Technical Bulletin No. 10

SCHOOL SCIENCE KITS – from two different perspectives

UNICEF Supply Division has recently provided technical expertise to facilitate the procurement of science teaching kits for secondary schools. The purpose of this Technical Bulletin is to share these past experiences with UNICEF Country Offices and Procurement Services customers and offer some guidance for future procurement of science kits.

Summary & lessons learned

- UNICEF Pristina requested assistance with defining a supply list of laboratory equipment, chemicals, visual aids and didactic materials for 35 pilot schools in Kosovo.
- A procurement services project for Rwanda called for the provision of science teaching kits in microscale format, involving research into current methods of teaching biology, chemistry and physics.

These two examples used two different approaches to the establishment of science teaching laboratories in secondary schools (see below). For countries contemplating science education at primary or secondary level as part of their programmes, UNICEF Supply Division can provide additional information on products, information sources and new curriculum developments.

Steps towards implementation of a successful science education project:

- Needs assessment by an education programme specialist or a consultant with subject experts.

- Needs assessment may include such topics as:

  - Review of the curriculum development.
  - Physical state of the school buildings, including water and electricity supply.
  - Locally-available resources and after-sales service.
  - Staff resources – do the existing skills of the teachers require upgrading? Appropriate training to build capacity.
  - Didactic resources available locally.
  - Translation – are there specific language requirements for didactic materials? If so, can translation be arranged locally?

- Ordering supplies:

  - Would the science teaching be strengthened by the provision of visual materials such as posters, flipcharts, overhead transparencies?
  - Will additional packing be required in order to adapt the science kits to the local environment? Plastic boxes were used in Rwanda to prevent the loss of the component parts. The Kosovo kits were supplied ready-packed in lockable metal cupboards.
  - Does the country office have the necessary resources to compile a supply list, or should Supply Division provide suppliers' catalogues and product samples for evaluation?
  - Timeframe - requests for assistance with identification of appropriate products should be submitted as early as possible, together with an indication of when the school year begins.
  - Are the school laboratory products available from a number of suppliers, or a proprietary product (e.g. microscale) which is only available from one supplier?

Kosovo

UNICEF's involvement in the re-activation of quality secondary education in post-war Kosovo included the provision of laboratory kits for 35 pilot schools. The project began with a consultant's report

proposing the purchase of traditional laboratory glassware, equipment and chemicals. In order to facilitate the procurement of appropriate supplies, a UNICEF Supply Division technical staff member was sent to Kosovo to visit some of the pilot schools, review the class locations assigned to science teaching, as well as meet with local teachers, to define their requirements for equipment and supporting materials.

From the visit, it became apparent that the schools did not have classroom space dedicated to laboratory use. It would be necessary for the equipment to be stored in a locked cupboard in a central location and then transported up several flights of stairs, along uneven floors to the classroom where the lesson would take place. Water and electricity supplies were unreliable and teachers, who had had no access to training for over ten years, felt the need for a training workshop to enable them to utilize any equipment purchased. Overhead transparencies and didactic materials to support the science teaching programme were also requested, preferably in the local languages, Albanian, Serbian and Turkish.

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Portable laboratory in a metal storage cupboard. Workshop for Albanian teachers in Peja, Kosovo.

The complexity of the requirement was such that suppliers were asked to propose a solution for teaching science in the situations described in the tender. The solution accepted was that kit components would be supplied packed in lockable, metal storage cupboards, modified to accommodate the larger components. A smaller portable storage unit would be provided for moving the equipment around the school; safety materials such as goggles, gauze mats for tripods and mats for hot beakers were also suggested, as well as pictorial and didactic materials.

Following receipt of the laboratory kits in Kosovo, two training workshops were held, in Peja (for Albanian-speaking teachers) and Mitrovica North (for Serbian-speaking teachers), using a facilitator experienced in international science teaching. The objectives of the training workshops were:

1. To train teachers from the pilot schools to use the newly supplied science equipment.

2. To train teachers in recent approaches to effective science education, in particular new child-centred inter-active learning techniques.

3. To ensure sustainability:

a) by training teachers to pass on their knowledge to colleagues.

b) by showing teachers how to utilize locally available materials, such as fruit, vegetables, local alcohol instead of imported chemicals which may be difficult to replenish, or hazardous to transport.

UNICEF Pristina worked in close collaboration with UNICEF Supply Division, Copenhagen to ensure that all training materials were translated into the local languages and that interpreters were available to assist the facilitator. Consumables and support materials for use in the training venues were purchased locally. During the visit to Kosovo, the facilitator held talks with the curriculum core development team from the Ministry of Education, to ensure that the training was in line with the latest development in science teaching in Kosovo.

After the workshop the kits were distributed to the 35 recipient schools. Teachers who had participated in the workshop agreed to act as resource persons and share their knowledge with colleagues.

Rwanda

As part of a large Procurement Services project on behalf of the Ministry of Education in Rwanda, UNICEF supplied thirty secondary schools with Microscale science kits plus teacher's and student's manuals, microscopes and supporting didactic materials in French and English, such as overhead transparencies, video cassettes and posters.

A needs assessment had identified the Microscale science system for teaching as the most appropriate to the situation in Rwanda, where schools average 480 pupils and the pupil/teacher ratio is high (around 40 pupils per class).

Microscale science teaching was developed in the U.S.A. during the 1980's at university level, where it

proved to be an environmentally-friendly way of carrying out chemistry experiments, using small quantities of chemicals (less waste disposal). The obvious advantages of microscale science (low-cost equipment, savings on consumables, higher safety levels, faster results, minimal waste disposal problems and hands-on opportunities for students) has lead to the development of kits for teaching at both secondary and primary levels.

The range of microscale science teaching covers physics, chemistry, biology and environmental science. Microscale science is an officially recognized teaching method in both U.S.A. and the U.K. and through the active support of UNESCO (Basic Sciences Division) the system has become established in a number of African countries, as well as several in Central Asia.

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Participants working with titration experiment at a chemistry workshop in Kigali, Rwanda.

Experiments are carried out using a comboplate (approximate dimensions 12.5 x 8.5 cm) made of durable plastic with 12 cross referenced 2 ml wells and 48 cross referenced 0.3 ml wells. The wells are used for chemical reactions, as well as for performing physics investigations, or water quality monitoring. Minute quantities of chemicals are used and the system does not require special equipment or laboratories, since each kit is equipped with small glass bottles, mini burner, thermometer, etc.

The Microscale science kits are supplemented by very clear teachers' and students' manuals, as well as worksheets. A single kit can be shared by 5-6 pupils working in a group and children adapt quickly to this innovative teaching method. Teachers trained in the traditional methods of science teaching can face problems; handling the small component parts requires both manual dexterity and good eye/hand co-ordination.

Shortly after the receipt of the microscale science kits in Rwanda, teacher training workshops in biology, chemistry and physics were conducted in Kigali by facilitators from the Yaounde Microscience Excellence Centre in Cameroon.

For more details, please contact UNICEF Supply Division, at customer@unicef.org.

Useful links:

www.ase.org.uk Association for Science Education

http://icase.unl.edu International Council of Associations for Science Education

www.scienceacross.org Science Across the World – international exchange programme in which students aged 10 to 16 years, exchange facts and opinion on current science topics, in up to 18 languages.

www.unesco.org Basic & Engineering Sciences