

## BUILDING CAPACITIES IN SCIENCE AND ENGINEERING

*Knowledge in the Sciences and its Applications – the Key to Innovation and Sustainable Development*

INTERNATIONAL COOPERATION, RESEARCH, EDUCATION AND CAPACITY BUILDING IN SCIENCE AND TECHNOLOGY WITH A SPECIAL EMPHASIS ON AFRICA AND GENDER ISSUES: APPLICATIONS TO ENGINEERING, RENEWABLE ENERGY AND NATURAL DISASTER PREVENTION

### Background and description

UNESCO is the only UN specialized agency with a clear mandate to build institutional and human capacity in the basic and engineering sciences, a prerequisite for social and economic development. In the basic sciences, UNESCO's activities focus principally on third-level, but also second-level education and on research in mathematics, physics, chemistry, the life sciences including biotechnology and basic medical sciences. The International Basic Sciences Programme aims to advance, transfer, share and disseminate scientific knowledge and to transform this basic scientific know-how into useful applications for today's multiple sustainable development challenges.

Science education has been a priority for UNESCO since its inception. Promoting science education at all educational levels and scientific literacy in society in general, is fundamental to building a Member State's capacity in science and technology.

Engineering, the application of science and technology to create useful products and services, is vital in addressing basic human needs such as health, agriculture, drinking water, industry, building, energy, transport, disaster prevention and poverty eradication. Through the UNESCO Engineering Initiative, UNESCO aims to encourage students, particularly young women and men in developing countries, to study engineering.

Science for sustainable development and societies must benefit from the talents and perspectives of both women and men. However, reaching gender equality in science remains a challenge. A unique L'Oréal-UNESCO partnership For Women in Science forms the core of UNESCO's national and international activities to foster gender equality and equity in science.



## MAIN PROGRAMMES AND ACTIVITIES

### 1. International Basic Sciences Programme (IBSP)

Since 2005, IBSP has harnessed international cooperation for human and institutional capacity building in the basic sciences and the use of scientific knowledge. This includes scientific networking, transfer and sharing of scientific information and excellence in science through North-South and South-South cooperation. It also aims to promote the creation and strengthening of centres of excellence, the provision of scientific expertise for, and advice to, policy- and decision-makers, and to increase public awareness of opportunities offered by the basic sciences for meeting societal goals. Since its inception, about 40 projects have been launched and carried out within the Programme.

Examples of UNESCO's IBSP activities:

#### SESAME – Synchrotron Light for Experimental Science and Applications in the Middle East

This is a third generation synchrotron-light source facility promoting scientific cooperation, mutual understanding and tolerance in the Middle East and neighbouring countries. It aims to harness synchrotron light for research in the physical, biological and chemical sciences including applications in health care, the environment and cultural heritage.

#### International Year of Crystallography 2014

Even though crystallography underpins all the sciences today, it remains relatively unknown to the general public. One aim of the Year is to promote education and public awareness about this scientific discipline through a variety of activities.

#### L'Oréal-UNESCO partnership For Women in Science award, national and international fellowships

A highly successful L'Oréal-UNESCO partnership to promote women in science places special emphasis on supporting women scientists through an international award and international and national fellowships to harness the intellectual and creative potential of women for science and to encourage young women to take up careers in science.

### International Prize for Research in the Life Sciences

The purpose of this Prize is to reward the projects and activities of an individual, individuals, institutions, other entities or non-governmental organizations for scientific research in the life sciences which aim to improve the quality of human life.

### 2. Science Education

The steady decline of enrolment of young people in science is cause for concern. The UNESCO Science Education programme aims at updating curricula, offering hands-on workshops, providing kits and guidebooks free of charge, training teachers and students alike, and finally helping Member States ensure that a sound basis in science is not just a privilege.

Microsciences kits are distributed through teaching workshops as part of the Global Microscience Project. This is an international, cost effective, environmentally-friendly project to develop science education and scientific thinking through practical experimentation at the primary and secondary school levels. The mini-laboratories (microscience kits) with proposed experiments on physics, chemistry and biology have been distributed, so far, in over 80 countries.

Another highly appreciated teaching material is Active Learning in Optics and Photonics (ALOP). ALOP workshops train teachers to enable them to develop professionally and use their skills in teaching physics in a more effective manner; the student being the ultimate beneficiary of these activities.

A new teaching toolkit on *Learning to Deal with New Technologies: The example of Genetically Modified Plants* is aimed at educating both youth and general public on new advances and concepts in the biological sciences and biotechnology with the objective of enabling their informed participation as consumers in the process of decision making.

The World Library of Science, being developed in association with the Nature Publishing Group, is a transformative resource for secondary and university-level students, promising a database for current, high quality, research based information on all concepts of life and physical sciences.

### 3. Engineering Initiative

The Engineering Initiative was established to address major challenges in engineering, which is a major driver for social, economic and human development. These challenges include the shortage of engineers around the world, decreased interest in engineering as a career option for young people, the underrepresentation of women in engineering and brain drain from many countries, particularly less developed ones. The Engineering Initiative focuses on working with UNESCO Member States, international partners, and engineering and curriculum experts to strengthen engineering education through curricula development and capacity building, stressing the participation of youth and women.

The UNESCO Engineering Initiative, which was approved by the UNESCO General Conference in November 2011, has started several projects in partnership with the World Federation of Engineering Organizations (WFEO) and the Institute of Electrical and Electronics Engineers (IEEE).

UNESCO is supporting the Airbus Fly Your Ideas challenge, a student contest designed to inspire a new generation of aviation engineers.

### 4. Renewable Energy

Within the context of sustainable development and climate change, UNESCO's programme on renewable and alternative energy promotes the development of energy policies, capacity building, the sharing of scientific knowledge and best practices, and supports model pilot initiatives providing technical assistance for Member States as needed. The development of renewable energy training platforms and regional summer schools on renewable energy sources contributes to achieving sustainable energy for all, and, in particular, for developing countries.

### 5. Disaster risk reduction

Through its broad mandate and expertise, UNESCO helps its Member States to reduce their vulnerability to natural hazards and build their capacity to cope with disasters. UNESCO promotes international, regional and national platforms and networks for the assessment, monitoring and mitigation of natural hazards and promotes the establishment of early warning systems, notably for tsunamis, drought, floods and geo-hazards. UNESCO advises on disaster prevention through programmes on disaster risk reduction targeting national policies, the strengthening of human and institutional capacities, the promotion of education for disasters preparedness and prevention and climate change adaptation. UNESCO works to protect schools and heritage sites from natural disaster by building a culture of disaster resilience. UNESCO also advises on post-disaster assessment, response and recovery.

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