

DESIGN, DEVELOPMENT AND PRODUCTION OF LOW-COST SCIENCE EQUIPMENT

The urgency of the need to develop low-cost science equipment for schools in the Caribbean was brought up during the presentation of country reports on the first day of the Seminar. This need was subsequently emphasized during the discussion of the lead paper on the potential for local manufacture of school science equipment and problems of equipping school laboratories. The general consensus of participants was that the development of equipment in each country should become an integral part of the local science curriculum.

During the discussion of the paper, attention was drawn to the need to generate ideas for the design of such equipment, to identify the role that relevant bodies could play in generating and making use of practical ideas, and to consider the function of production units in areas of design, production and evaluation of such equipment.

Production Unit

The issue of whether or not a centralized or decentralized unit should be set up within the Caribbean received much attention. Although the participants recognized that a centralized system would have such advantages as availability of resource materials and specialist skills, it was generally agreed that the difficulties involved in the mass production, distribution, communication and material resources could best be solved by decentralization. In this connection it was proposed that a survey of each territory should be conducted to determine how feasible it would be to set up such units within each territory. Meanwhile, however, the participants accepted the proposal that the first stage in setting up a production unit at the regional level should be the creation of a central monitoring body. One of the functions of this body should be to disseminate ideas on the design of equipment in the region.

Science Education Programmes

The country reports revealed that in some countries science education was not receiving, either from teachers or from Ministry officials, the attention and consequently the place it deserved in the curriculum. Therefore, it was recommended that every effort should be made to convince governments about the need to accord high priority to science education at all levels, and to provide the time and money necessary for its development.

Also, in order to overcome the lack of adequate teacher training, which is one of the major obstacles to the introduction of science at the primary level, the following suggestions were made:

- (a) Organization of seminars/workshops for interested participants.
- (b) Demonstration and provision of materials, including specimen lessons.

(c) A salaried curriculum committee chairman to ensure continuity of curriculum development programmes.

(d) Consideration for adoption of the system in practice in some countries where the first week of the academic year is devoted to teacher seminars at which attendance is compulsory.

It was noted that a government body like the National Council of Educational Research and Training (NCERT) in India, assists in the development of meaningful programmes in many areas of difficulty, even before the design of equipment is attempted.

Areas of difficulty outlined by participants were: a curriculum that meets the needs of the schools; the motivation and training of teachers particularly at the primary level; development of instructional materials such as teachers' guides; and the provision of adequate laboratory/workshop facilities including trained technician staff.

It was also emphasized the money is an absolute factor in determining what a programme might be, and that proper costing therefore should be considered before ambitious schemes are attempted. Further, it was noted that the development of low-cost equipment should be seen as a necessary support to curriculum-based on pupil-oriented practical experience in science, and that the use of indigenous resources, including "scrap" material, would help to conserve much-needed foreign exchange.

Generation of Ideas for Equipment

Many of the countries represented at the seminar have science teachers' associations which are members of the Caribbean Regional Organization Association for Science Education (CROASE). It was recommended that where national science teachers' associations are presently non-existent, CROASE should encourage the formation of such organizations. It was also agreed that CROASE be requested to act as a clearing-house for teachers' ideas on designs, noting that teachers could generate ideas through activities such as science exhibitions and seminars/workshops similar to the current meeting.

A number of suggestions involved the use of students, at various levels, as a source of ideas. It was felt that technical students could concentrate on functional designs, while teachers in training colleges and undergraduates in university colleges should concentrate on methodology. Participants suggested that it would be useful to have a museum of scientific equipment and that regular exhibitions would be a stimulus to creativity in all sectors of the community, including technicians from schools, universities, industries, and other sections of government.

Also, exposure to existing pieces of apparatus and kits (such as those presented during the present seminar/workshop) could act as a stimulus to further ideas. In this regard it was recommended that a directory of commercial kits and literature about their use should be compiled for general information.

The Role of Relevant Bodies

Each of the territories represented at this meeting has some form of institution involved in curriculum development. This type of arrangement varies from informal activities of teachers to units within ministries of education or universities respectively. It was suggested that all efforts at producing ideas for

equipment design should be co-ordinated very closely with the curriculum development efforts of the various bodies, namely, science teachers' associations, university departments, educational research units, and the Caribbean Examinations Council. In particular, if countries plan to set up production units, national science research units should, where they exist, be asked to provide financial, technical and managerial assistance. Where these bodies do not exist, or where it is difficult to obtain assistance from such bodies, it was suggested that assistance should be sought from international or external donor agencies like UNESCO, UNICEF, the Commonwealth Secretariat, CIDA, and the British Council. In relation to funding by external agencies, attention was drawn to the Commonwealth Secretariat publication, International Activities in Science and Technology, which provides information on such donor bodies.

The meeting noted that the School of Education at the University of the West Indies, University of Guyana, and the Science Evaluation Unit of the Caribbean Examinations' Council could be sources of specialist advice in the field of production of equipment. It was felt that if territories kept them informed, their organs of communication could be used to disseminate information on areas of design, production and evaluation throughout the Caribbean.

In connection with evaluation of equipment, it was thought that when prototypes are available, items which lend themselves to production should be put into pilot schools as a kit. For effective pilot projects, it was suggested that in general, equipment should be tested in a wide range of school situations, and that the prototype builder should be involved in the testing exercise. Again, with regard to evaluation it was pointed out that difficulties relating to subjectivity in evaluation could be avoided or minimized by instituting cycle of work, with feedback at each stage. Evaluation could end with a conference of interested parties to review the programme.