

## Why do research? Information handling and decision making in design and technology

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Frequently, the information gathered by pupils in the research phase of a project is not used to inform later decisions about their designing and making. This article considers the potential of databases (CD-ROMs in particular) to support informed decision making by pupils carrying out projects in design and technology.

We are told that ours is an Information Age. As any ten-year-old knows, computers can do interesting things with any amount of information. For design and technology, the question of information handling is important. Although the latest rewrite of the Order makes much less demand for AT1 — the 'needs and opportunities' of yesteryear, information handling is included in the Manufacturing and Engineering GNVQs as a grading criterion.

Over the last two years, as part of a project concerned with the use of databases in design and technology, we have been exploring what pupils actually do when they carry out research. For us, a crucial question has been the extent to which any research supported decision taking during designing and making.

The process of researching could involve skills and techniques for:

- clarifying what is to be found out
- identifying sources of information
- retrieving and recording information
- judging relevance of information retrieved
- presenting findings
- making use of the information to inform decisions or actions.

On the other hand, 'doing research' can refer to a process whose main or sole aim is to pad out the project folder. Pupils often ask 'Have I done enough yet?' or 'Can I get on with making now?'.

### ■ Do pupils use research to take decisions about designing and making?

Most teachers believe that how they set projects requires pupils to 'do research' and that this activity will link with the designing and making pupils do subsequently. We have found little evidence of pupils being *taught* either research skills or practising methods for making use of their findings. This has confirmed points communicated to us by Gabriel Goldstein HMI<sup>1</sup>. 'While pupils use databases to produce for example a pie chart, they are neither challenged to explain nor exploit their output'. For him there was not always evidence that the notion of 'data handling for meaning' (i.e. information) informed actual pupil practice in the classroom.

The potential of databases is that they can help pupils access information which would in turn

enable them to take better informed decisions, but it is clear that any database must be seen as something more than a convenient source of 'data' to be regurgitated to satisfy perceived demands for 'enough research'. Our work with schools has shown pupils' activities to be characterised by a variety of conceptions about what research was for. The following examples are taken from practical project work:

- **'Data gathering'** — such as 'Collect animal pictures for your folder'. In this case research was undertaken 'Because the teacher told us to' and had little effect on the project.
- **'Confirmatory'** — such as 'When she gave out the project I already knew that I wanted to do a squirrel, so I looked it up and it was OK'. The research here does little more than firm up an initial fuzzy response.
- **'How to . . .'** — such as 'I thought an elephant would be good, but it's difficult to draw. So I found a picture that I could trace'. In other words, it's a convenient method for solving a problem.
- **'Focusing'** — such as 'What I did was to look at a few leaflets and they all used cuddly animals — there weren't any snakes or slugs! So I thought it would be good to use something that people had used already.'

The first three headings typify the vast majority of activity for KS3 pupils. Only in the fourth case can it be said that the pupil's thinking has moved forward through clarifying what needs to be found out and linking this to ideas for the project outcome. Many pupils never get to understand the importance of information handling to designing and making. In part this is practical — pressures of time and resources. There will always be potential difficulties in obtaining and accessing data, but at root remained the question: did the way the project brief was set *really* require information handling?

### ■ CD-ROMs in school design and technology

We have been working with a number of schools trialling the use of CD-ROM databases in design and technology, and this has given us an opportunity to observe the way in which teachers and pupils set about handling information from this potentially rich

electronic data source. We will refer here to work in three of these schools by way of illustrating some of the possibilities and limitations of using dedicated CD-ROMs.

### School 1

This is a suburban all-girls comprehensive school (approximately 800 pupils) which has over the past five years de-centralised its IT provision although many of the staff still claim uncertainty and a lack of confidence in exploiting IT. They are concerned that there is insufficient or inappropriate database material covering the content domain of D&T. The vast majority of pupils take the traditional GCSE route in either food or textiles, though a small number take CDT: Realisation.

The computer with CD-ROM was mounted on a trolley so that it would be available to any group within the faculty. The database was used during the early stages of projects to support pupils in identifying needs and opportunities. The aim of using databases was to broaden the field of research and to provide a wider range of data from which pupils could select items specific to their task. Example projects included:

- KS3: 'Exploring the creative use of a sewing machine' — pupils were required to research a variety of images and design ideas before selecting or creating their own for use as a template for their making. Designs from *Wheeler Quick Art* CD-ROM were reviewed along with printed resources.
- KS4: 'Designers and the fashion industry' — pupils were required to research the recent history of fashion and fashion designers and select one as a case study. The *Guardian on CD-ROM* was used to explore recent fashion trends. Pupils selected useful information and combined edited versions of these with information from other sources as the basis for their project.
- KS4: 'International Cookery' — pupils were required to research food sources and cookery methods, culture and cuisine in a chosen foreign country, before going on to plan and make a series of dishes. In addition to the *Guardian* and *Times* CD-ROM discs supplied, the school acquired *Europe in the Round*. As with the fashion project, pupils used their selected

information as the basis of their designing and making.

The main thrust of their work has been in supporting general research, which would normally have been carried out only from printed resources. Teachers feared that the CD-ROM was not only unfamiliar to pupils but that the 'browse' architecture and user structures were unsympathetic for pupils in their early research, but were pleased that once pupils became more familiar with the equipment they could easily transfer information directly into other software packages. The more specific the research, the more easily pupils were able to target and retrieve appropriate information. Teachers were particularly pleased that the software was sufficiently user friendly for pupils not only to teach themselves the basics but also to explore the limitations and the potential of the system.

An interesting additional bonus for staff was that the obvious enthusiasm of the pupils tended to promote inter-departmental working and discussion about the potential that CD-ROM could have for teaching and learning in D&T.

### School 2

This is an inner-city all-girls Roman Catholic day school with approximately 650 pupils. Academic subjects are held in high esteem but the demands of the National Curriculum for technology are seen as 'very difficult'. The school has in the past offered home economics textiles and child care as life skills.

Given a split site, all trialling was done in textiles and food using newspaper CD-ROMs with the equipment on a trolley. Despite being able to move it from room to room it was kept for the majority of the time in a small study room to be used by individuals or small groups. Projects included:

- KS3: To support National Curriculum SAT 'Design and make a snack bar'. The CD-ROMs were offered to pupils as a resource to help with their ATI (Identifying needs and opportunities) although the traditional database on nutrition proved more useful.
- KS4: 'The family' — CD-ROM was used as part of the developmental psychology module for GCSE in child care. The newspaper CD discs were particularly effective in allowing pupils to explore

## ■ SAMPLE PROJECT PLAN

### Model Theatre

Year Group: 7  
Duration: One Term

Outline of Project: To design and make a model theatre production that includes an educational message. The performance should be aimed at KS3 pupils. Initially, pupils are encouraged to brainstorm ideas such as 'drugs' or 'AIDS' etc., and develop these into a spider chart of possible ideas. Once they have decided on a theme for the project, they are then encouraged to research the factual background for their subject. This involves using both paper and electronic sources. Using this information the groups then develop a storyboard for their production. All the props and characters are made from cardboard.

Hardware used: Stand-alone Archimedes, external Cumana CD-ROM drive

Software used: Guardian and Times CD-ROMs

Purpose of using software: To allow pupils to use relevant data to deliver a specific message to a particular target audience.

popular conceptions of the family and the influence of social trends on behaviour. Individual projects then looked more deeply into one specific aspect, for which the *Guardian* proved very useful. Pupils selected not only statistical information but also compared and contrasted opinion and comment. The edited versions were combined with information from other sources as the basis for their project.

Much of the comment above from School 1 was repeated by teachers in this rather different school environment. They too used the databases predominantly as an aid to research. In both schools the enthusiasm of the pupils and their resulting work overrode many of the initial fears the teachers had about new technology/computers. The project has stimulated the school library to buy a CD-ROM drive and two discs (*The Bible* and *World Atlas*).

### School 3

This inner-city comprehensive has 550 girls in the main school and 250 pupils in a mixed sixth form. The school has for a long time enjoyed a reputation for its excellence in the arts. Design Technology is a relatively new department in the school. There are, however, fairly extensive computer facilities.

There are two modules taught at KS3 that specifically address the use of databases. The first, 'Model Theatre', a Year 7 project, is designed to introduce the pupils to the possibilities of using CD-ROM as a research resource for all design and technology work. The second, 'Electronic guide to the school', is a classic Year 8 project which is often used solely as a means of teaching basic electronics but in this case involves the pupils designing a multimedia database. This looks in greater depth at how information is stored and presented, and is designed to give the pupils more confidence in the effective use of electronic information systems.

We include here the plan for the model theatre project. The dual approach, using paper and CD-ROM resources, avoids the logistical problem of everyone wanting to use the CD-ROM drive at the same time. It also allows a class discussion as to the merits of both systems. The groups are encouraged to discuss all the information collected, in order to decide what is relevant and useful for their final production.

## ■ Summary of school-based research

Two significant conclusions can be drawn from our work and for the future development of replicable good practice.

The first is that the CD-ROM is user friendly. It has promoted research during the initial phase of D&T project work — investigating needs and opportunities. At present there is a relatively small range of CD-ROMs available, but this will be remedied over the next two to three years — through for example NCET-funded developments (the excellent Design Council *Image Bank* CD-ROM, for example). The great advantage of CD-ROM usage apart from its portability is that it does not require specialist knowledge or great practice to use it effectively and speedily. Most pupils were able to teach themselves to use the hardware and the search structures in one lesson. Also their success encouraged staff to include its use in other areas — as in School 2 above — and promoted inter-departmental discussion and collaboration.

The second is that CD-ROM does not address all the problems of information handling which pupils encounter in D&T. This is easier to explain by example. At School 3 the Y7 pupils

engaged in the model theatre project used the newspaper databases to find factual information about their chosen health topic. The D&T task was to produce a playlet to put across their chosen health message to other KS3 pupils. The school's learning objective was to get the pupils to use the database as a source of factual information on the chosen health issue.

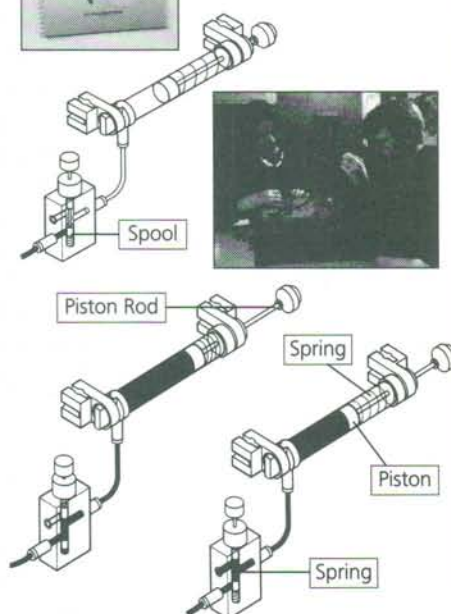
The database use in this project was typical: the CD-ROM was used to trawl useful information, not to facilitate decision taking. In other words, how did the pupils at School 3 decide how to turn newspaper articles about their topic into language that their peers could understand? How did they decide what to leave in and what to miss out? How did they decide how to turn the facts into a story? It was clear from the outcomes that the CD-ROM-based material had informed the factual aspects of the playlet — as in an English project. The specific D&T aspects of the project — such as drawing the storyboard or constructing the props and characters — did not require a database, nor were images, characters or dialogue directly attributable to the newspaper source material. All newspapers carry a range of advertising alongside the news and features, and this art material could have been used by the majority of children in decisions about drafting the story line and designing the props.

Unfortunately, limiting pupils' database use to a dedicated system such as CD-ROM has not yet allowed projects to explore 'information handling for meaning' fully. In the example above, an open (content free) database could have been used to facilitate decisions about the D&T aspects of the project. For instance, in drafting the storyline pupils could have used the database to collate information about current views and attitudes to the health topic of the potential audience. During the project, to help design the storyboard, characters and props, other KS3 pupils could have been canvassed about their responses to the message and to alternative images. In evaluating the final production, an open database could have been used to collate and interpret opinions and check whether or not these related to the original survey of opinion. However, the comments of staff in these schools showed that they might have used open databases were they as simple and effective as CD-ROM.

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## ■ Conclusion: information as a material

The aim of the research process, as outlined above, is to produce information useful in moving the project forward. This may well require that data gathered for other purposes, or for no single specific purpose, be interpreted or reorganised in the light of the context and purposes of the project. This is the process which Layton<sup>2</sup> describes as *recontextualisation*. The original information from the data source needs to be worked on; skills, knowledge and practice are needed to work it effectively. There is a sense in which information can be viewed as a material, to be used actively like other D&T materials such as food metals or textiles.

Information does not, however normally arrive in a 'raw' state any more than other materials arrive in the work-room in their raw forms. Materials generally arrive part finished and the amount and type of work to be done on them depends on the form in which they arrive. Even the most generic and least contextualised databases contain partly processed information, if only by virtue of the data having been formatted in accordance with the database structure. Structure and modes of access will affect how easy it is to 'work' the material.

One of the most interesting attempts to produce information in a readily 'workable' form is the CD-ROM being produced by Adrian Marden and colleagues at Goldsmiths' College. It is designed to support D&T project work, using the context of the theatre. Organised into eight data sets, each level gives a clear indication of the potential complexity of the information-handling process required. Their search architecture includes a browse or general scanning mode, called PLAY; a FIND mode to explore detail; a WORD mode that seeks by key word; and a WORK mode that offers potential classroom activities.

For information handling to work in classrooms, the key issues are ease and friendliness of access and appropriateness of the data found. In selecting any data source for classroom use, teachers needed to think about not only whether the information contained is suitable — but also whether the data could be interrogated and manipulated in a manageable way. If pupils view the CD-ROM as a bit like a teacher: 'I can find out what I need to know from it' — and the structure is too limited or

unresponsive, pupils fail to find what they want and become disillusioned.

In an overview of database management systems, Paul McDonald and Malcolm Batchelor<sup>3</sup> have pointed out that training children to use inappropriate systems is at best ineffective and at worst detrimental. From a brief set of indicative uses for D&T activity, they concluded that 'until databases can be made to act as information-bases rather than mere *data*-bases, it could be more profitable for pupils to gain the concepts, skills and habits of information handling by better use of the library'.

Before teachers can use databases effectively as an integral component of their teaching and learning programme, they need to establish for themselves the learning aims to be achieved through using a database. They need to understand the interventions needed so that pupils better understand not only how to use the database but also how to use the resulting information in their designing and making. The Nuffield Design and Technology Curriculum Project materials<sup>4</sup> give useful guidance on this important aspect of teaching.

One practical approach, which encourages pupils to link research work to subsequent decision taking, is to ask them to keep a simple record of their research activity — both the 'what I found' and the 'why it was worth recording'. Pupils could then be asked to colour code their findings and use the same colour code throughout their folders, perhaps to outline parts of a drawing or to underline some text to show where the research was relevant and useful. It is also helpful if any assessment explicitly credits how the research was used rather than simply that it was there. Finally, we would emphasise that if the task does not really *need* research, then the pupils should not be encouraged to try and do any!

## ■ References

1. Gabriel Goldstein, Private Communication
2. D. Layton, 'Science education and Praxis: the relationship of School Science to Practical Action' in *Studies in Science Education* 19, 1991, pp. 43-79
3. P. Macdonald and M. Batchelor, Private Communication
4. Nuffield-Chelsea Curriculum Trust, *Design and Technology Resource Book*, 1992