grassroots scientific organisation founded in 1997 with over 2,000 members in 40 countries. ESOF2006 is initiated by the Robert Bosch Stiftung and the Stifterverband für die Deutsche Wissenschaft. Further information from: <http://www.esof2006.org>

An International Summer School for Young Physicists - ISSYP 2000 organised by the Perimeter Institute, Waterloo, Ontario, Canada, will be held on its grounds in 2 sessions - **22 July - 3 August** and **5-17 August 2006**. Participants in the two-week programme will get to explore the most fascinating ideas theoretical physicists have about how the universe works: from the

weird quantum world of atoms and subatomic particles to black holes, warped space-time and the expanding universe. They will also get to work with world-class theoretical physicists in small-group mentoring sessions, visit laboratories and enjoy social events. Meant for highly self-motivated students from around the world aged 16-17, with a keen interest and a strong aptitude in both physics and mathematics. **All costs associated with ISSYP within Canada will be covered by Perimeter Institute.** Further information from: www.youngphysicists.ca

Educación Energética para un Futuro Sostenible (*Energy education for a sustainable future*) organised by the Instituto de Ciencias da Educación of the Universidade de Santiago de Compostela (Spain), and ISPEJV of the Universidad de Havana (Cuba) will be held in Havana, Cuba, from **1-4 November 2006**. Further information from: *Comite Organizador, Instituto de Ciencias da Educación, Universidade de Santiago de Compostela, Avda de Las Ciencias, s-n, Chalé na3- Campus sur, 15782 Santiago de Compostela, Spain. Fax: 981.528.078.*

IV IberoAmerican Congress on Science Education (*IV Congreso Iberoamericano de educación científica: Innovación y socialización*) organised jointly by the Ministry of Education, Peru; CONCYTEC, Peru; and UNESCO-OREALC, will be held in Lima, Peru from **7-9 November 2006**. Further information from: *CONCYTEC, Calle de Comercio 197, San Borja, Lima, Peru. Fax: 511.225-1150 ext. 1455 E-mail: tsalinas@concytec.gob.pe* <http://www.concytec.gob.pe>

Tenth Annual Regional Science and Math Educators Conference: *Bridging Research and Practice (SMEC 10)*, organised by the Science and Math Education Center (SMEC) of the American University of Beirut with support from UNESCO/Cairo, will take place in Beirut, Lebanon from **11-12 November 2006**. Contact: *Dr. Marj Henningsen (marjh@aub.edu.lb)* or *Dr. Saouma Boujaoude (boujaoud@aub.edu.lb)*, Fisk Hall, SMEC, American University of Beirut, P.O. Box 11-0236, Beirut, Lebanon.

epiSTEME-2: Second international conference to review research in Science, Technology and Mathematics Education, organised by the Homi Bhabha Centre for Science Education, Mumbai, India **12-15 February 2007**. It is the second in the series of biennial conferences meant to review research world-wide in science, technology and mathematics education. The conference will focus on three broad strands that influence science, technology and mathematics education: History and Philosophy of Science, Technology and Mathematics; Cognitive Bases of STM Learning; and STM Curriculum and its Transaction. Contact: *Conference epiSTEME-2, Homi Bhabha Centre for Science Education Tata Institute of Fundamental Research, V. N. Purav Marg, Mankhurd Mumbai 400 088, India. fax: 91-22-2556 6803, 2558 5660 email: episteme@hbcse.tifr.res.in* <http://www.hbcse.tifr.res.in/episteme2>

Publications



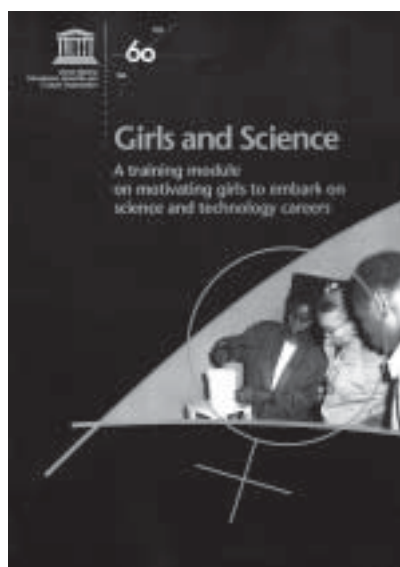
UNESCO Resource Kit on STE for the Arab states (CD-ROM). This CD-ROM is the outcome of the Experts Meeting held in Amman, Jordan, November 2003 (v. **Connect**, vol. xxix, no. 1-2, 2004) on transposing the UNESCO Resource Kit on STE to the Arab region context. **In Arabic**

only. For copies contact: Mr Sulieman Sulieman, Programme Specialist, UNESCO-Beirut, P.O. Box 5244, Beirut, Lebanon. Fax: (966-1)824854 E-mail: s.sulieman@unesco.org



UNESCO Science Report 2005 (2005, 274 p.) With a foreword by Koïchiro Matsuura, Director-General of UNESCO. The UNESCO Science Report 2005 is the fourth in a series which periodically presents a global overview of science. It reviews the state of science around the world through the eyes of an independent team of experts. A series of informative and thought-provoking

essays identify and discuss emerging trends in scientific research and higher education. Each chapter describes how research and development are organized in a given region or country. Who is performing research and development today? Where and with what means? What are the new priorities? Authoritative and readable, the UNESCO Science Report 2005 brings together an extensive number of figures and tables to help understand how contemporary issues are shaping science. Price: 44,00. Order (online): www.unesco.org/publishing or from: DL Services sprl – Jean De Lannoy, Avenue du Roi 202, B-1190 Bruxelles, Belgium. Fax: +32-2-538.08.41 E-mail: jean.de.lannoy@euronet.be



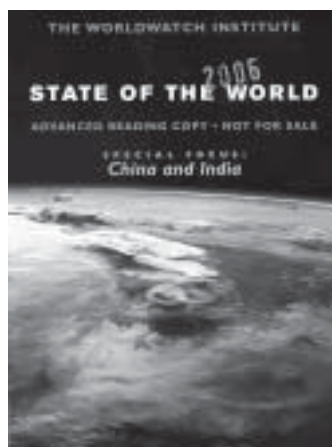
Girls and Science: A training module on motivating girls to embark on science and technology careers (2006, 132 p.). With women accounting for over 50% of the world population, gender parity is an issue of global concern. And to the extent that in a rapidly globalizing world it is the economic factor that is of

over-riding importance, it is essential to demonstrate the practical utility of STE if girls are to be encouraged to opt for science careers. It is with these considerations in mind that this module was developed by UNESCO's Science & Technology Education Section targeted at policy makers, teacher trainers, education and career advisors, teachers and inspectors. The module comprises six units: *Setting the Scene; Training and Supporting Teachers; Career Guidance; Career Guidance Activities; Training and Supporting Science and Maths Teachers; and Initial Teacher Education*. For copies contact: Science and Technology Education Section, UNESCO, 7 place de Fontenoy, 75352 Paris Cedex 07, France. Fax: (33-1)45.78.56.44



Technology based training for marginalized girls: Cambodia, Indonesia, Nepal. (2005, 68 p.) This report synthesizes the findings of pilot projects conducted in Cambodia, Indonesia and Nepal in the context of a UNESCO Project on Technology-based Vocational Training for Marginalised Girls. The project, initiated in 2002, aimed specifically at demonstrating that technical and vocational

skills training can have a significant impact on poverty reduction. It also showed that education together with the involvement of local stakeholders was critical in the success of such enterprises. For copies contact: Ms Julia Heiss, Science & Technology Education Section (address above).



State of the World 2006: Special Focus: China and India (2006, 272 p.). This edition focuses on the two most populous nations of the world who are also positioned, as the report states, "to leapfrog today's industrial powers and become world leaders in sustainable energy and agriculture within a decade". It emphasises the fact that the choices

made by these two countries in the coming years will be critical in influencing the path that global development will be led to follow. Besides China and India, this edition also critically examines, notably, trade and sustainable development, alternative energies, freshwater ecosystems, nanotechnology and environmental concerns. Abundantly illustrated with statistics, tables, charts, graphs etc. Price: US\$18.95 (+s&h). Order from: www.worldwatch.org/pubs/sow/2006/ or E-mail: wwpub@worldwatch.org Fax: 570.320.2079.



The UNITWIN/UNESCO Chair on Reorienting Teacher Education to Address Sustainability (York University, Toronto) and the International Network of Teacher-Education Institutions have prepared **Guidelines and Recommendations for Reorienting Teacher Education to Address Sustainability**. The guidelines and recommendations cover a number of areas that are crucial to the success of reorienting teacher education to address sustainability and include: 1) Ministerial and national level involvement; 2) Community and regional/provincial involvement; 3) Changes within institutions of higher education; 4) Funding and other resources; 5) Partnerships; 6) Research; 7) Communications; 8) Information Technology Opportunities.

Available online at: <http://unesdoc.unesco.org/images/0014/001433/143370E.pdf>

Earth Charter/UNESCO musical CD on iTunes. This international musical CD initiative is being developed under UNESCO sponsorship by the Earth Charter Secretariat in collaboration with the NGO "Pour la Terre". The songs, which reflect the diversity of the world, have been selected for their musical quality and the messages that they transmit. In France, an international CD is now accessible on iTunes at www.itunes.com (put Earth Charter or UNESCO into the search). The URLs mentioned in it will take you straight to the iTunes U.S site/children's genre. There is also some wonderful animation material in English on the Earth Charter at: <http://www.littleanimation4kids.com/EC/LEC.html> and <http://www.littleanimation4kids.com/EC.html>

One Pencil to Share – ed. Michael Chartres and Kathryn Paige, is a publication resulting from a collaborative project in primary mathematics and science education in the South African province of the Eastern Cape. The nine experiences of participating teachers presented in this volume relate the transformation taking place as black, rural and disadvantaged teachers feel 'free to learn'. The commitment and hope emerging in this project deserve to be shared with a wide audience, but particularly with educators working in adverse conditions. Price A\$30.00. Contact: *CREEW Books, Centre for Research in Education, Equity and Work, University of South Australia, Mawson Lakes, South Australia, SA 5095, Australia* (creewbooks@unisa.edu.au).

Science Education for Everyday Life: Evidence-based Practice (2005, 192p.) by G. Aikenhead. This book is the result of a three-year project that sought to juxtapose educationally sound research results with political realities of teaching science, in a way that reviewed a wide range of research for the benefit of graduate students and fellow colleagues in science education. It provides a comprehensive overview of humanistic approaches to science teaching - approaches that connect students to broader human concerns in their everyday life and culture. Price

US\$27.95. Further information from: *Teachers College Press, 1234 Amsterdam Avenue, New York, NY 10027, USA. Fax: (212) 678-4149* http://www.teacherscollegepress.com/info_desk.html#8

Environmental Education and Advocacy: Changing Perspectives of Ecology and Education (2005, 333 p.). Edited by Edward Johnson and Michael Mappin. The articles in this collection examine the issues arising from the use and abuse of the term «ecology» in environmental education to encourage ecologists to become more engaged with education at all levels. Although great efforts have been made to improve understanding of the environment via programs offered by educational establishments, government agencies and others, it is sometimes perceived that environmental «education» actually entails the «advocacy» of particular values and beliefs. Cambridge University Press. Price: £55.00 (approx. \$105/82). Contact: *NHBS, 2-3 Wills Road, Totnes, Devon TQ9 5XN, UK. Fax: +44 (0)1803 865280 mail: customer.services@nhbs.com*

Encyclopedia of World Environmental History (2006, 1600pp). This three volume set, written by a team of international experts, provides not only broad historical coverage on how human beliefs and actions have altered the natural world, but also covers the latest developments in the field. An analysis of natural phenomena and events and their impact on human societies is also included. Includes over 500 articles on topics such as: Acid Rain; Air Pollution; Alternative Energy; Biodiversity; Deforestation; Environmental Law; Famine; Global Warming; Law of the Sea; Rainforests and Social Ecology. Price: US\$595.00 including delivery. Order from: *Asia Pacific Infoserv Pty Ltd. (Acn: 118 111 756), GPO Box 2987, Sydney 2001, Australia. Fax: 61 2 4934.3692 E-mail: aapi@aapi.com.au*

The Australian Research Institute in Education for Sustainability (ARIES) has released a new series of **Reports on Educating for Sustainability**. Environmental education (EE) has had a long history in Australia and now, with the strength of the sustainability agenda, it is time to question what has truly been achieved through this process; what is the latest thinking and how has the practice of EE evolved to reflect this? What are the dominant trends in practice across the sectors and how do they contribute to creating a sustainable society? Each volume reviews a specific sector and identifies gaps and needs in EE so that they can be strategically addressed for the future. The series covers the following areas: Frameworks for Sustainability; School Education; Community Education; Business and Industry Education; Further and Higher Education. For paper or CD-ROM copies contact: ariescoordinator@gse.mq.edu.au providing postal details. PDF copies of the full reports or key findings can be downloaded from: <http://www.aries.mq.edu.au/project.htm> or <http://www.deh.gov.au/education/>

World Conference on Science & Technology Education

Perth, Western Australia, 8 - 12 July 2007

Incorporating:

- ICASE 2007 (Conference of the International Council of Associations for Science Education)
- CONASTA 56 (Conference of the Australian Science Teachers Association)
- CONSTAWA (Conference of the Science Teachers' Association Western Australia)

Conference Themes:

- Education for sustainable development, as part of the UNESCO World Decade of Education for Sustainable Development (2005-2015);
- World health (including AIDS, malaria, other diseases and health challenges such as clean water);
- Science for life and citizenship; and
- The Way Forward (educational directions and priorities established by ICASE)

For further information contact: *Elaine Horne & Robin Groves, Convenors, WorldSTE2007, PO Box 244, Mt Hawthorn, W.A. 6016, Australia fax: + 61 8 9201 0004 email: grovesr@ozemail.com.au*

CONNECT is also available on the Science and Technology Education homepage:
<http://www.unesco.org/education/educprog/ste/index.html>

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