An examination of the potential of interactive video for supporting teaching and learning in design and technology

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Abstract

Design and technology in schools highlights the need for pupils to identify with the needs and opportunities in a (design) context and to consider the attributes of a well designed product which might meet those needs. It is generally apparent that whilst this element of design capability characterises the move from "making" to "designing and making" in schools it has not yet been fully developed.

This paper describes the development of a prototype interactive video (IV) application which helps pupils to understand how design criteria may be specified by considering the design context. This IV application will be used to evaluate the feasibility of using flexible learning approaches to support students investigating design contexts and specifying design criteria.

The IV disc makes use of conventional video material developed for use in National Curriculum Technology. The evaluation of this original material was reported at DATER 90 [1].

The importance of design context

Design and technology teachers have always been concerned with the need to frame pupil activities in a meaningful manner. This helps to provide relevance and purpose to the pupil's designing and making, and is a vitally important first step in the analysis of design requirements and considerations. As schools have moved from 'making' towards 'designing and making' so the notion of 'design context' has been increasingly introduced into the pupils' project work. The development of technology as a National Curriculum subject was not the first time that design context has been highlighted as a prominent feature of curriculum development or documentation. For example, when the GCSE in craft design and technology [2] was introduced, design problems were to be described with reference to their context. However, attainment target (AT)1 of Technology in the National Curriculum requires pupils to :

> identify and state clearly needs and opportunities for design and technology activities through investigation of the contexts. [3]

This has not been helpful. The implication is that pupils should be undertaking what are clearly complex and unfamiliar tasks at the very first levels of attainment. It is not surprising that HMI reported :

> The great majority of teachers found it difficult to devise work leading to AT1. In some schools, especially those where an integrated approach had been adopted, pupils spent much unproductive time trying to identify needs; the outcomes were rarely satisfactory, and pupils sometimes became despondent about their lack of progress. [4]

Where AT1 has been interpreted as identifying *with* needs and opportunities the teaching and learning has been more effective, and provides the basis for progression within this attainment target. Proposed changes in technology [5] appear to take some account of the difficulties which were highlighted in the HMI report, by suggesting that the identification of needs and opportunities are required only at higher levels of attainment. Whilst this is a positive suggestion, there is still a need to emphasise the importance of design contexts as the framework for designing and making activities. It characterises the difference between making an artefact which has been described by others and producing an outcome by employing a process of design and development. If the pupil has no feeling for the design context then the design process is likely to be artificial and ineffective. Successful teaching of design and technology has always taken account of the need to provide a real context in the eyes of the learner. However, the need to overtly develop capability in the area of AT1 has not always been identified, although it is considered entirely appropriate to develop tasks which focus on specific capabilities in other areas of designing and making. There is clearly some scope for teaching and learning materials which are concerned with developing a

pupil's ability to identify needs and opportunities from within a design context.

The use of information technology (IT) in design and technology teaching and learning

It is now accepted that young people should learn about the potential for IT to improve their quality of life (usually!) and to become confident in its application, albeit often in only a limited range of real situations. A recent review of IT use in schools by HMI suggests :

> That young people should know about this new technology is obvious but less plain is what IT can do for the process of learning itself. ... The best teaching with IT makes use of the opportunities offered to change the ways in which pupils and teachers approach tasks and solve problems. [6]

Design and technology education illustrates this difference in IT use as well as any subject might. There are a number of computer applications which may be regarded as "design tools" and which have, to some extent, been incorporated into pupils designing and making activities. However, there are very few examples which aim to develop design capability in a manner which exploits the techniques of computer based learning (CBL).

Bearing in mind that a great deal of design and technology data is in the form of images, it would be sensible to consider the use of interactive video (IV) applications as a means of developing pupil capability in this subject. Such applications have the potential to combine images, text, video and animation with interactive tutorials and questions, and hence provide a learning resource which can be used to supplement the teacher's role.

The use of IV in schools is by no means new, although evidence of its effectiveness as a curriculum resource is not readily available. However, a study of how this technology might be used in schools was carried out as part of the Interactive Video in Schools (IVIS) programme. The IVIS programme funded eight development projects which aimed to disseminate and evaluate IV packages in schools. One of these projects was concerned with design. Those persons concerned with the evaluation of the IVIS programme highlighted some potential for the use of IV applications in school:

> Three of its significant attractions echo longstanding claims for computer assisted learning generally. First, IV enables pupils to learn at their own pace, allowing repetition and revision at will. Second, when used as a medium of demonstration it can release the teacher to work more closely with pupils and reduce the need for repeated explanation. Third, pupils enjoy using IV. [7]

The key to capitalising on these attractions and successfully realising the potential of IV lies in the nature of the 'interactions' themselves. It is possible to identify three elements in such interactions - the teacher, the computer and the learner. The balance of control is often determined by the software design and may place any one of these three elements at the centre of interaction. For example, an IV application may simulate an 'electronic blackboard' by providing opportunity for the teacher to flip through specific video sequences which he believes to be useful in a specific learning context. Alternatively, a prescribed route through the learning material may be managed and determined by the computer software itself, perhaps based on its evaluation of answers to simple questions. A third option, in which the learner may browse the material at will with no apparent structure or pre-determined intention, provides a particularly flexible classroom resource.

There is considerable interest in the concept of interaction and much debate about whether particular 'interactive videodiscs' are truly interactive. Certainly IV raises difficult conceptual and empirical questions about the nature of interaction. The educational potential and unique properties of the technology appear to lie in its capacity to structure learning. This structuring is achieved through the software that to varying degrees directs the learning opportunities available to the user. In essence, the software allows and obliges the user to interact with, rather than merely to view, the videodisc. Planned interactions are the pedagogy or teaching method of the program. [8]

To be really useful as a research tool the prototype videodisc should allow the exploration of different types of interaction. If it is only possible to use the videodisc as a 'visual database' or 'resource' disc then it will not be possible to explore this central pedagogical issue.

The balance of control and the nature of intended interaction must be key features in the design of IV applications. The IVIS programme provides no guidance as to the preferred type of teaching approach or learning style, indeed :

> The experience of IVIS suggests that the demonstrated educational value of IV lies in

> the area of teaching support. In general the IVIS teachers considered that IV could be a useful resource, capable of being adapted to their own requirements and personal styles of work. It appears that IV does not appeal to or require any particular kind of teacher or style of teaching. [9]

Teachers involved with the IVIS project suggested that the potential of IV could be realised so long as they had control over its use. Flexible learning strategies also involve passing more control of how the system will be used to the pupils. Authors of CAL software for use in mathematics have also identified the need for software with enhanced user (teacher and pupil) control :

> The philosophy takes the view that that, since users are intelligent and, as yet, computers are not, the former should be given major control over the learning situation. In order to achieve this, our software has been designed to enable it to match a variety of teaching/learning styles, since we recognise that it is more likely to be used if, in the first instance, no radical changes of style are required.[10]

If IV applications are to be effectively used to enhance the teaching of design and technology then they must allow for teachers and learners to take control over the way in which they will be used.

Initial development of a prototype IV application

Information technology has already been used with some success to help pupils identify needs and opportunities by considering design contexts. Conventional video has often been used to bring the real world into the classroom, particularly in showing designers at work and manufacturing processes. The Assessment of Performance Unit (APU) used video to illustrate design contexts and the Design Council produced programmes like 'Stories as starting points for design and technology' (aimed at primary school pupils), and 'Brilliant, or what?' and 'Quiche, keys and roller skates' (aimed at secondary school pupils). Curriculum Video Ltd published a video series also concerned with AT1 of technology in the National Curriculum. Five programmes illustrate how needs and opportunities may be identified from a variety of design contexts. They describe a series of design scenarios and highlight many of the issues which may be raised, providing the sort of background information which is otherwise only available through visits outside school. The authors of the video material carried out investigations into their actual classroom use and concluded that :

> It is likely that video resources will become increasingly important if teachers are to expose pupils to the wide range of contexts required for design and technological activity. This may be particularly important in meeting the requirements of AT1 ... which may be dangerously restrictive without access to the speed and variety of presentation offered by video. [11]

Computer software has also been developed as a means of raising discussion about the importance of design context and how different needs might emerge from the same situation. A package called 'Space Rescue' [12] took the form of a computer adventure game where pupils moved around a strange planet, identifying priority needs for survival and collecting materials which would be used to provide their design outcome. This was usually used as a starting point for a short project in schools, and aimed to develop awareness of how design criteria might emerge from careful consideration of the context. Although effective, the software was specific to one particular design and technology project, and therefore quite limited in its use.

It was decided to actively pursue the strengths of these two approaches and investigate the feasibility of using an interactive multimedia application to support the identification of needs and opportunities from the study of a design context. The aim was to develop a teaching resource, in the form of an IV package, which helps to develop a pupil's ability to move from a design context or situation to the specification of design criteria or considerations.

More specifically, the application will :

- allow information about design contexts to be gathered efficiently and allow this information to be linked with case studies, statistical data and teaching resources.
- allow pupils to select and specify design criteria, developing their ability to identify needs from a range of design contexts.
- allow for different forms of interaction ie. as an 'electronic blackboard', for use with small group tasks and as a resource disc.
- provide a degree of user control so that it may be used in a manner which is particularly appropriate to the needs of teacher and learner.

The intention is to develop a prototype IV application based on the Curriculum Video tapes. Appropriate

sections will be transferred to laservision disc and combined with computer software developed though an 'authoring language':

> The authoring application allows images and text to be specified, manipulated and presented with great accuracy and ease. Teachers who are used to 'Hypercard', 'Genesis', 'Magpie' or 'Top Class' will be familiar with the approach and style of an authoring application. [13]

Feedback from potential users is seen as as vital to successful development of the prototype and so another advantage of this approach is that the views of teachers and learners may be easily assimilated at formative stages of development. Screen layouts, relevant questions/answers and learning options may be easily modified as trials proceed, or even modified to suit the particular needs of an individual school.

This approach overcomes the need to shoot expensive video material and provides a relatively rapid means of prototyping the application. Trials of the IV resource are to be undertaken shortly, and any schools willing to take part should contact the authors.

References

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