

## **USING ICT IN GEOGRAPHY GCSE COURSEWORK**

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### **Research Date:**

September 2001 – December 2002

### **Geographical area where research is conducted:**

St Ives, Cambridgeshire

### **Pupil Age Range:**

Secondary (my research focuses on Year 10/11 ages 15-16)

### **What were my original aims?**

As the geography department's ICT co-ordinator, my research aimed to look at whether ICT, in particular web-based support and Geographical Information Systems can be effectively used to enhance pupils' learning and achievement in GCSE geography coursework. As well as our ongoing commitment to developing the successful use and integration of ICT to enhance geographical teaching and learning, this was particularly pertinent considering the need to satisfy the demands of the new GCSE specifications. The exam board now specifies an explicit ICT component in the coursework that is also clearly identified in the mark scheme. My aim was therefore to look at how I could facilitate the effective use of ICT to support and facilitate good quality data collection and analysis in the GCSE geography coursework of a group of Year 10 pupils who were likely to have a range of ICT capabilities. The coursework is designed to look at how the CBD in St Ives has moved over the past 30 years, through the analysis of past land-use maps and the construction of present-day land-use maps through the collection of data and its subsequent input into a GIS (Aegis 3). Data is collected through fieldwork, recording building function which is then classified into type of land-use so it can be entered into the GIS spreadsheet.

### **In what way were my aims refined?**

My initial aim was to try and carry out the research based on the whole of my Year 10 group. However during the planning stages, it became apparent that this could become overwhelming in terms of data collection. I decided therefore whilst I would integrate the use of the ICT with the whole group and gather their opinions through a whole-class questionnaire, I would focus my research in particular on a selected group of pupils. Using baseline data (including KS3 ICT levels and average SAT scores), I selected a group of pupils who spanned the range of ICT capabilities for whom I would focus on for specific data collection such as pupil interviews, learning diaries and pupil observation. At this stage in my research I realised that I also needed to refine my original, rather broad aim, by setting up a series of more focused research questions. As well as monitoring the use of GIS (in this case AEGIS 3) and programmes such as Excel to manipulate geographical data and facilitate the search for patterns in data through its re-manipulation in a graphical and spatial format, I decided to consider how I could encourage pupils to tackle their coursework more independently using supporting resources in an electronic form. I therefore decided to focus my research through two refined questions:

1. In what ways can GIS be used to support data collection and good quality analysis of geographical data?
2. How can web-based resources be used to support pupils with a range of ICT capabilities?

### **Research Processes I found helpful:**

I found it particularly useful to be able to discuss progress with my mentor and within a group of researchers who were working on same theme of using ICT in coursework. This provided a valuable opportunity to debate the general issues involved as well as discussing ways of identifying how we could determine the value added by ICT to the coursework. From the outset, I also kept a research diary; this enabled me to track my own progress and provided me with a useful opportunity to record ideas and thoughts throughout the research process, as well as observations made by other members of staff, and my own evaluations of lessons and the work involved in their preparation. This proved very useful as a way of reflecting on and evaluating progress as well as using the thoughts and ideas recorded to inform the subsequent direction my research would take.

During the initial stages of research, before I had made decisions on the target group, I devised an ICT audit which I gave to the whole of my Year 10 set. I used this opportunity to draw attention to the research I was carrying out, emphasising the importance of them becoming involved and how they would benefit from this. It also enabled me to get a better understanding of their baseline ICT skills and proved a valuable insight into the potential issues surrounding differences in access to computing facilities within the group.

Another valuable research process used included lesson observations, both my own evaluation, and observations made by other members of the department providing a more impartial view of the progress pupils were making. Above all, the most insight was gained through semi-structured interviews with the chosen group of pupils carried out by a university researcher under my direction. Prior to the interview a meeting with the researcher enabled us to discuss the core issues and decide upon open-ended questions that would allow pupils to talk freely about their experiences in using ICT in their coursework, whilst within the specific areas of research I was targeting, i.e. how the GIS facilitated and supported data collection and analysis and how useful the electronic support resources were, and the degree to which they promoted independence. The fact that this part of the research was carried out by an independent researcher with no ties to the pupils helped to ensure that they were more open in their views than they may have been with me. Overall, this multi-method process of data collection (triangulation) has helped to highlight core issues that arose time and again, for example in the interviews, questionnaires and observations made.

### **Research processes my pupils found helpful**

The pupils I approached to become specifically involved in the research, by keeping learning diaries and giving interviews, appeared to view the research positively. I am sure that they appreciated the opportunity to give their own opinions in the context of the interviews and questionnaires. A surprising number of pupils also took advantage of the ICT rooms being made available to them

during the lunchtime period. Pupils also liked the fact that they were each given a CD-ROM to take away with them as part of the research which seemed to give their coursework increased 'status'.

In addition, pupils benefited from the curriculum development central to this project, demonstrating that as a department we have made a valuable step forward. This was the first cohort that was able to experience using a GIS, as I was able to spend time devising activities to support their coursework through the use of AEGIS. During interviews pupils showed appreciation of having access to the extra resources created as part of this research.

### **The learning points gained from undertaking the research**

Evidence collected and observed during this research has shown that ICT has many valuable roles to play in motivating pupils and enhancing their achievement in coursework. However, the degree to which ICT adds value is dependent on a number of factors, including: teacher preparation; pupil familiarity with the software; pupils' ability to use ICT as an analytical tool.

A number of salient learning points can be identified:

1. The GIS proved useful in data collection, enabling the quick and simple production of baseline maps for plotting land-use in the field at a variety of scales. This saved time and enabled pupils' to develop spatial awareness of the study area. In the analysis of data the software proved valuable in its capacity to deal effectively with large amounts of data and display it as appropriate. Pupils were able to interrogate the data set by undertaking searches which they were able to refine in order to search for patterns in land-use. By displaying the results visually, the GIS enabled pupils to clearly identify areas characteristics expected of a CBD.

2. In this instance the use of GIS in effective analysis was limited and inevitably impeded by pupils' lack of familiarity with the potential analytical functions of a GIS. This issue needs to be addressed. Pupils did however integrate land-use maps into their coursework and many began to annotate and interpret what they showed.

3. Providing pupils with electronic support resources, proved successful, providing access to a greater wealth of resources than otherwise would have been possible. It also provided pupils with the same help and opportunities whilst not being overly prescriptive, allowing differentiation by outcome. Pupils found that having these resources (e.g. support sheets) in an electronic format, helped their organisation by reducing the amount of paper and sheets they had and enabling them to navigate the sources quickly and easily through the use of hyperlinks, to find information and help that they required. Pupils also appreciated the fact that they could make use of resources that otherwise would be difficult to access. It became apparent that pupils appeared to become more autonomous in their learning as a result of this resource being available.

4. Throughout the research, evidence has shown that pupils have benefited greatly from using ICT. It has clearly enabled pupils to speed up, what would otherwise be laborious tasks of dealing with large amount of data and in many cases the presentation of coursework has undoubtedly been improved through the use of packages such as Word and Excel. Many pupils have also been well motivated during the coursework period and many have grown in confidence, both in the use of ICT and in their own geographical ability.

In this research, ICT has successfully facilitated:

- a. the collection and use of individual and group data;
- b. an improved spatial awareness of the local area;
- c. the search for patterns and extraction of relevant information by successfully manipulating data in graphical and cartographical formats to identify patterns and relationships.

#### **The evidence which relates to this learning.**

The finished coursework provides evidence of how pupil's coursework has benefited from the use of ICT. There is some evidence of the integration of text, digital photographs and graphics in which text boxes and simple drawing functions have also been used to annotate and provide interpretation for what is shown. Land-use maps have also been used, however the extent to which their use has been maximised varies and this is likely to have been impeded by pupil's rather superficial understanding of the benefits of the GIS.

In the interviews, pupils did identify the benefits of being able to display the land-use maps visually on the computer screen in packages such as Word, whilst also integrating digital photographs and other sources. Pupils' views were that this made it easier to compare and interpret the features shown whilst also enabling them to then formulate their understanding in text form underneath. This seemed to show the benefit of ICT as a tool to aid cognitive development through the functions it allows the user to perform in integrating and manipulating text and graphics whilst supporting both visual and kinaesthetic learners.

The fact that pupils were in many cases unable to use GIS as an effective analysis tool became clear in the feedback from interviews. Some pupils' perceptions of why we used the GIS were unclear and much of the discussion focused on the practicalities of it as an ICT tool. It is however essential that this doesn't overshadow the desired outcome, which is of course the geographical significance of the data. It is important that pupils do not perceive the creation of simple maps using the GIS as the outcome; it must be their geographical interpretation that becomes the focus of their thinking.

### **Questions for my future practice**

1. *How can I help pupils develop the analytical skills necessary to make full use of the powerful functions of a GIS?* It has become clear to me that the value of ICT can only be taken to the next level if the time saved through rapid data manipulation encourages more divergent thinking by pupils, stimulating them to undertake greater exploration of data to seek patterns and explanations for relationships found. I believe that there was little evidence of this during my research as a result of this being the pupils' first experience of using a GIS which emphasised the understanding of the mechanics of using the software as a data representation tool rather than exploiting its full functionality as an analytical tool. One particular pupil who grasped the concept of the GIS very quickly did begin to explore further patterns and diverge from the suggested structure showing signs of a potentially beneficial thinking sequence.

2. *How can I develop a framework for progression in the use of GIS throughout the geography curriculum?* It is clear that the degree to which pupils were able to use the GIS for effective analysis was severely constrained by the issue of lack of familiarity with the software and not possessing the necessary analytical skills to maximise its use. I believe that if I could develop a framework, within which the basic skills of using the GIS were introduced early in Key Stage 3 and were followed up later in the Key Stage with structured exercises which promote the development of analytical skills, by the time pupils reach Key Stage 4, they would be more confident and conversant in using the GIS and greater time and effort could be spent on dealing with and interpreting the output.

3. *How can I effectively demonstrate the use of GIS in a geographical context?* One of the issues raised by pupils in the interviews was the way in which I delivered the demonstration for using the GIS using a single computer. On reflection use of the school's data projector would have been a better option. The way in which this demonstration is structured needs careful consideration for future years. If it is done in a way that fully models the capability of the GIS, this may also enable pupils to become more divergent and innovative in the way they use it to solve or address a geographical problem / issue.

### **Questions for my school**

*How can the school help to promote the successful use of ICT in geography coursework?* Access to and provision of ICT facilities is essential if pupils are to be able to use ICT successfully. Although more and more families now own a computer, it cannot of course be assumed that all pupils have access to computing facilities outside of school. This issue was highlighted by the ICT audit I carried out amongst pupils. As a school we are very lucky in terms of ICT provision and support, inevitably however, there are still issues of accessibility that need to be addressed if the whole cohort of GCSE Geographers is to gain equal and sufficient access to these facilities. It may be worthwhile investigating possible further developments such as the use of interactive whiteboards in demonstrating software to pupils, which may also reduce the time needed in computer rooms if whole class expositions can be undertaken within the classroom. The success of the electronic support resources I provided has also highlighted the need to ensure pupils can access these remotely. For obvious reasons, it would not be possible to provide all pupils with a CD-ROM as was done for the purpose of this research. How can we ensure that pupils have access to these electronic resources outside of school?

### **Questions for further research**

Does gender influence the value added to coursework by the use of ICT such as a GIS? Boys often prefer practical tasks, but often under perform in coursework – can GIS reverse this trend?

How can the value added to coursework through the use of ICT such as GIS best be quantified?

How does performance in GCSE coursework vary between a group using GIS and a group that isn't?

### **Dissemination**

As the project has just ended, the dissemination phase is still to come. I intend to share the materials developed and my understandings about how to use ICT in Geography course work with the rest of my department through internal feedback and inset during department meetings and/or professional days as well as more informal discussion on an individual basis. The group of seven BPRS researchers involved in similar projects intend to meet to share the results of our research and draw out the key learning points in 2003. After this meeting, results may be shared with a wider audience.

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**Rob Chambers (Cb) December 2002**