Developing diagnostic assessment instruments for technology

DATER 90

DEVELOPING DIAGNOSTIC ASSESSMENT INSTRUMENTS FOR TECHNOLOGY

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Background

In 1988 SED commissioned SARSU to write a paper exploring the links between technology and home economics and the role which the latter could play in delivering the 'Technological Activities and Applications Mode' in Scottish secondary schools. (See Figure 1 for a list of the 'Modes' current in Scottish secondary education).

Figure 1: The 'Modes' in Scottish Secondary education

1. Language and communication	2. Mathematical studies and applications
3. Scientific studies and applications	4. Social and environmental studies
5. Technological activities and applications	6. Creative and aesthetic activities
7. Physical education	8. Religious and moral education

The Technological Activities and Applications Mode is defined as follows 'development of practical skills; designing, making and using artefacts; practical problem solving and applications' and expanded thus — 'Activities within this mode promote the development of technological capability through the processes of designing, making and evaluating the effectiveness of systems or artefacts; these experiences provide opportunities for the acquisition and application of knowledge, practical skills and the generic skills of problem-solving, co-operation and enterprise; involvement in such work makes a major contribution to pupils' growing awareness and appreciation of technological applications in their environment. (SCCC, 1989)

It was planned to begin the paper (*Technology in Home Economics,* Turner et al, 1989) with a definition of technology but this proved no easy task. A literature search provided almost as many definitions as there are writers on technology. Eventually, five defining characteristics of technology (Figure 2) were distilled from relevant literature. These have been used as a working definition in the current project

Figure 2: Five Defining Characteristics of Technology

A review of relevant literature revealed the following characteristics about which there appeared to be a large measure of consensus

1. a concern with some of the material needs of people;
2. a system study of the design, production and use of artefacts and systems;
3. a concern with adapting the man-made environment;
4. open-ended problem solving;
5. a focus on efficiency.

Reference: Turner et al (1989) p2

Diagnostic Assessment in Technology

In 1989 the Training Agency funded a two year project based at SARSU which aims to develop a diagnostic assessment resource in technology in collaboration with teachers in TVEI schools.

Work began in April with an extensive literature search to update and build upon the bibliographic work reported above. It has resulted in the, initially unanticipated, publication of an annotated bibliography (*Technology: an annotated bibliography*, Turner et al, 1990).

Early contact was made with TVEI Co-ordinators in Scottish local authorities who recommended schools with interesting developments in relation to technology in different subjects. These departments were visited and a selection made. When the new school session started in August, 1989 close collaboration with small groups of teachers in ten departments began (See Table 1).

Table 1: Departments involved in 'A Diagnostic Resource in Technology' Project

School No	Subject	Pupil Group	Type of Course	Details of Assessment
1	English	S5/6	SCOTVEC Modules Media Studies 1 Media Studies - television	Issues addressed include: - assessment of group work (structured recording folio) - quick checks on technical terminology, procedures etc - self evaluation sheets for individuals (with a measure of peer assessment)
2	Social Subjects	S3/4	Standard Grade 'Contemporary Social Studies'	Concentrating on a unit called 'Change in Society' Delivered in a flexible learning environment, - assessment of awareness of technological impact, data base, micro-fiche and photographic interpretation skills
3	Technical	S3/4	Standard Grade Craft and Design	Concentrating on the internally assessed element - designing - paying particular attention to pupil self-assessment which involves simplifying published assessment criteria for pupil use.

4	Physics	S3/4	SEB Short course 'Electronics in Society'	Specified learning outcomes:. Pupil demonstrates .... 1. awareness of the impact of electronics on the individual. 2. awareness of the impact of electronics on society 3. Pupil accurately records/reviews his/her participation in group activities. 1 and 2 are being addressed by means of a number of quick-to-complete assessment instruments (eg close passages, picture stimuli) and a new pupil log book has been devised.
5	Business Studies	S3/4	Standard Grade Office and Information Studies	Specifically Unit on 'Electronic Office'. It is hoped to develop machine-based assessment instruments relating to use of databases.
6	Comput-ing	S3/4	Standard Grade 'Computing Studies'	Word processing unit. Several assessment instruments have been developed to check on pupils' knowledge and understanding and their ability to solve problems.
7	Technical	S3/4	Standard Grade Technological Studies	Specifically the problem solving element. Developing a feedback sheet for pupils as they proceed with problem. Conceptual difficulties encountered. Need for short instruments to assess pupils' understanding of crucial steps in process identified and being met.
8	Art	S3/4	Standard Grade Art and Design	Attention focused on the internally assessed element of designing but it impinges on critical activity. A successful instrument is a grid which allows pupils to assign a number of activities to particular stages of design process. Work is proceeding on an evaluation checklist.
9	Technical	S3/4	Standard Grade Technological Studies	Specifically - problem solving. A pupil log book has been produced, used, modified and re-used. It provides structure to lead pupils through the process and has built-in self and teacher assessment points. Additionally short tests of knowledge, terminology have been produced.
10	Art/Home Economic	S3/4	SCOTVEC module 'design and make'	Before starting the module pupils do a taster course in which they are introduced to the PRISME design model. One instrument is a cartoon strip which assesses their understanding of its stages.

NB. Scottish pupils take national public examinations (Standard Grade) in their fourth year (S4) after a 2 year course. Fifth and sixth year pupils (S5 and S6), may take courses leading to Higher Grade qualifications and/or National Certificate Modules. Modules, which last for forty hours, are designed, validated and moderated by the Scottish Vocational Education Council (SCOTVEC) though assessment in carried out by teachers. Some modules are also available to S3/4 pupils. The Scottish Examination Board has also introduced ‘short’ modular courses of 20 or 40 hours duration.

Some of the subject areas represented — technological studies, craft and design, home economics, computing are to be expected but some of the others — English and Contemporary Social Studies are perhaps surprising. The five defining characteristics outlined earlier were applied when choosing departments to work with. It is clear, however, that in most cases only some of these characteristics are present. It is our belief that such activities can make a genuine contribution to pupils' technological

education provided they and their teachers are well aware that certain aspects of the technological process are missing from these experiences.

Over the years SARSU has evolved a successful assessment development strategy while working with teachers in other curricular areas. (See, for example Black and Devine, 1987 for social subjects and Black and Devine, 1987, 1989 for mathematics). This strategy, which will be described and exemplified during the presentation, has been more or less completely followed in all the departments though inevitably progress has been greater in some areas than others. The teachers' contributions are crucial in identifying the key skills and knowledge which their pupils need to master before making progress. Additionally their knowledge of what pupils find motivating is invaluable. Pupils too have a role to play. They try out all the instruments in class and the resulting feedback is used to make modifications where necessary. Revised assessment instruments are then further trialled with other pupils groups.

A wide range of assessment instruments is currently being developed. Some will look very familiar — they are variations of multiple choice, short answer or structured questions, some using picture stimulus. Others are recording devices which pupils use during practical or project work but which have built-in check points. Yet others require 'hands on' involvement — for example the only way to assess whether pupils can **use** a database is to get them to use it. Probably the most innovative format is the use of a cartoon strip to assess understanding of the PRISME design model with which the design students in School 10 must be familiar before going on to design artefacts.

The DATER presentation

The presentation at the conference will concentrate on describing the process used to develop assessment instruments and illustrating the various steps in that process with examples drawn from different subjects. At this point it would be inappropriate to specify which examples will be used because they are still in the process of evolution. It should be stressed that even by September the majority of the assessment materials available will still be draft form. Final publication of the resource is planned for 1991.

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**SARSU forms part of the Scottish Council for Research in Education (SCRE) and is located in Edinburgh. The Unit is funded by the Convention of Scottish Local Authorities, the Scottish Education Department and SCRE itself. Amongst its other remits (supporting local authorities' staff development programmes and conducting fundamental research in relation to assessment) SARSU is charged to collaborate with teachers in the development of classroom-based assessment materials). Currently the Unit is headed by Harry Black, Senior Research Officer at SCRE and there are three full-time members of staff — Marion Devine, Eileen Turner and Ursula Schlapp.*