

Section 5

GENERAL CONSIDERATIONS

"Local production" and "improvisation" are not synonymous with one another, although they are often used in the same context. Teachers can readily improvise, using local materials, for their own requirements, and they are increasingly being encouraged to do so during their pre-service training. Local production, which implies a sophistication over and above local improvisation, is related to producing apparatus for the needs of the whole school system rather than for the needs of the individual school.

Local production is being implemented by many countries for basically two reasons: the lack of financial resources to supply the whole school system with equipment which has to be imported, and the development of curricula related closely to the local environment.

To reconcile local production with improvisation we can say that the local production unit provides the teacher with his basic requirements. The teacher then extends his teaching resources by improvisation. Whittell summarizes this distinction quite ably*. The NCERT publication, Improvising Science Teaching Kits for Schools is an example of the mis-use of the word "improvisation" since it really relates to the development of kits for the whole school system.

The foregoing chapters deal with centres developing school science equipment. Apart from DAYM these centres could also be classified as assisting with improvisation through their in-service course work. In this section it is perhaps worthwhile to indicate some of the less evident areas of concern which became apparent during the case studies, and which may be of help to a country when it considers establishing a production unit.

DEVELOPMENT OF APPARATUS

Kit Development Two centres are concerned with developing kits for teaching science. These kits are basically demonstration kits, although one centre has also developed pupils' kits. The lack of adequate finance for school equipment often limits the purchase of apparatus to one-off demonstration items. In India for example, with some 460,000 primary schools,

* Whittell, J.M.S., "Local Production: Principles and Practice", School Science Review, Vol. 56, No. 197, June 1975, pp.669-84.

the development of a demonstration kit is probably the only way of getting practical science introduced into the schools. Naturally such introduction is also coupled to teacher competence. If the teacher education system does not orientate teachers towards practical science, then the teacher demonstration kit, rather than the kit for pupil involvement, is likely to be the norm. The project operated by the Educational Technology Department of the NCERT to investigate the use of satellite television to provide in-service training to rural teachers would be worthy of closer examination as a means of orientating serving teachers towards practical science teaching.

The development of a kit pre-supposes that it is to be an integral part of the teaching syllabus (although this is not necessarily so). Consequently curriculum and equipment development should proceed together. In India the two units are part of the same Department which work together to produce the whole. In Kenya the production unit is remote from the curriculum development unit. Hence the production of kits was only undertaken after the production unit had made a survey of the needs of the schools and the availability of teaching apparatus from local commercial suppliers. It is obvious therefore that before a kit is developed a thorough identification of the role of the kit must be made, particularly its relationship to the curriculum.

Non-Kit Equipment

The DAYM production unit in Turkey is an example of a production unit which concerns itself with producing some 80% of the school science equipment requirements, as compared to India and Kenya which produce only kits. Because such a production unit produces apparatus for use in many learning environments, it can operate independently from curriculum development. One of the dangers of this isolation is that too little innovation may take place, and the items produced may be stereotyped year after year. To prevent this from happening the design and development section of such a production unit needs to have close links with curriculum developers so that changing curriculum requirements can be reflected in their products.

Quality of Products

There is quite a difference between a good idea and a quality-produced piece of science equipment, and appropriate staff are necessary for all stages of development. Many factors have to be taken into account before a good idea reaches the classroom. This is best illustrated by an example from NCERT. The primary science kit was originally designed to be wall-mounted and at the same time to provide a safe storage for the apparatus. So the container had to be sturdy. With village schools having mud walls, the fixing of this robust container proved difficult or even impossible, and when mounted the demonstration surface was not always at a suitable height for the children. The kit went through a series of containers before one was found suitable to meet the requirements of the village schools.

A further example from NCERT relates to the quality of product. Under its component of assistance, UNICEF provided kits of apparatus which, though based on the workshop designs, had to be purchased from commercial suppliers (due to the production load on the workshop). Considerable quality control problems existed, and the workshop department held three courses in 1974 to train key personnel from each State in the inspection and quality control of science kits. The courses included introduction to engineering instruments and materials, particularly related to the kits developed. An inspection kit was developed during the course and supplied to each key institution in the States. Since the kits include items manufactured by local industrial concerns, the department has its own quality control unit. In addition, by implementing the tender requirements on a batch number basis, no supplier is able to become complacent in the belief that he will automatically receive an order. Nor is the lowest tender bound to be accepted, although reasons have to be given to justify

any action taken. Where the department finds sub-standard quality it refers the items to the National Standards Institute. The Institute on its part occasionally requests the department to supply specifications for certain items. Hence a close co-operation exists in an attempt to maintain standards.

IN-SERVICE TEACHER TRAINING/CURRICULUM DEVELOPMENT

NCERT in India and RECSAM in South-East Asia are two centres which provide course work. RECSAM in particular is concerned with curriculum activities and is not a production unit as such, though eventually it will have workshop facilities for developing and producing prototypes which member countries can then reproduce in their own centres. (The Curriculum Development Centre in Kuala Lumpur is an example of one such centre in one of the member countries.)

At NCERT, most course work has been related to the primary science project, with selected State institutions providing facilities for the in-service training of teachers. The choice of such institutions needs to be carefully made so as to ensure that they are all able to support the duties required of them. The successful running of courses requires the timely provision of the necessary finance and materials.

It is important that courses should be provided over as wide a geographical area as possible and not only in the Centre. This not only helps the teachers in their own environment but assists the public relations that are needed to establish the credibility of the Centre. It also provides the basis for the multiplier effect whereby the Centre's activities can reach persons who themselves are not directly involved but who nevertheless may be required to make a decision affecting the implementation of the Centre's activities.

RECSAM, as a regional centre, relies on the multiplier effect in operating its courses. On returning to their countries, participants are expected to be in a position to train others and influence local developments. Ideally, this pre-supposes that course participants should be selected from those (such as senior teacher educators, curriculum developers, and administrators) who can wield some influence. In practice, it is unlikely that such individuals can be released for extended periods of some twelve weeks duration and course participants are therefore generally chosen from the teacher or teacher educator level. Nevertheless, this does not necessarily negate the multiplier effect as long as courses for the senior educational administrators are provided so as to orientate them towards the effective use of the course participants within the national system.

At RECSAM a procedure exists for providing an overlap to courses, and for enabling some participants from a previous course to return to participate in later courses. In this way feedback is obtained, and continuity in the development of curriculum materials and equipment is ensured. In India a similar process has been tried. In 1975, a seminar for participants from selected teacher training institutions was held to deal with the use of local resources to supplement the developed kits. Such a seminar was found necessary to overcome the immediate impracticality of providing every primary school with a kit. A UNICEF consultant specializing in local resources related to the child's environment assisted with this course. A second workshop was held early in 1976 using previous participants who presented and discussed their prepared materials. The workshop then considered further possibilities in the use of local resources as well as media of instruction. Workshop assignments were related to the use of pictorial posters as a medium of instruction for primary school children. The results of this approach will be analysed at a further workshop to be held at a later date. (The UNICEF consultant was again present at this workshop.)

ESTABLISHMENT OF LOCAL PRODUCTION CENTRES

It is worth noting the efforts referred to on page 20 to produce school science equipment in Kenya prior to the existence of SEPU. These were made at educational institutions which either utilized the services of school-aged children or university students and teachers in training who did not have the necessary technical training or skills to produce the required items. In addition to this problem, it was found that a term-based programme was not conducive to effective continuous development or quality production. Only when SEPU came into existence as a separate entity with its own autonomy could it really be said that a production unit existed to serve the needs of the school system. In Turkey DAYM started as a component of a technical/vocational teaching establishment which rapidly developed an autonomy of its own (i.e. not tied to term-time operating). In practice this autonomy was brought about by employing craftsmen and others to provide the continuous operation while at the same time, the students in training participated in the activities during their teaching programmes. NCERT and RECSAM were established as continuous-operation educational establishments.

Physical Facilities

If the Centre is to be of a multi-purpose nature (i.e. equipment development/curriculum development/course work/repair maintenance), considerable care is necessary in providing adequate facilities to meet the demands. If course work is to be a regular component hostel accommodation as at NCERT and RECSAM needs to be provided. In the RECSAM development, priority was given to hostel accommodation with the purpose-built facilities for course work and administration following as a second phase. In practice, the planned dining and recreational building was used for teaching purposes, and will revert to its intended function on completion of phase 2. Phase 2 will have prototype production workshop facilities as well as a small practical area for course work (improvisation). This highlights the need to separate the design and production component of a centre from the course work component. A workshop trying to cater for production as well as training is not usually successful at either. NCERT was developed as a whole, but its course work activities are carried out separately from the production workshop area. DAYM and SEPU are not directly involved in course work but at SEPU the facilities of the teacher training college could be utilized for course work.

Finance

A centre must be provided with enough money to enable it to operate properly. The amount will depend upon the manner in which the centre is going to work. For example, it was envisaged that after its initial establishment, SEPU would become a self-financing operation, and in actual fact it has a sales manager concerned with the marketing of its products. DAYM is a Ministry establishment, and its products are ordered directly by the Ministry and distributed accordingly by them. Similarly, NCERT has its own budget with State Ministries of Education purchasing directly from NCERT. The production of kits at NCERT is mainly related to a primary education project which is supported largely by UNICEF.

Staffing

The staff of a centre must have the right type and level of training. For example it is not realistic to expect a science teacher to be competent in the design, development and production techniques of school equipment. RECSAM, for example, will need to consider this problem when the section dealing with the development of prototypes comes into existence because this operation requires personnel with an engineering background who can liaise and interpret the requirements of the educationist. The other centres have met these requirements, as can be seen from the example of the personnel involved at NCERT.

Components

Mention has already been made of the multi-purpose nature of a centre concerned with the development and production of school science equipment. Not only is it necessary to produce the equipment and get it into the schools but it is also necessary to consider that the equipment will need some follow-up replacement of parts. Consequently, the requirements of staff and facilities for repair and maintenance should be considered when establishing such a centre. Trained laboratory technicians may also be needed in the schools. It is worth noting that of the four production centres only one was concerned with this aspect of equipment care.