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Structuring Design and Technology for pupils with learning difficulties

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Abstract
The purpose of this paper is to break down the various stages design activity into a number of smaller units, to enable pupils with learning difficulties to be able to cope with its logic/philosophy of the design process. Key Stage 3 pupils with learning difficulties are the target for the ideas and considerations set out in this paper. The pupils in question are those that have moderate learning difficulties, who may have some form of statement and who are, in general, in main stream schools.

In spite of the National Curriculum for Technology (and Design) having a series of levels for each Attainment Target and Key Stage, some if not all of the various levels, whenever they occur, are perhaps asking too much of some pupils with learning difficulties. Learning difficulties in a design context not only refer to lack of reading and writing skills but also spatial/drawing skills, and the ability to sequence and manipulate information.

Introduction
This paper does not attempt to describe a model or a particular approach to the problem of accommodating learning difficulties in a design education context at the present time. Its purpose is to state a range of thoughts and ideas that may be used by teachers to enable/encourage pupils to gain more from the design and technological opportunities provided for them at school and, at the same time perhaps, help to reduce or overcome their learning difficulties.

While teachers of any subject specialism could argue that their subject can help to develop particular skills, I would argue that within design and technology activities a much wider range of skills and the interaction between them have the potential of enabling academic attainment to take place and be further developed. It is because of this that design and technology can cater for all levels of ability and act as a focal point for many differing strengths and weaknesses in the individual child. This is not to say that the so called "academically poor" child or the child with moderate educational special needs is necessarily going to be good or very successful at design and technological work in school. But the cross curricular nature of the designing and therefore, design and technology work in school can facilitate, encourage and show relevance for, and relationships between, a range of academic and practical skills.

Special educational needs can take many forms. The range can include pupils who are in need of "support teaching" for poor reading, writing or numerical skills, in main stream schools, through to "statemented" children in special schools (moderate learning difficulties) who may in some cases have a combination of learning and behavioural difficulties. There are also special schools for children with severe and complex learning difficulties (profound handicap) but this category is not included in the ideas expressed in this paper.
The following are indicators of areas of learning difficulties:

**Verbal**
1) Reading/Comprehension
2) Written - spelling - punctuation
3) Spoken - communicating/expressing ideas

**Numerical**
1) Number Concept(s)
2) Basic Numerical Operations
3) Mensuration/Measuring Spatial
1) 2D and 3D visualisation
2) Graphical Communication - various forms

**Physical or Motor Co-ordination/Dexterity**
1) Using Graphical Instrumentation
2) Using Modelling Tools/Materials
3) Using Tools/Equipment/Manipulation of Hard Materials

The above list could be extended to include additional aspects related to learning activities, especially if some or all of the categories are present in the individual, such as:
- Motivation
- Self Esteem, and
- Personal Organisation.

All of the above skills become increasingly important when education takes place through the use of a design framework which gives the child/student the opportunity to decide on a particular approach and solution to a problem which she/he may have identified or have been expected to identify.

**Elements of designing and the national curriculum for technology - with Design**

Designing may be considered using the following, convenient, headings: design brief; research, analysis, development, final design, realisation, modification, working log and evaluation.

Those elements used and the extent to which they are used will depend on the general age and level of ability at which particular design and technology work is directed. In a sense the Attainment Targets of the National Curriculum for Technology - with Design have grouped together, in a repeated fashion in places, some of the above design elements as follows;

- **AT1** Identifying Needs and Opportunities
  - Design Brief
  - Research
  - Analysis

- **AT2** Generating a Design
  - Research
A variety of techniques applicable to many aspects of the design and making process.

These areas of the design activity and Attainment targets are augmented and focussed by the Programmes of Study in the National Curriculum for Technology - With Design, under the general headings of:

Developing and Using Artefacts, Systems and Environments,
Working with Materials,
Developing and Communicating Ideas,
Satisfying Needs and Addressing Opportunities, and
Information Technology Capability.

It also needs to be emphasised that design and technology curricula, whatever the topics, themes or contexts by chosen particular schools, is now concerned with a range of activities traditionally dealt with by the separate subject areas of C.D.T., Home Economics (domestic science and textiles), Art, Business Studies, Information Technology, and to a certain extent Science. In addition to the above is the question of which Levels of Attainment are going to be achieved by all pupils, including those with moderate learning difficulties.

Possible approaches in attempting to link aspects of the last section with particular learning difficulties

Although a lot of design and technology work in school requires spatial and motor skills, the quality of such work and the potential educational experiences within it can be greatly impaired if the individual has poor verbal or numerical skills.

One possible way of helping with poor verbal skills in terms of reading and spelling is for the design/technology teacher to produce a list or lists of technological words related to a particular piece of work. Such list(s) could be produced on a class or individual basis, and displayed around the room/workshop as well as a copy being given to each pupil in the group.
By using the technique of syllabification many words can be broken down to help make the reading and spelling of them easier.

The idea of using lists of words can be extended to give the meaning of the word, thus forming and gradually building up a glossary of technological terms.

Verbal skills can be improved by requiring individual pupils to talk about/demonstrate aspects of their design and technology work to the rest of the class for a few minutes. This could be done at the end of a project as part of the evaluation stage or during a project to initiate class/group discussion of how best to finish the project.

In relation to numerical skills, a lot of basic numerical work (the practice of which is often needed by pupils with special educational needs) can often be covered in a variety of design and technological projects at Key Stage 3, even at the lower levels of attainment. For example, working out areas and the cost of covering them with something, or the amount of food required to feed a given number of people for a given occasion.

The essential point is the way the particular learning difficulty is approached and how and to what extent it is perceived by the pupil as being an integral and natural part of the design and technology work undertaken.

A similar approach can be adopted with other types of learning difficulty within many specified design and technology areas of working/projects. It is a matter of breaking down the variety of components that are likely to relate to a given design and technological project so that pupils with particular learning difficulties can be catered for so that they are able to work through the project reasonably efficiently in an educational sense. At the same time the complete set of activities that make up the project need to be capable of slotting into the framework of the Technology National Curriculum.

Perhaps with this last point in mind it would be useful to make a sort of design and technological map that shows at a glance various areas that can be used either in a general sense or related to a given project.

From the general viewpoint such a map could include:

Research - Types of resources

Generating Ideas - Brain Storming/Types of Thinking

Areas of Scientific/Technological Knowledge - Structures
  Electricity
  Electronics
  Mechanisms
  Energy
The above arrangement of Design/Technological areas is somewhat basic. Obviously there is a variety of interconnections not shown but the idea of such an exercise is to give pupils with learning difficulties an overview of design and technological activities and processes.

The problem of level of motivation of pupils with learning difficulties is perhaps a little more difficult to solve, although the implementation of the suggestions made so far in this section should help.

A useful approach in attempting to increase level of motivation for pupils with learning difficulties and at the same time help them with design and technology work in a general sense in school, is to ask them to buy themselves a scrapbook (or supply them with one) and allow them to stick cutouts of design/technological things in it that interest them. Once such a practice has been established it can be developed to include:

1) information being collected on set topics that could form the basis of a design/technological project in school.

2) words, associated with pictures and/or diagrams collected, could be written alongside them in the scrapbook.

3) sentences could be used, again written alongside items fixed into the scrapbook, to describe/explain such items.

Increased motivation can result from increased self esteem, a very important issue in design and technology because the individual, at whatever level, is being invited to explore and make decisions in new or relatively new ways, a daunting task for a professional designer let alone a Key Stage 3 pupil with learning difficulties.
Self esteem is important in a general sense, especially if a school is unsympathetic to individuals with special educational needs due to its ethos and/or organisation.

**Liaison with non technological subject areas in school**

Although the design and technology teacher can do a lot to help pupils with moderate, special educational needs to be able to participate fully in design and technological activities, there is a strong need for close curriculum liaison between technology and other non technological subject areas within the general curriculum.

**The reasons for this include;**

1) limited expertise of verbal and numerical special educational needs and the teaching/psychological techniques used to reduce/overcome them.

2) a need for planned practice and reinforcement to take place across several subject areas.

3) reduction/elimination of duplication of work, thus perhaps maintaining interest and motivation on the part of the pupil.

4) taking care not to "overload" the pupil with a combination of work from design/technology, and special educational needs, because such a pupil needs to be "brought on" gradually.

5) teachers are able exchange ideas/approaches to work with particular special educational needs of individuals/groups.

6) saving of preparation time/increased teaching efficiency (transfer of knowledge/ideas) in the long term.

The obvious person to approach for cross curricular work of this nature is the Special Needs Co-ordinator, which most Secondary schools have. Such a person is not only in regular contact with other departments but also the feeder primary schools. This last point could be particularly important when planning design and technological work (or any other curriculum work) where there has been a history of special educational needs on the part of some individuals.

**Conclusion**

As indicated earlier this paper does not offer a scheme of work in design and technology for Key Stage 3 pupils with special educational needs. What it does offer is a set of ideas and considerations to allow design and technology to be taught effectively to pupils with special educational needs of a moderate nature.
This, it is suggested, can be done by taking individual and group needs into consideration when planning design and technological work within the framework of the National Curriculum for Technology. Also, the need for liaison between a variety of subject areas, both technological and especially non-technological, and the regular feedback afforded by such a curriculum arrangement to pupils with special educational needs, is seen as being very important for their technological and general education.

Although it is possible for some pupils to be exempt from parts of the National Curriculum due to the nature of their "statement" in some subject areas, it is hoped that by having a positive attitude towards pupils with special educational needs and careful cross curricular planning, exemptions can be avoided in all but the most severe cases.

The Warnock Report (1978) stated -

"...the purpose of education for all (students) is the same: the goals are the same. But the help that individual (students) need in progressing towards them will be different."

Here the Warnock Report is considering the total spectrum of special educational needs.

References

D.E.S. Technology in the National Curriculum, H.M.S.O., March 1990.