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Using the Internet as an information gathering tool for the design and technology curriculum

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Abstract

The authors describe how the writing of case studies of industrial and commercial practice for the Nuffield Design and Technology Project for 14-16 year old students has led to the use of the Internet as an information gathering tool. They then describe how this experience led the NCET and the EdExcel Foundation to commission research to identify a range of web sites that could be used to source relevant information for the EdExcel Foundation D&T GCSE coursework component 'An investigation into an existing product'. The focus of the research was primarily to identify sites which gave information about methods of manufacture and then to use this experience to gain an appreciation for the problems and opportunities that might face schools in enabling novice WWW users to access information through the Internet. The authors then consider whether these experiences can be developed into a generalisable/transferable model for using the Internet as an information gathering tool.

Introduction

This paper describes how writing student material for a curriculum development project led to an exploration of research methods using the World Wide Web.

The Nuffield Design and Technology Project¹ has published a wide range of curriculum materials to support both teachers and students (aged 11 - 16) in the teaching and learning of design and technology (for example, Barlex *et al*, 1995a, 1995b, 1995c, 1995d). One of the features of the materials is the inclusion of case studies (Barlex *et al*, 1996a, 1996b, 1996c, 1996d, 1997) - stories of design and technology in action in the world outside school. It was the intention of the Project that these studies be used to help students consider the interaction between technology and society. The focused case studies in materials for 14 - 16 year old students look in detail at a product or group of products and deal with the following features:

- commercial aspects - how designs are developed, manufactured, marketed and sold;
- technical aspects - how the product works;
- human aspects - how the product affects people.

A particular study might focus almost exclusively on one of these features or might

consider several features. The exact balance depended on the detail that emerged through the writing. Usually each study was drafted in a way that dealt with each feature in some depth and then the complete set were surveyed with a view to finding which ones dealt with which features in the most appropriate way. Within the case studies there are three devices which help to make the reading active:

- Pause for thought - to help the reader think about what's gone before and what is coming without any need for the reader to write a response;
- Questions - which the reader should discuss with others and answer in writing;
- Research activities - to promote reflection and which require access to information not included in the case study and can be set for homework.

Researching and writing case studies without using ICT

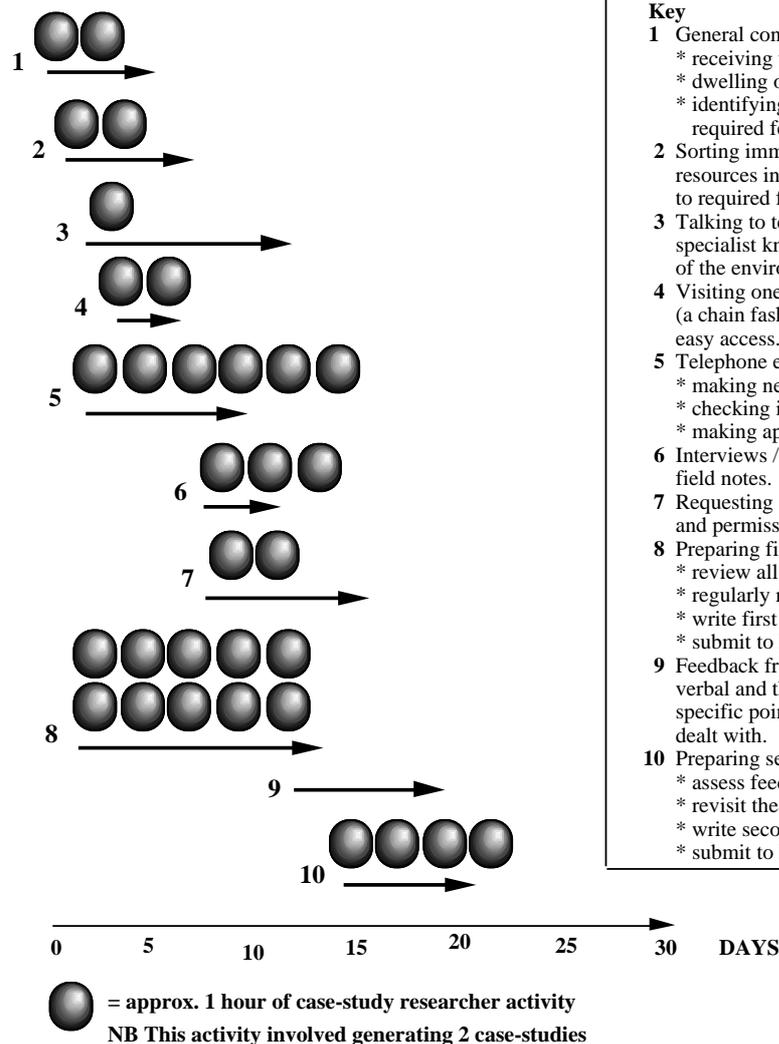
In September 1995 Ruth Wright was commissioned by the Nuffield D&T Project to research and write two focused case studies for *the Graphics Student's Book* (Barlex *et al*, 1996d). The subjects of the case studies were as follows:

- interior design to feature three different environments - a night club/disco, a chain store for fashion goods and a fantasy environment;

- packaging - from the graphic products view point with an emphasis on the relationship between the packaging plus a discussion of how attitude to packaging and waste disposal are affecting packaging.

The Nuffield D&T Project requires a minimum writing rate - two hours per page; and allows time for research activity including visits. So

a four page case study might require two days work - one day researching and one day writing. The interior design case study became a seven page case study while the packaging case study occupied four pages in the final publication. The Project supplied deadlines for first draft, editorial feedback and second drafts.



The time period from General Considerations to submitting the second draft was 21 days. (Equivalent to 4 days work over 21 days period.)

The approach taken by the author is summarised in Panel 1.

Inspection of panel 1 shows that at the outset a range of influences was brought to bear on the task (1-3). The task became more focused with a convenient visit and telephone

enquiries (4, 5) so that site visits and interviews could be organised and field notes taken (6). This informed the quite specific subsequent task (7) of contacting organisations requesting particular information - facts, figures and visual reference material. The first draft writing (8) started early and paralleled many of the early

activities. During this information gathering process relevant information was selected from that available by reference to the brief. The author notes that the active reading devices emerged naturally as part of the writing. Rapid feedback from the Project (9) at this point - verbal feedback over the telephone with a follow up summary letter of issues to be addressed and the second draft deadline - ensured that writing momentum was not lost. In many cases this feedback was simply a request for more detailed visual reference material. The second draft could then be written (10) in response to the feedback with little if any delay.

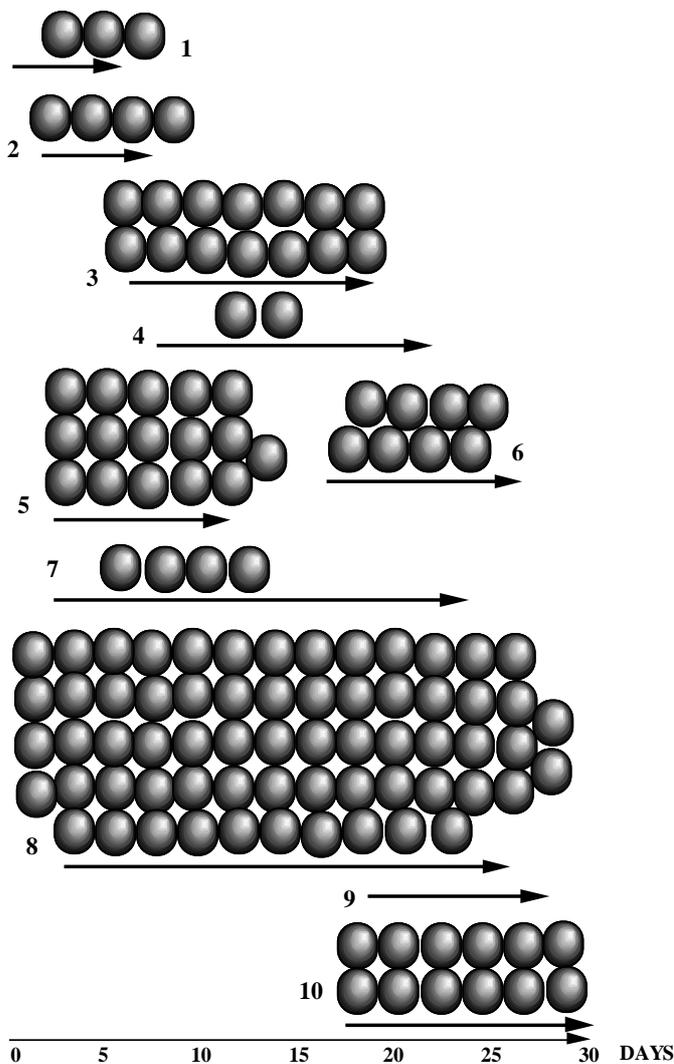
Researching and writing case studies using ICT

In January 1997 Ruth Wright was commissioned

to research and write eight focused case studies for the *Electronic Products Student's Book* (Barlex *et al*, 1997). Each study was to be between 4 and 6 pages. The subjects of the case studies were as follows:

- sensing devices;
- measuring devices;
- electronic novelties;
- security devices;
- control systems;
- communicating devices x 2;
- summary of developments in electronics since World War 2.

Writing and research time allocation with deadlines was as in the graphics case studies. The approach taken by the author is summarised in Panel 2.



● = approx. 1 hour of case-study researcher activity
 NB This activity involved generating 8 case-studies

The time period from General Considerations to submitting the second draft was 30 days. (Equivalent to 16 days work over 30 days period.)

PANEL 2

Key

- 1 General considerations :
 - * receiving the brief;
 - * dwelling on the problem;
 - * identifying areas relevant to required features.
- 2 Sorting immediately available resources into groups relating to required features.
- 3 Website enquiry.
- 4 E-mail enquiries.
- 5 Telephone enquiries:
 - * given contacts;
 - * identifying new contacts through yellow pages etc.;
 - * making contact.
 - * checking information;
 - * making appointments.
- 6 Purchase, disassembly and photography of some products.
- 7 Interviews / consultations / requests for visual or sample material by telephone.
- 8 Preparing first draft :
 - * review all information;
 - * regularly revisit the brief;
 - * write first draft;
 - * submit to Project via e-mail.
- 9 Feedback from Project Director :
 - verbal and then via e-mail so that specific points can be noted and dealt with.
- 10 Preparing second draft:
 - * assess feedback;
 - * revisit the brief;
 - * write second draft;
 - * submit to Project.

Inspection of Panel 2 shows a range of influences brought to bear on the task initially (1 and 2) with telephone calls (5) being used quite extensively early on. The author notes that the amount of information produced by this cold calling was limited and that she turned to using the Internet as an alternative (3). Useful sites were not that difficult to find and usually gave an e-mail address which could then be contacted with specific requests for information (4). Contacts established by e-mail were then followed up with successful information gathering by telephone (7). As visual material was not available in all cases purchase, disassembly and photography of some products took place (6) to ensure good visuals in the final text. Finalising first draft was now possible (8) and could be sent to the Project via e-mail with rapid feedback possible by both phone and e-mail to allow the production of a second draft with minimal delay.

Comparison of traditional and ICT researching

There are strong similarities between these two methods of researching and then writing the case studies. Procedurally they require very similar skills - reviewing, reflecting, organising, classifying, communicating, co-operating, planning, scheduling, creating, imaging, visualising. The author notes the importance of the brief in both approaches - at the beginning of the task to inform initial wide ranging thinking, regularly throughout the activity, and at each of the deadlines. Without a clear briefing moving forward in the task is impossible. The author also notes that in both cases the time line of the task with the two clear deadlines - first draft and second draft - provides staging posts which focus attention on the decisions that need to be made in successfully completing the sub tasks leading to each of these deadlines.

The most obvious difference between the two examples of researching case studies is that the first involved visits whereas the second (admittedly a much broader study) was made entirely from a desk (other than in purchasing the products). This was despite, or maybe as a result of, a reasonable degree of author

familiarity with the graphics subject area and much less familiarity with the electronics area.

Another difference is in the geography of the information sources found. In the case of the first example all sources were UK based. In the latter example the information for two case studies (and part of a third) came from outside the UK. Further differences are in the speed at which the ICT-based information was gathered and in the use of e-mail communications (rather than post, telephone conversations or visits) with companies and in communicating with Nuffield Project Centre. The costs of time, telephone charges and travel were therefore substantially reduced.

Enabling students aged 14 - 16 year to use websites for design and technology research

The successful use of Websites for case study authoring led the Nuffield Project to consider whether this was an area of activity useful for students on GCSE courses. There was already considerable general interest in students using the World Wide Web (for example, DfEE, 1997) and contact with both the National Centre for Educational Technology [NCET]² and the Edexcel Foundation³ led to the Project suggesting that these organisations funded the identification of a range of Websites that could be used to source information relevant for the Edexcel D&T GCSE coursework component "an investigation into an existing product". The activity was in two parts. Firstly to identify websites that would provide information about the use of systems and control in manufacturing of products across all focus areas; and secondly to use this experience to gain an appreciation for the problems and opportunities that might face schools in enabling novice WWW users to access information through the Internet. The time available was three days to search, list and provide guidance for students. The author was able to identify a range of sites under the following categories :

- General access (6 sites including 1 with manufacturing content).
- General information (14 sites, 2 with manufacturing content).

- Sites relevant to the focus areas :
- resistant materials (31 sites, none with manufacturing content);
- food technology (10 sites, 2 with manufacturing content);
- textiles (11 sites, 3 with manufacturing content);
- electronic products (5 sites, none with manufacturing content);
- graphic products (7 sites, none with manufacturing content).

How the websites were identified - a personal account

The author tackled this study by starting with a 'just looking' process to see if any sites previously identified might have relevance in this case. In this initial search she attempted to find sites that were linked through from other sites and realised that in a small number of cases the site address had disappeared or changed. These experiences confirmed that sites may well be transitory. The author found that through informed guesswork it was possible to come up with addresses that worked for sites where she couldn't find an address or link. This strategy was included in the guidance for students.

The earliest phase of the process also highlighted her inclination to serendipity - useful in some respects in this sort of activity but also time-consuming. It was here that she also began to fully realise just how much possible information was available and found herself later rejecting a number of found sites as irrelevant to the task in hand. She began to use the brief in just the same way as she had in the case study research.

From the start the author worked on a table of results at stages during breaks in the on-line time and so regular reflection upon the brief and task was enforced through the need to continuously generate this table. Consequently, she realised that the sites identified as useful were starting to fall into categories. However, it was not until perhaps more than half of the sites had been found (with regular re-sorting of the groupings they had closest fit within) that more focused categories emerged :

- General access.
- General information.
- Sites relevant to *some* of the focus areas.

She realised that she needed to actively seek sites that had particular relevance to the *full* range of focus areas. The numbers of sites reflected in the outcomes are simply the result of time constraint. Time considerations also came to the fore because the author became very aware that she seemed to be finding remarkably few sites strong in the areas of systems and control employed in manufacturing - a key part of the brief. She began to search, find, reject to a much greater extent. As time began to run out the authors made a joint agreement that 'if there aren't any, we say so and that raises questions and opportunities'.

"How much do you care ... Well, then, don't be picky. Do it." (Fielding, 1994 : 138-9)

Organisation

From the start, the author printed out on-line pages from seemingly relevant sites as she found them. Immediately upon finding she copied the site address to a post-it note and stuck this to the stapled pages. Pages were identified faster than her printer could print and this occasionally resulted in a backlog that caused printer-error problems. So the need to pace the search in line with printer output led her to go temporarily off-line more (for the printer to catch-up) thus encouraging continuous construction of the table. (She transferred the addresses and briefly described the sites by referring to the printed out pages and the sticky-notes.)

Outcomes

Around thirty hours, over three consecutive days, was spent on-line. 84 relevant sites were identified.⁴ Around ten printed-out sites were rejected as not relevant in this case. No record was kept of non-printed out sites rejected. This reflects a rate of identifying about three relevant sites per hour.

The results table was completed at the end of the main on-line activity and included address, organisation and a comment about the site, for example :

http://www.wbs.warwick.ac.uk	Warwick University	Introduction to Operations Management which links you to factory tours: e.g. M&M's and Llenroc Plastics
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Following typing-up the table of sites, the addresses were checked (for typing errors) on-line against the sites and, even only a few days later, a few of the sites had changed in image and / or content.

Including the tabling, relevant site-finding using this sort of process works out at roughly two sites per hour - the total time taken for the study was around forty hours. Clearly, as the study was designed to be a three-day activity, the time constraint was not strictly adhered to and there are implications here for anyone with time constraints.

What is an effective model for researching on the web ?

We must immediately acknowledge that in this research activity the researcher was quite clear on the information being sought - information about products, particularly information concerning the use of systems and control in the manufacture the products.

What was unclear was where this information might be and that quite a lot of sites looked at may not contain the information being sought.

So a model of the activity must engage with this uncertainty. The first issue is about deciding where to look. The researcher used two approaches:

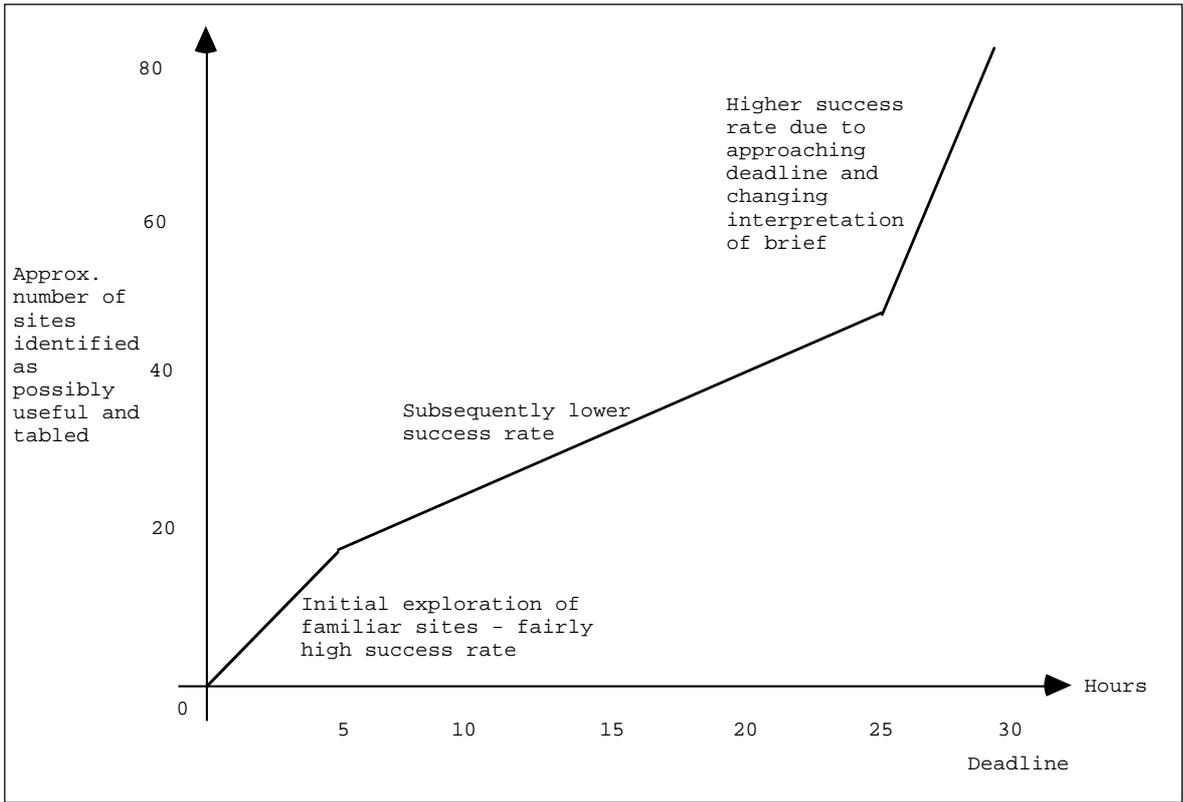
- 1 use a general access site to find a promising site through links;
- 2 look for a site where the information might be (either through having an exact address - from another source - or by 'guessing' the address).

Another key to success seems to be what you do once you have identified a possible site. It is important to look at the site and reflect immediately on whether the information you want is likely or unlikely to be there. If in your judgement it is unlikely to be there then reject the site and move on to another site. If the information seems likely to be there then look further. If it is there then you have been

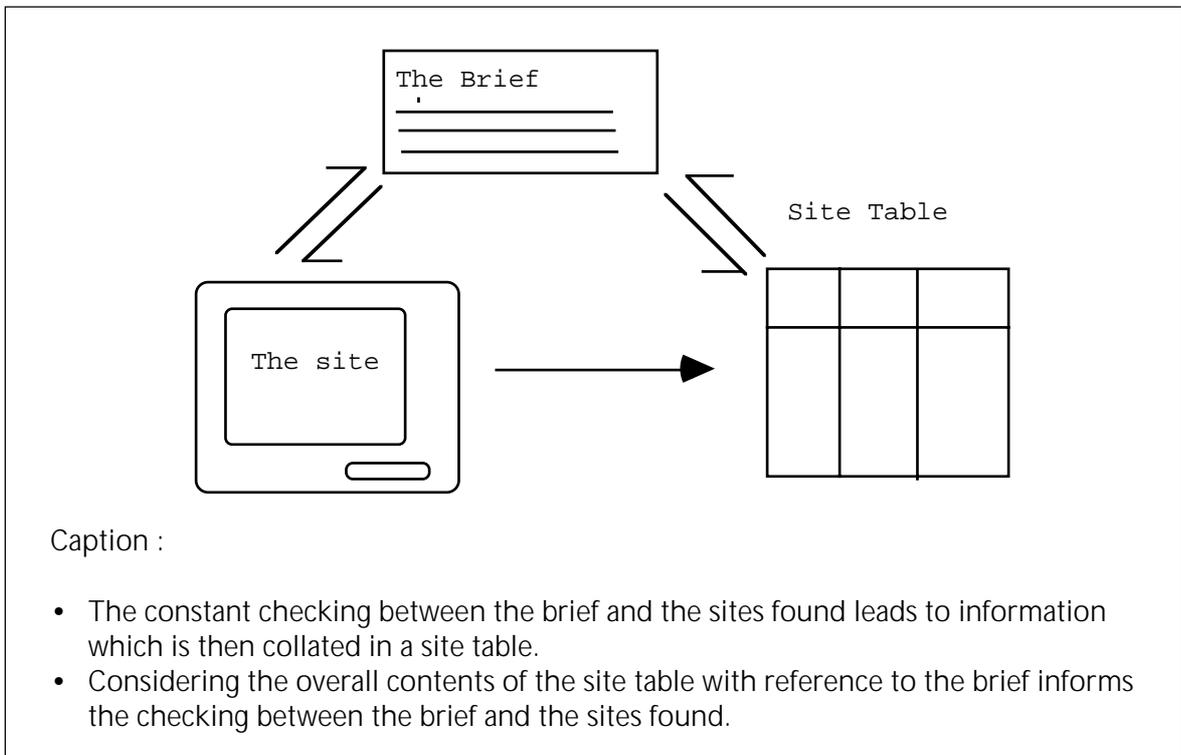
successful and you can bookmark the site, copy it to disc or print it out. It is essential not to be distracted by irrelevant information or engaging presentation and to be well organised in recording what is found.

It is the brief that provides the key to what is and is not relevant. It is the discipline of using the brief quite ruthlessly that makes for effective researching on the Web. This is because the brief and associated constraints provide the criteria through which the researcher interacts with the information in an iterative way. For example, in our activity these criteria included not only what to look for but also the requirement to present what was found, and a time-limit. The need to present (communicate) the information led to the generation of the site table. The need to generate relevant categories within the site table encouraged the researcher to regularly reflect on the brief. It seemed that the nearer to deadline (particularly within the last quarter of the time) the more intense and effectively focused the search became. It seems that both time-pressure and some sort of 'externalising' mechanism, in this case developing the results table, encourages the researcher to be disciplined in constantly referring to and reflecting upon the brief. Note that in our case the brief had two key elements - the site should contain information about manufacturing and there should be a range of sites across the design and technology focus areas. Towards the end of the activity the second element took priority over the first. The effect of these constraints is summarised in Panels 3 and 4. This has several implications for the teaching in which students are required to use the Web for research and in a future publication the authors hope to report on school use of websites within the design and technology curriculum.

We can build a picture of the activity as follows See opposite.



Panel 3 A visual representation of the growth of useful sites identified and tabled during the enquiry activity



Caption :

- The constant checking between the brief and the sites found leads to information which is then collated in a site table.
- Considering the overall contents of the site table with reference to the brief informs the checking between the brief and the sites found.

Panel 4 The iteration between the brief, the site and the site table

Summary of the issues identified in using the Internet for research activity

The drivers of the activity are:

- a clarification of the information sought by having a clear brief;
- the concrete mechanism of constructing the site-table;
- pressure of time (the time-constraint).

An effective procedure can be described as follows :

- identify/list promising sites;
- scrutinise each site in turn for its potential to meet the brief;
- if the potential is low reject the site and investigate the next on the list;
- if the potential is high investigate further until success is achieved or site is seen to be of no use in which case reject and move to the next on the list;
- do not be distracted by engaging presentation or irrelevant information;
- be organised from the start - having a system for noting site information and sticking to it.

It was crucial to the successful outcome of the activity to :

- have uninterrupted time and workspace;
- make use of intuition, guessing and exploring possibly useful previous finds;
- check typing-up of site addresses on-line;
- be resilient, fast in making judgements, stubborn yet flexible, realistic and calm;
- have a human support system.

Notes

- 1 The Nuffield Design and Technology Project published materials for Key Stage 3 in 1995 and KS4 in 1996 and the Nuffield materials. The Project is based at Nuffield Curriculum Projects, 28 Bedford Square, London WC1B 3EG
- 2 National Centre for Educational Technology (NCET) based at the Science Park in Coventry, England is now called British Educational Communication and Technology Agency (BECTA)

3 The Edexcel Foundation, is an awarding body of academic and vocational qualifications based in London

4 Listing of the websites was sent to all Edexcel Centres in February 1998. Copies of the Listing and Guidance notes for students may be obtained by writing to Barry Roberts, at Edexcel or from the Edexcel website www.edexcel.org.uk

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