Assessment of Design Based Project Work

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Since the introduction of the C.S.E., project work has become an accepted and important aspect of most external examinations in the materials subjects. Responsibility for assessing projects in both C.S.E. and G.C.E. has fallen squarely on the shoulders of teachers who supervise pupils undertaking projects, and there is an indication that this may be continued if 'a common system of examinatiing' is introduced:

> "Course work or project work are suited to teacher assessment, since the teacher is the only person able to watch the development and progress of the work, and to disentangle the contributions of individual pupils to a communal piece of work". (1)

This emphasis on project work represents a fundamental change in the approach to examining pupils' attainment in materials education, requiring some re-thinking about the assessment procedures to be used. When the facility to examine project work was first introduced with the C.S.E. handicraft teachers appeared content to have workshops crammed with sea-grass stools and coffee tables, often copied from illustrations in taxonomies of tables, table lamps and tea-trollies. Similarly in home economics children were tatting together garments from commercially prepared patterns and young artists producing artifacts arising from the practise of skills. When project work was limited to these dimensions and attainment was confined in the main to motor skills and low order cognitive abilities, it was perhaps sufficient to use end products as the evidence on which to base assessment of pupils.

However, teachers' sights appear to have been raised and attempts are being made to develop higher order cognitive abilities through the medium of project work, particularly by using a design approach. Hence there has been a development and refinement of the term project work — in this article it is used to mean:

> 'a practical enquiry, involving the pupil(s) in activities in *all* the stages of a design process'.

Several models of a design process have been formulated, one of which is printed on the following page.

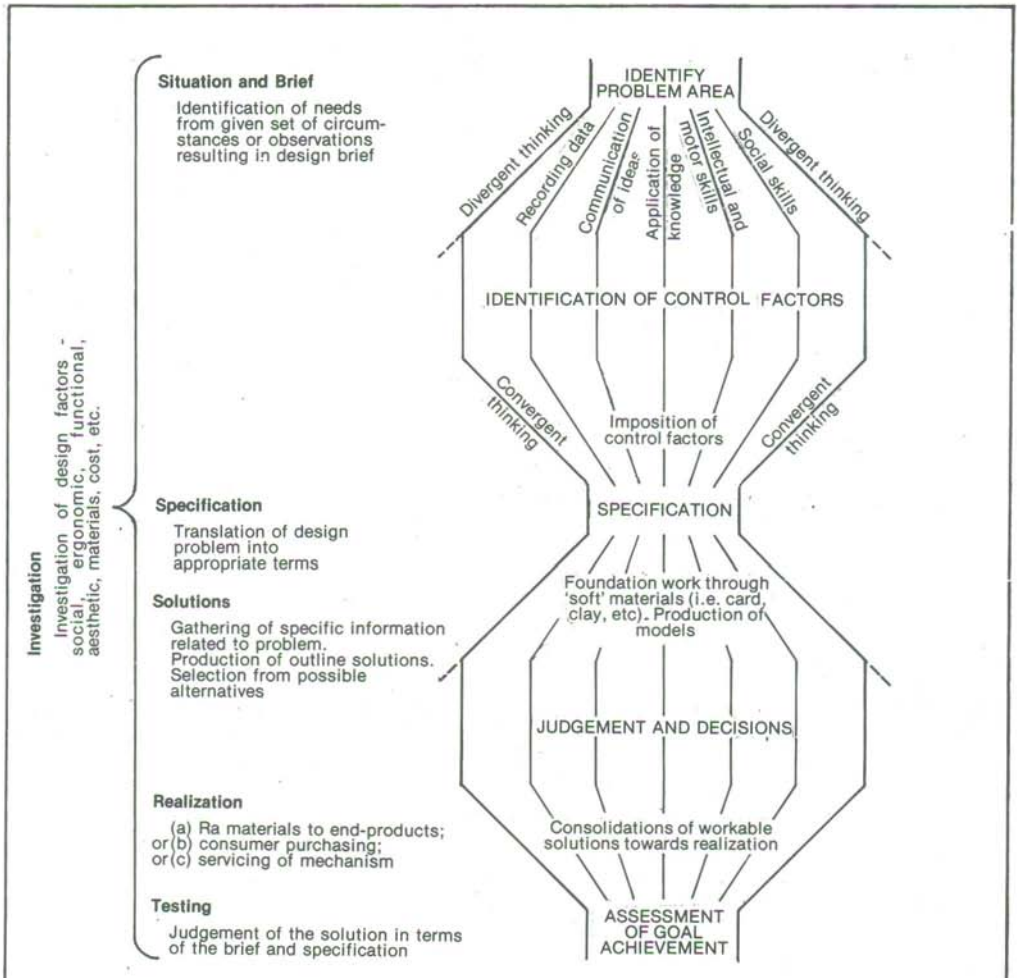
If design based project work is to form an important part of examinations in the materials subjects then it is vital that *valid* assessment procedures are used. In other words, it is essential that assessments are accurately made of pupils' abilities which together make up attainment in project work. The question is therefore raised:

> What are the abilities which we ought to be measuring in project work?

The first stage in establishing valid assessment procedures in any area of the curriculum, including the materials subjects, is to define with precision the pupil abilities which are to be assessed. Our current external examinations have been heavily criticised for failing to spell out attainment — expressed differently, we have failed to specify educational objectives which can be used as assessment criteria (3), (4), (5).

Unfortunately this criticism can also be levelled at examinations in materials education and in particular at project assessment. An analysis by the author of 73 C.S.E. Mode 1 syllabuses, each containing the facility to assess project work, did not reveal one list of objectives or precise specification of attainment. (The majority of syllabuses contain aims expressed in a vague and generalised form). Where assessment procedures required teachers to make subjective work the criteria were equally broad. Qualities such as 'creative ability', 'inventive design', 'standards of craftsmanship', 'pride in achievement', occur frequently in syllabuses both as aims and in making schedules. Hence doubts exist of the validity of teacher assessment in all the syllabuses reviewed.

However, one C.S.E. examination does now



A design process for secondary schools

This model should not be considered an inflexible linear process. Pupils may well 'recycle' the design process while undertaking a design project.

exist with a clearly defined set of objectives for design based project work. The examination was devised by the Schools Council Project in Design and Craft Education, is being run by the North West Examinations Board and is called "A Course of Studies in Design". Details of the examination can be found in "Education Through Design and Craft", (6) a publication of the Schools Council Project.

In order to arrive at the objectives, a careful study was made of pupils working through the stages of the design process to complete design projects. At each stage a record was kept of pupils actions, and as far as possible their thoughts and ideas. Subsequently, an analysis was made of this record of pupil 'behaviour', from which twelve more general

abilities were formulated. These are listed below.

Ability to:

1. Analyse a situation in order to identify a need or problem area.
2. Identify specific factors affecting the need or problem area (factors may include social, ergonomic, functional, aesthetic, material and cost elements).
3. Relate factors identified (synthesis) to define precisely a brief, specification or design problem.
4. Gather from a variety of sources specific information related to a brief, specification or design problem.
5. Produce outline solutions which satisfy the requirements identified in a design problem.
6. Make valid and logical selections from all known alternative solutions.
7. Specify a procedure necessary for the production of a solution.
8. Apply relevant motor skills to produce a solution.
9. Judge a solution in terms of the design, brief or speculation.
10. Record information and evidence of observations, investigations and decisions.
11. Communicate ideas/solutions clearly in graphic, written or 3D form.
12. Apply knowledge of tools, materials, techniques and principles.

The process of generalisation was necessary for two main reasons:

1) Since design projects can differ widely in subject content and in the detail of learning experiences it is not possible to itemise the wide range of activity involving large numbers of pupils. Neither is it possible at the beginning of a design project to forecast what activities or outcomes may emerge.
   Therefore in order to compare the performances of pupils engaged in widely varying activities, the objectives need to describe 'core' abilities that can be identified in any design project.
2) If each of the objectives are to be used as assessment criteria the number must be limited to give the assessment procedure 'face validity' – i.e. that it will be an acceptable work load for teachers.

It can be seen that there is a close relationship between the objectives and the stages of the design process. For example objective 7, 'the ability to specify a procedure necessary for the production of a solution', is crucial to the realisation stage. Similarly, objective 8, 'the ability to apply relevant motor skills to produce a solution', is also crucial to the realisation stage.

For this reason Objectives 1 – 9 have been called 'crucial' objectives. The remaining three, however, appear to be abilities which are required in most of the stages of the design process as tools through which crucial objectives are achieved. These three have been called 'enabling' objectives.

The reader will also have probably noted that the list of objectives is restricted to intellectual abilities and motor skills. Attitudes and values, such as level of motivation and perseverence, are obviously related to the degree of involvement and commitment of pupils to succeed in solving a design problem but it was considered that attitudes themselves were not attainments and therefore should not form part of the assessment procedure. Also with 15 – 16 year old adolescents many attitudes and values vary almost from day to day – doubtless we can all recall pupils who are co-operative one day and bloodyminded the next – therefore it is difficult to make a judgement on the 'achievement' of an attitude.

If design projects are to be assessed validly even using the core objectives, evidence is still required of the achievements of pupils before judgement can be made. Some evidence may be available if an end product is produced, some evidence may be in the form of a record book or project report but

much may only be available to the teacher supervising the project through conversation with or observation of the behaviour of the pupil engaged in the project. Whatever the form of evidence, teachers must be able to relate it to the core objectives, if these are the assessment criteria, before any judgement can be made of the level of achievement of the objectives.

Can teachers relate the evidence to the objectives, particularly when the evidence is in the form of observed incidents of behaviour? To try to answer this question, the author asked teachers working on the examination 'A Course of Studies in Design', to complete a questionnaire. (Some items are given below – you may wish to try them for yourself).

The teachers were asked to relate the *underlined* incidents of pupil activity in each item to *one* of the five objectives listed beneath each incident. The photographs were provided to give additional information either of the conditions under which the incident occured or illustrate an outcome of the incident. Incidents were taken from typical design projects in the materials subjects.

Item 1

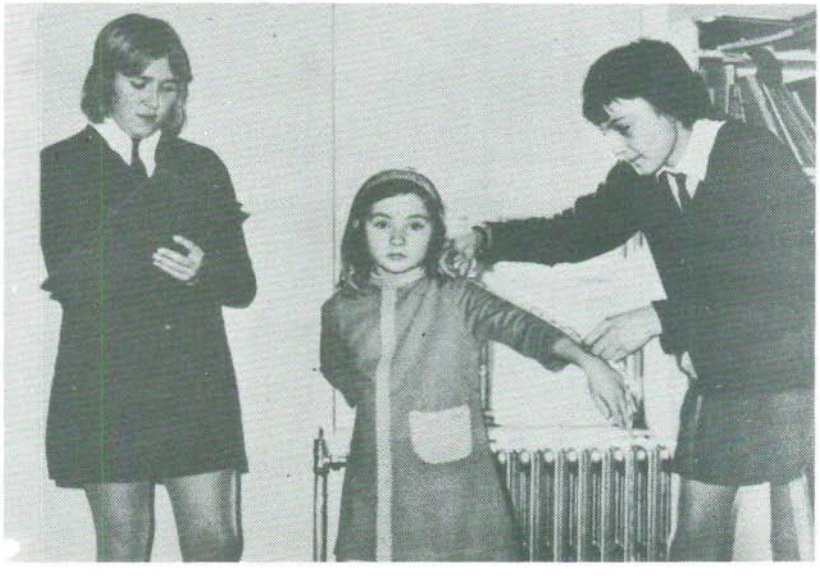
Description of Project:

This project involves the design and making of protective clothing for handicapped children.

Description of Incident:

When obtaining data on individual handicapped children, *the pupil (on the left), tabulates all the measurements necessary to make up a garment to meet the special needs of this child who has a defective right arm.*

1. Ability to record information and evidence of observations, investigations and decisions.
2. Ability to analyse a situation in order to identify a need or problem area.
3. Ability to gather from a variety of sources specific information related to a brief, specification or design problem.
4. Ability to judge a solution in terms of the design brief or speculation.
5. Ability to apply relevant motor skills to produce a solution.



Item 4

Description of Project:

This project involves the design and construction of an aid to teaching in an infant school.

Description of Incident:

When observing infants playing 'shops', *the pupil on the left recognises that this piece of equipment is inadequate to develop infants' mathematical abilities.*

1. Ability to relate factors, identified (synthesis), to define a brief, specification or design problem.
2. Ability to record information and evidence of observations, investigations and decisions.
3. Ability to identify specific factors affecting the need or problem area (factors may include social, ergonomic, functional, aesthetic, materials and cost elements).
4. Ability to gather from a variety of sources specific information related to a brief, specification or design problem.
5. Ability to analyse a situation in order to identify a need or problem area.

111 Item 7

Description of Project:

This project involves the design and construction of a cross for a school devotional room.

Description of Incident:

When using a diamond edged saw to cut an agate which is to form part of the cross, *the pupil accurately trims it to the required size.*

1. Ability to apply relevant motor skills to produce a solution.
2. Ability to produce outline solutions which satisfy the requirements identified in a design problem.
3. Ability to specify a procedure necessary for the production of a solution.
4. Ability to make valid and logical selections from known alternative sources.
5. Ability to judge a solution in terms of the design brief or specification.

Item 22

Description of Project

This project involves a group of pupils in the design and construction of an adventure play unit.

Description of Incident:

After discussing the scale models of possible units, *the group decide to make full size the model the pupil is holding since they consider it will enable children to be adventurous, it will be safest, and will fit most easily in the space available in the playground.*

1. Ability to identify specific factors affecting the need or problem area (factors may include social, ergonomic, functional, aesthetic, materials and cost elements).
2. Ability to make valid and logical selections from known alternative solutions.
3. Ability to produce outline solutions which satisfy the requirements identified in a design problem.
4. Ability to specify a procedure necessary for the production of a solution.
5. Ability to relate factors identified (synthesis) to define a brief, specification or design problem.

113 Agreed Answers:

Item 1 – alternative 1
Item 4 – alternative 5
Item 7 – alternative 1
Item 22 – alternative 2

Of the teachers who answered the questionnaire just over ½ (54%) were able to relate incidents of pupil behaviour to the objectives across the whole range of objectives, and therefore their assessment of pupil attainment is likely to possess at least this element of validity.

The remaining teachers experienced varying degrees of difficulty in the task and were given further assistance before they made assessments of pupils for the actual C.S.E. examination. Teachers with previous experience in assessing project work did better than those without experience, suggesting that perhaps through in-service education and making trial assessments most teachers should be able to relate the activities of their own pupils to the core objectives.

If teachers wish to adopt the objectives as their assessments criteria for design projects, or use the modified form outlined in 'Education Through Design & Craft' (pp. 39 – 46), it may be helpful to bear in mind the following factors.

Some difficulty may be found at first in distinguishing pupils' activities related to objectives 1 and 2. Pupils have been found to recognise a need or problem area without verbalising this or communicating with the teacher before starting to identify specific factors affecting the need, such as constructional or aesthetic factors. For example a pupil may say that he/she would like to build a tubular steel walking frame for a disabled child without verbalising that the child's needs are to be mobile like ordinary children Part of the teachers role is to question and probe for evidence of thoughts and ideas before they can be assessed. This has been found particularly true in the early stages of a project. Similar problems of overlap, which the examination technologists prefer to call 'contamination effect' may also be found between objectives 5 and 12.

Produce outline solutions which satisfy the requirements identified in a design problem.
Apply knowledge of tools, materials, techniques and principles.

If teachers prefer to make assessments on achievement levels of different *stages* of the design process (7) rather than using the objectives, it should be borne in mind that judgements will still be based on specific incidents of pupil behaviour. By using the 'stages' fewer assessments have to be made but these judgements will have to be made by grouping pupils' abilities together, a procedure perhaps requiring a greater degree of mastery in relating incidents of pupil activity to the objective.

Whether the objectives are used as assessment criteria for project work or judgements are made of achievement of different stages of the design process, the first step appears to have been taken towards assessing children rather than 'jobs' – we do seem to be getting away from the hang-up on end products.

References:

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