

C.D.T. - Unity or Trinity?

There are two very powerful reasons why the current nationwide consultation exercise to determine national criteria for Craft, Design and Technology at 16+ is both welcome and timely. Firstly, CDT, as a school subject, is emerging from a transition period in which extensive changes in philosophy, objectives and content have taken place. Secondly, CDT, traditionally a boys-only subject, is increasingly being offered to the female half of the school population. The task of developing national criteria, which is essentially a consensus-seeking exercise, is made that much more difficult in the context of change, but more critical, in that the emergent criteria should in no way restrict the process of change nor constrain the curricular gains already achieved.

For some years now the teaching approach which emphasises traditional handcraft skills has been giving way to a curriculum that is more concerned with the development of cognitive abilities. The existence of these opposing influences creates a special problem for CDT National Criteria. The present confusion among parents, employers and pupils about what exactly constitutes a course in CDT is reflected in the wide variety of course types currently being examined in this subject area.

Of the 75 CSE Mode 1 and GCE 'O' level courses which shelter under the CDT umbrella, less than half can be said to be concerned with the central aim of the subject – which is to give girls and boys confidence in identifying, examining and finally solving problems with the use of materials. And amongst the minority of courses that satisfy this central aim there exists a wide variety of assessment methods. How can nationally agreed criteria reflect such a spectrum of practice, support curriculum developments and, at the same time, win credibility amongst users?

The working party on national criteria proposed one solution. CDT teachers will remember that the draft proposals circulated to all schools in February of this year divided the subject into three areas: 'craft and technology', 'craft and design' and 'design and technology' and went on to develop detailed criteria for the second and third of these. (Technical Drawing or Graphic Communication was an additional area, but because of its rather different nature and special resources required it is not included in the present discussion) These divisions reflect the stages through which workshop-based courses have progressed in recent years. By proposing separate criteria for each stage these become fixed and further development is constrained.

The divisions are also closely tied to perceived employment definitions (craft and technology: mechanic, plumber, etc.; craft and design: turner, fitter, carpenter, etc.; design and technology: technician, engineer, etc.) which have been stereotyped as male. While the subject is thus geared to specific employment the operation of stereotyping will tend to make it less accessible to girls than to boys. Unless criteria are relevant to all secondary

school pupils, girls as well as boys, the subject will continue to exclude half the school population by its image and ethos.

Before national criteria can be formulated we suggest that the following aspects of Craft, Design and Technology must be recognised and accepted: (i) The essential irreducible elements of courses containing the words 'design and technology' in their titles need to be isolated. The key and common characteristic of all design-based courses is the *design process*. The systems to which the process applies may vary and include one or more of materials, structures, electronics and so on, but the *process* is common.

(ii) Courses in CDT must be seen first and foremost as an important ingredient in general education, and should be portrayed as being equally relevant to all possible career orientations. In providing opportunities for problem-solving and personal decision-making in the context of real problems for which there are no single right or wrong solutions, CDT courses contribute uniquely to education in the years of compulsory schooling and should be equally accessible to girls and boys.

(iii) CDT examinations must pay more than lip service to the claims made for them regarding their relevance to the wider concerns of technology in society. As with Science, Economics and all other subjects, the design process has a social context. Concern for the social implications of science and technology has been shown to be an important differential discriminator between boys and girls in subject choice. By attaching greater importance to social responsibility in CDT examination courses the motivation of girls to choose and maintain interest in CDT subjects is likely to be increased. The education of boys would also benefit by such an emphasis.

(iv) If criteria for CDT are to be concerned with a core process rather than a core content, it follows that examination techniques most appropriate to the assessment of process criteria should be used by public Examination Boards. There remain difficulties in assessing design and problem-solving skills, but some assessment techniques such as the use of coursework, reports, logs, folios and extended design examinations are more likely to succeed than timed written, objective type, practical and realisation examinations.

It was with these considerations in mind that the GATE (Girls and Technology Education) project* recently convened a conference** to identify criteria for CDT that would be relevant to all boys and girls in 16+ examination courses. The criteria arrived at are outlined here and they represent an alternative view to those proposed by the Schools Council and the Joint Examinations Council CDT Working Party.

	Common Core	Assessment Objectives
(a)	knowledge and information research skills	3, 6, 7, 8, 10, 17, 22
(b)	problem solving and decision making activity	1, 3, 5, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 21
(c)	realisation	12, 13, 14, 15, 16, 21
(d)	social responsibility	2, 4, 5, 11, 14, 15, 16, 18, 19, 20, 21, 22

Figure 1:

1. Introduction:

Craft, Design and Technology is principally concerned with design and problem solving processes, which draw upon scientific and technical knowledge and which influence for good or ill the quality of life of the present and future generations.

2. Titles:

'Craft, Design and Technology' is an umbrella title for a wide range of activities pursued in school workshops. It is also used by many schools as a departmental label and by at least one Examination Board as a course title. It may therefore be confusing to use the full term to describe examination courses conforming to the criteria detailed here. We consider, however, that the inclusion of the words 'design and technology' in all such courses is essential.

3. Aims:

The aims of a course in Craft, Design and Technology are:—

1. To promote the development of competence and self-esteem through making decisions and evaluating the consequences of these.
2. To foster awareness, understanding and experience in those areas of creative thinking which can be developed through practical and intellectual activities.
3. To foster attitudes of social responsibility in relation to the social aspects of technological change.
4. To promote the development of initiative, ingenuity and resourcefulness.
5. To encourage students to relate the course to their personal interests and abilities, and to develop communication skills and attitudes of co-operation.
6. To develop skills relevant to a wide range of career opportunities.

4. Assessment Objectives:

The assessment objectives for a common core of a course in Craft, Design and Technology will test the ability of the candidate to:

1. recognise problems and, within them, identify appropriate needs.
2. recognise the wider social origins of problems under consideration.
3. identify the constraints imposed on proposed design solutions by resource availability.
4. identify the constraints imposed on proposed design solutions by moral, economic and social issues.
5. establish criteria for evaluating commercial products and systems.
6. gather information relevant to the solution of design and technological problems.
7. interpret diagrams, flow charts, graphs, experimental results and other data.
8. generate and record a variety of design ideas as potential alternative solutions to a problem.
9. evaluate alternative solutions to design problem.

10. communicate ideas and information about an artefact or system in a clear and appropriate form.

11. select the optimum solution to a problem bearing in mind the total resources available and moral, social and economic constraints.

12. develop a programme of practical work for realisation of the selected solution (as an artefact, system or analogue).

13. construct or model the selected solution thereby demonstrating skills of construction, assembly and communication.

14. evaluate the performance of the solution against technical specifications and social constraints.

15. conduct qualitative and quantitative tests.

16. propose or make modifications in the light of these tests as appropriate.

17. maintain a record of all decisions made and justify these.

18. demonstrate a continuing self-critique at all stages of the design process.

19. demonstrate a concern for economy in the use of materials, energy, time and other resources.

20. demonstrate an awareness of the potential of design and technological activity to improve or harm quality of life.

21. apply all mandatory and other necessary safety precautions relevant to the use of tools, machines, apparatus, materials, chemicals and other resources.

22. relate workshop/laboratory activities to industrial practice.

5. Content:

1. Craft, Design and Technology is a subject area that is identified by a 'core of process' and draws upon knowledge from a wide range of disciplines. Its activities are characterised by its use of appropriate knowledge and the skills it develops to identify and apply that knowledge. It is not therefore possible to specify a core of content in CDT criteria. Latitude should be allowed for examination boards to specify a particular knowledge area(s) but the examination of the acquisition of this knowledge in isolation should not form part of the assessment of the core in CDT.

2. The minimum core of process includes both practical and intellectual skills and it follows that assessment which does not require a candidate to construct a device or artefact cannot possibly use the words 'Design and Technology' in the subject title.

3. Assessment of the minimum process core should account for 80% of the total subject assessment and should be divided approximately equally between the following areas:—

See figure 1 above.

The remaining 20% should be left to the discretion of syllabus makers and could be distributed amongst the four elements above or to be confined to the

assessment of the acquisition of knowledge, principles and concepts relevant to specific areas such as electronics, materials, mechanisms, energy, medical technology, agricultural technology, food technology, etc. etc.

4. Courses whose titles contain the words 'Design and Technology' should permit the use of construction kits, computer aided design, control by microprocessors as well as a wide range of materials.

6. Techniques of Assessment:

1. Methods of assessment thought to be applicable to CDT are identified as follows:

1) *Coursework*. The assessment of coursework is considered essential and teachers should be involved in the assessment process. Coursework should be externally moderated by sampling.

2) *Extended design examination*. This would involve candidates choosing from a range of problems or problem areas, gathering data, defining

detailed specifications, proposing and evaluating alternative solutions, developing an optimum solution, communicating this in such a way as to allow realisation and proposing quantitative and qualitative evaluation tests.

A minimum of six weeks should be allowed for the extended design examination.

Realisation of the final solution would not be necessary since candidates will already have demonstrated the necessary skills in their coursework.

3) *Design Folio*. This should be used to assess graphical and pictorial skills and would include detailed drawings of proposed and final solutions for coursework and could be accompanied by photographs, graphs, flowcharts and two or three dimensional models.

4) *Report/log*: This should contain written details to demonstrate the decision-making process followed by the candidate throughout the duration of the course. It would include all data gathered, investigations of material properties, considerations

Figure 2:

		30%	15%	15%	20%	
ASSESSMENT OBJECTIVES		5	5	5	5	20%
		5	5	5	5	20%
	knowledge and information research skills	15	—	—	5	20%
	problem solving and decision making activity	5	5	5	5	20%
realisation						
social responsibility						
coursework						
extended design examination						
folio						
report/log						
						ASSESSMENT TECHNIQUES

of resource, energy use, control devices, etc. and the relevance of these to the problem in hand. It would also record details of decisions made, modifications and tests and evaluations. A record of the considerations given to social aspects and safety would also be found here. Assessment of the report/log should be carried out by the teacher and externally moderated by a sampling process.

5) *Written examination.* Although not considered essential for assessing the CDT core, we recognise that some examination boards and syllabus makers may wish to incorporate this technique. We strongly recommend, however, that written examinations should not be entirely devoted to the assessment of knowledge acquisition. This would in many cases lead to formalised teaching and a regurgitation exercise on the part of the candidate. Elements of the social aspects of CDT activity could be appropriately assessed in a written examination and these elements could be related to facts, principles and concepts concerned with materials, energy and control.

Branching structured questions, short answer questions and open-ended essay questions are considered suitable and appropriate in a written examination in CDT.

Multiple choice or objective type tests should be used sparingly because they encourage a superficial response to problems and, moreover, seem to carry a bias which disadvantages girls.

Oral questions and responses could be appropriately used in the moderating process.

Phased or sequenced testing is not considered appropriate in CDT because of the danger of developing the 'learn it, test it, and forget it' syndrome.

7. Relationship between assessment objectives and techniques of assessment:

1. The common core of process given in 4.1-22 can be grouped into four sections:—

- a) knowledge and information research skills
- b) problem solving and decision making activity
- c) realisation
- d) social responsibility.

2. The recommended examination techniques given in 6.2 1-4 have been identified as:—

- 1) coursework
- 2) extended design examination
- 3) folio
- 4) report/log.

3. The proposed minimum weightings total 80% of the examination assessment, the remaining 20% being left free to be allocated as syllabuses committees see fit.

4. Figure 2 displays the relationship between assessment objectives and techniques of assessment. The percentages allocated to each cell are included here for illustration only and could be modified according to the wishes of syllabus makers. We strongly recommend, however, that the four groups of assessment objectives should be equally weighted.

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