Working Group on Design & Technology

Department of Education and Science/Welsh Office

We report here, with permission the summary of the interim report of the Working Group on Design and Technology chaired by Lady Parkes.

1. We have adopted the term 'design and technology' to describe the area of curriculum with which we are concerned. The term emphasises the intimate connection between 'design' and 'technology', as well as implying a concept which is broader than either individually (1.6).

2. It might be objected that a more appropriate title would be 'Craft, Design and Technology' which is already widely used in secondary schools. However, while CDT has much to contribute, we are dealing with an activity broader than CDT which, to quote our terms of reference, 'goes across the curriculum, drawing on and linking in which a wide range of subjects' (1.8).

3. Our usage of the term 'design and technology' is not intended to devalue 'craft' — craft skills are essential means to the achievement of many design goals (1.7).

4. The special characteristic of design and technology (D and T) is that pupils learn the *capability* to operate effectively and creatively in the made world. D and T is an activity carried out with definite purposes in mind, within specific constraints and requiring value judgments at every stage. It has its own distinctive non-verbal ways of thought including use of imagination and 'imaging' (1.9 — 1.12).

5. It is essential that pupils actively engage in the processes of design and technology. Practical involvement is fundamental. An additional dimension is appreciation of the social and economic impact of design and technology (1.14).

6. We emphasise the provisional nature of our thinking as D and T lacks a research base and a school curriculum tradition comparable to that of other subjects in the national curriculum (1.15).

7. D and T needs to be sufficiently broad, balanced and relevant to ensure that *all* pupils, regardless of age, sex and ability can be engaged and their motivation for learning sustained (1.16).

8. Design and technological activity should take place in a range of contexts (e.g. industrial and domestic) to enhance motivation and confidence, to ensure balanced experience and to facilitate 'transferability' of skills and capabilities (1.17).

9. Most primary and secondary schools already provide some experience of D and T activities in a variety of contexts. At secondary level contributions may come from a number of existing subjects (e.g. CDT, art and design, home economics, business studies, IT) but effective coordination is frequently lacking (1.20).

10. We see our attainment targets and programmes of study as offering a clear and firm framework for schools to plan for progression in pupils' attainments in design and technology throughout the years of compulsory schooling (1.20).

11. Within this framework we prescribe a core of knowledge in sufficient detail to give some structure to teachers for planning design and technological activities, while encouraging a broader and more balanced range of pupils' work than has often been the case in the past (1.22 to 1.26).

12. It is not possible to isolate and assess separate components of design and technological processes because the activity is holistic. Pupils' performance in this area ought to be assessed on the detailed observation of pupils' work throughout the whole design and technological task. We recognise there are practical problems associated with the large scale adoption of such procedures and, accordingly, we are exploring a complementary approach based on characteristic tasks which are readily recognisable as ones in which pupils will engage while undertaking design and technological work (1.27 to 1.31).

13. D and T activity involves pupils in making judgments of many kinds — technical, economic, social aesthetic and others. As pupils' capabilities increase, there should be progressive refinement in the art of making these judgments. We distinguish between intrinsic values — considerations such as efficiency of resource use, value for money; and contextually related values — considerations such as health and safety, user preferences and ecological benignity (1.32 to 1.34).

14. Community is of vital importance to D and T capability, both as part of the process of clarifying ideas and as an aspect of working collaboratively in teams (1.35).

15. Our terms of reference do not require us to look at resource implications, but our proposals will require a collaborative effort by teachers across existing subject specialisms and a considerable in-service training programme on a scale outweighing that likely to be needed for other foundation subjects (1.32 to 1.34).

16. An important resource constraint will be the availability of specialist accommodation and technological equipment, particularly for IT (1.40).

17. D and T capability should cover the effective use, critical appraisal and improvement of existing artefacts and systems; the rectification of faults; and the design and making of new ones (1.42).

18. Progression in D and T activity from 5 to 16 will involve movement from a small number of simple contexts, easily related to pupils' immediate experience and with minimal constraints, to a wide variety of contexts extended well beyond immediate experience into the social, commercial and industrial world with multiple, complex and conflicting constraints (1.43).

19. As the range of contexts in which D and T activity becomes broader and more balanced so the demands for knowledge, skills, personal qualities and judgment in the field of values will expand progressively over the four key stages (1.43).

PROFILE COMPONENTS, ATTAINMENT TARGETS AND PROGRAMMES OF STUDY FOR DESIGN AND TECHNOLOGY (CHAPTER 2)

Profile Components

20. For D and T, we judge it to be important that any scheme of profile components, attainment targets and programmes of study should be as uncomplicated as possible (2.2).

21. At this stage of our thinking the

arguments for a single profile component called 'Design and Technological Capability' seem very strong but we may be led to modify our present position in the light of further work (2.9).

Attainment Targets

22. A possible approach to the construction of attainment targets would be to prescribe what knowledge and concepts pupils should be expected to learn at different stages. However, the specification of knowledge-led attainments targets for design and technology could encourage the learning of knowledge as an activity separate from its application (2.11 to 2.12).

23. The distinctive quality of design and technology is the ability of pupils to *use* their knowledge, in combination with skills, value judgments and personal qualities. We have therefore formulated our attainment targets in terms, not of knowledge or skills, but of *practical capabilities.* In achieving these, pupils will acquire and use knowledge of different kinds, but the knowledge will always be a *means* to an end rather than an end in itself (2.13).

24. It follows that the most appropriate and helpful way of indicating the knowledge and understanding needed is by providing detail in the programmes of study, where we outline the *means* by which attainment targets might be achieved (2.19).

25. We have provisionally identified five attainment targets for design and technology (2.1 and 2.15).

AT1 Explore and investigate contexts for design and technological activities.
AT2 Formulate proposals and choose a design for development.
AT3 Develop the design and plan for the making of an artefact or system.
AT4 Make artefacts or systems.
AT5 Appraise the processes, outcomes and effects of design and technological activities.

26. Our intention is that the total number of attainment targets at any key stage should be easily manageable by teachers. Each of the five attainment targets attempts to describe an activity which will be readily recognisable by teachers as being characteristic of the work of pupils in their design and technology education. At a later stage in our work we may want to increase slightly this number of attainment targets and we are keeping open the option of conflating two or more of the targets for the first two key stages (2.15).

27. Collectively, the five attainment targets define a series of tasks which, at appropriate levels of sophistication, will be undertaken by all pupils. The attainment targets identify educationally valid learning outcomes from D and T activities which can be assessed and reported on as worthwhile in their own right (2.16).

28. It is important to emphasise that pupils should undertake D and T activities relating to each of the attainment targets in a variety of contexts. It will not be sufficient to restrict the curriculum for design and technology to say the context of the home or the business office (2.18).

Knowledge and understanding

29. In describing the range of knowledge and understanding to serve as a core resource for design and technological activities we have drawn from existing subjects, especially mathematics, science and CDT, but also art and design, business studies, home economics and IT (2.21).

30. At this point in our work we have not yet explored the detailed coordination of the mathematics and science proposals with our own ideas for design and technology.

31. The core of knowledge and understanding for design and technology can be organised under four headings.

Media for D and T Activities
Designers work in three different kinds of media: materials, energy and information. Some knowledge and understanding of each is essential.

Influences on D and T Practice
This includes knowledge and understanding of the range and potential of available tools and equipment, mathematical and aesthetic principles and of business practice and economics.

Characteristics of D and T Products
This includes knowledge and understanding of systems, structures and mechanisms.

Applications and Effects of D and T Activity
This includes knowledge and understanding of the relationship between scientific and technological advance and of the social and economic impact of technological change, both in history and in the contemporary world.

32. We emphasise that in their D and T pupils will often need to use knowledge and understanding which falls outside the limits of this basic core. Without certain kinds of knowledge and understanding, the range of design solutions to a defined problem may be very restrictive, but it is impossible to predict beforehand what will prove helpful (2.26).

Skills

34. For the purpose of this interim report we have grouped skills into clusters which have some internal coherence. It is important to stress, however, that there is no unique organisation of the skills base. Different arrangements are helpful for different purposes and we cannot be exhaustive and definitive in our listing of skills (2.30).

35. It is important to emphasise also that skills do not exist in the abstract. Only by relating them to specific D and T activities do they become meaningful for planning schemes of work and for assessment. Skills will be set in context in the programmes of study and in the statements of attainment at the various levels (2.31).

36. Skills in D and T may be placed broadly under six headings (2.32.1. to 2.32.6.).

Exploring and Investigating
Imaging and Speculating
Organising and Planning
Making
Communicating and Presenting
Appraising

Attainment Targets — Examples

37. Our attempt to formulate statements of attainment which are both realistic and challenging is based on professional judgments informed by our knowledge of developments now taking place in primary and secondary schools (2.34).

38. The provisional nature of the sample statements of attainment for attainment targets four and five must be

emphasised and we would welcome comment on them as well as on other aspects of our work (2.35).

39. The prime function of statements of attainment is in connection with assessment: they define the criteria in terms of which assessment will take place and which pupils will have to satisfy in order to reach a particular level of achievement (2.35).

Programmes of Study — Examples

40. Programmes of study in D and T should include the core of important knowledge and understanding and the spectrum of skills identified earlier in the report. They need to provide guidance to teachers on the range of contexts for D and T activities. They also need to indicate progression in the nature of the constraints and in the exercise of value judgments (2.37 to 2.38).

41. The programme of study will also reflect progression by incorporating a broadening range of contexts in which tasks should be set and increasingly sophisticated knowledge and skills (2.40).

42. It is our intention to write programmes of study for each key stage which will relate to the attainment targets *as a whole* (2.42).

43. To illustrate our thinking we provide outline extracts from the programmes of study relating to Attainment Target 4 (Making) and Attainment Target 5 (Appraising) for the second and third key stages (pp.55 to 63).

INFORMATION TECHNOLOGY (CHAPTER 3)

44. Our terms of reference ask us to provide a focus for the development of computer and IT awareness, by recommending appropriate attainment targets, together with supporting programmes of study, related to IT and basic computer skills and to awareness of the uses of advanced technology (3.1).

45. The development of IT capability is an essential part of the education of every pupil. All areas of the curriculum provide contexts in which the use of IT is appropriate and through which pupils develop general IT capability. IT is also an important tool for learning throughout the school curriculum (3.2.1).

46. IT also forms an essential part of many artefacts and systems. Pupils therefore need to develop the knowledge, skills and understanding to design implement and appraise IT systems and to incorporate IT where appropriate in their design and technological activities (3.2.2).

47. It is particularly through experience of IT in the design and technology curriculum that pupils will develop an understanding of the broader principles and processes of IT, of the range and scope of its implications, and of its social and economic importance (3.4).

48. IT capability must be based on an understanding of the principles and must avoid a clutter of detail which will soon become obsolete (3.5).

49. It is necessary to have a framework for the assessment of pupils' capability in the general use of IT across the curriculum. In our further work we shall need to consider the number and nature of attainment targets for general IT capability and how they should be grouped for assessment and testing (3.7).

50. Progression in the development of general IT capability is only to a limited extent concerned with the accumulation of specific skills; progression comes more through the increasing demands of the context in which the IT is applied (3.8).

51. It is essential that the supporting programmes of study for attainment targets concerned with developing general IT capability are based on realistic, worthwhile and varied contexts for the use of IT. We therefore suggest that the supporting programmes of study for general IT capability should relate to the subjects from which the contexts for the use of IT arise, with attention also being given to the coordination of pupils' IT experiences (3.9).

52. In addition to the framework for the assessment of general IT capability, we believe there is a need to assess IT capability as an integral part of design and technological ability, i.e. within the framework of attainment targets for D and T set out in Chapter 2.

53. In our final report we shall provide statements of attainment relating to IT capability for each of the ten levels of the attainment targets we are proposing for design and technological capability (3.11).