PUTTING GIS IN ITS PLACE: PROACTIVE APPROACHES FOR CLASSROOM BEGINNERS

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Abstract

When used effectively, digital GIS are powerful purveyors of geographical information. Despite research evidence reflecting associated pedagogical benefits, the place of GIS in many schools remains less secure. Some teachers continue to associate it with both real and perceived implementation barriers.

This paper will refer to a recent research study in a UK secondary school which reflects reasons for growing optimism. The main aim of the study was to investigate how using quite readily accessible GIS tools can help teachers begin incorporating GIS into their teaching. Students used ESRI ArcView 3.3. and an adapted version of the ESRI online GIS activity based on the Titanic disaster (Kerski 2002) to develop their spatial skills.

Suggestions for developing more proactive approaches to getting GIS effectively into geography classrooms also form the basis of the discussion.

Introduction

‘When geography and life intersect, people pay attention.’

Nick Boyon, 2002

The study of places lies at the core of geography education (Tuan, 1977; Massey, 1997). At a time when geography’s standing in UK schools is subject to both positive (Taylor, 2005) and negative critique (Standish, 2004), the potential benefits of using GIS has been heralded by some educationalists as a panacea to enhance the subject’s kudos (Waters, 2003).

Our responses to places are both personal and complex (Taylor, 2005). Some behavioural geographers suggest that we respond to places in two closely connected stages involving firstly perception and secondly cognition (Tuan, 1977). From an early age, we develop strong emotional ties with specific locations so that ‘home’, ‘school’ and other places become important phenomenological spaces for each of us. Initially, as young children tend to, we draw quite distinct mental boundaries around places ‘important to us and attach significant cognitive information to them (Creswell, 2004). The full extent of our geographical understanding involves a combination of these experiences and our cognitive interpretation of data about places, (Fien and Slater, 1983).

At the same time, the level of development of our geographical thinking about both local and more distant places is strongly affected by the channels through which geographical information (GI) is represented to us (Roberts, 2003). In particular, geographical impressions have always been shaped by maps, images and stories as well as individual experiences of places. The increasing digitisation of spatial data has transformed how GI is communicated to us in a wide range of human contexts including education.

Established research indicates that GIS use can benefit geographical learning in several ways. A much wider range of rich spatially-related data can be held within one GIS than teachers are able to provide by other means. The possibilities of providing students with opportunities to think and understand spatially with real world tools are particularly promising for GIS enthusiasts. Increasing capacity to cache GI data on the Web has made GIS even more flexible to use in this way.

A growing body of literature indicates that effective use of GIS can augment enquiry-based geography education (Baker, 1999; Kerski 2000). Specifically within the UK context, enquiry is identified as one of the key aspects of the National Curriculum for geography (Roberts, 2003). In conjunction with a GIS, a constructivist approach to learning allows the student to generate a range of digital GI data which they can manipulate and adapt as they decide and require. Constructivism can be interpreted in education as a model of practice where students create and adapt their own knowledge and skills. The teacher is seen as facilitator and student peers are often engaged in collaborative learning (Baker, 1999). Linking and layering geospatial information becomes part of the overall learning process but also a pivotal aspect of student's own understanding.

Although the UK curriculum provides plenty of potential opportunities for using GIS to support it, very little specific guidance exists on how to plan our pedagogy around it. Already over-stretched teachers, many of them non-geography specialists in primary and lower secondary schools are unlikely to embrace GIS without a considerable amount of collaborative professional development and sustained direction. The results of a teacher survey carried out by the leading map agency in Great Britain suggests that the uptake of GIS in schools remains patchy and inconsistent (Ordnance Survey, 2004).

Real and perceived barriers associated with using GIS in schools

'Above all, planning must consider the pre-implementation issues of whether and how to start, and what readiness conditions might be essential prior to commencing. Implementation planning is not a matter of establishing a logical sequence of steps deriving from the innovation or reform at hand.'
(Fullan, 1991)

Only a small number of UK teachers are using GIS (Ofsted 2004). It is possible that perceived as well as real difficulties are preventing teachers from embracing these technologies. Initial costs and training commitments are still key causes for concern for many teachers considering GIS use. Access to ICT facilities remains a major stumbling block for many schools. At secondary level in particular, the perception that using GIS requires the booking of whole ICT suites in order to be effective is discouraging many teachers from using it. (Ofsted, 2004).

Lack of user-friendly GIS data remains a real barrier for many. The search for appropriate data can be daunting for the un-initiated. Even commercial GIS providers acknowledge that UK-orientated GI can be inappropriate or difficult to manipulate in a school environment, (Fargher, 2004).

Limited curriculum direction has further curtailed the uptake of GIS in UK schools. GIS is mentioned only briefly in national curriculum guidance. One exception is the relatively new Oxford Cambridge and RSA (OCR) geography pilot GCSE examination where students are offered the opportunity to study GIS as an optional module.

At present the UK school curriculum provides plenty of potential opportunities for using GIS to support it but very little specific guidance on how to implement its inclusion. Teachers, many of them non-geography specialists in primary and lower secondary schools are unlikely to embrace GIS without a considerable amount of support.Despite these recognized implementation difficulties, optimism about the potential benefits of using GIS in schools has continued to grow (Baker 1999;Bednarz 2000).

Proactive pedagogy with GIS

> 'We must now go beyond the "wow" stage of implementing GIS into the classroom and honestly and realistically examine why we want to use GIS and how we will use it in the future. Such methodology and pedagogical discussions are imperative if GIS is to be more than just classroom entertainment.'
> (McInerney, 2003 p.14)

Despite the commonly held belief that GIS software is expensive, there are several starter packages which now come with one year trial site licences (Malone, Palmer & Voigt, 2003). These GIS teaching programmes provide a useful starting point for GIS beginners. Effective training with GIS should not only involve showing classroom beginners the practicalities of using the software but also pedagogical strategies for using GIS as a platform for injecting variety into and enhancing our somewhat tired national geography curriculum.

Creating a teacher qualification in GIS use in the classroom where participants have the opportunity to use GIS in their teaching would also help to raise the profile and quality of teaching spatial querying. Making full use of online GIS training could compliment this type of professional development.

Providing 'safe starts' in GIS for colleagues new to these technologies does not mean that we should not embrace real world opportunities to be creative with GIS. Although at a very early stage, a number of staff in Geography Education at the Institute of Education, University of London in association with the Geographic Association are involved in planning a GIS-enabled schools project on London as host city for the 2012 Olympics.

Providing opportunities to develop a continuous GIS-enabled curriculum now will help greatly in assimilating future GIS- related technological innovation. Planning the integration of GIS use into each key stage of our curriculum would help to develop future use of GIS. Building on well documented empirical evidence there is a range of GIS software available which could be used appropriately for each curriculum phase (Martin, 2006, p.117).

The 'start simple approach': A school case study

The advantages of getting started at a simple level with GIS are many (Eylon, 1998). Adopting the approach that getting GIS into our schools is more of a 'work in progress' may help us to develop our aims more successfully,(Duke, 2005).Also, whilst the reality of many GIS implementation difficulties cannot be ignored, there are several successful examples of the 'start simple approach" to getting GIS into UK classrooms.

One such study was carried out with an Information and Communication Technology department in a school in north London. The main aim of the classroom-based research was to investigate the effectiveness of using a GIS to develop spatial skills in a geographical enquiry. The GIS tools used in the classroom-based research were deliberately chosen to be representative of readily available 'off the shelf GIS.'

The enquiry was co-taught with a classroom teacher with no previous GIS experience. The GIS tools used in the classroom-based research were deliberately chosen to be representative of readily available but industry-standard GIS. Students used ESRI ArcView GIS software available with a one year site licence for the price of the accompanying textbook, (Malone, Palmer & Voigt 2003) and an adapted version of the ESRI online GIS activity based on the 1912 Titanic disaster (Kerski, 2002).

During the ten hours of lesson time, thirty-eight ICT GCSE students (aged 14-15 years) used a wide range of maps at a variety of scales, photographs, satellite images and statistical databases to assess the main causes of the disaster. They were given opportunities to explore how physical and human processes contributed to the tragedy and to develop a deeper understanding of the geographical characteristics of the specific location where the ship sank.

Although very small-scale, the research indicated that using GIS can enable students to develop as more effective autonomous learners beyond the scope of practising their spatial skills. More abstract geographical concepts seemed to become more accessible to them via the high quality digital visualization available within the GIS (Pang, 2001). The more intellectually able responded to the academic challenge of using and manipulating a range of data sets in their problem solving whereas the less able could still access geographical information often beyond their academic capabilities in a comparable learning setting not assisted by GIS (Baker, 2002).Whilst geographical learning with GIS is no substitute for real experience of different localities, it can be a very useful pedagogic tool for fixing significance to specific places (Fargher, 2004).

The 'Local Solutions' approach: 'Spatially Speaking'

Spatially Speaking' is a 'Local Solutions' (LS) project developed by the Geographical Association and supported by ESRI UK and the British Educational Communications and Technology Agency (BECTA). The project currently involves a team of GIS teacher innovators and beginners from six different schools working together on developing pedagogical strategies around the use of the newest geo-technologies in the classroom. All schools involved with the project use ArcGIS 9 software and a range of GIS resources and support provided by ESRI UK. The 'Spatially Speaking' membership also draws on expertise and experience from other representatives of the GIS industry, teacher educators and educational researchers. A central aim of the project is to give the team time and space to work together to provide tried and tested pedagogical guidance that will be made available to other UK teachers via the Geographical Association's website. Although the project has only been running for seven months, tentative findings suggest that he bringing together of GIS innovators and beginners to work together in small groups has had several positive effects on participants.

However the dynamics of successful teacher collaboration are complex (Fullan, 1991).The processes of sharing new strategies at peer level can be successful if complex phases in professional learning (Groundwater Smith 2001). Clearly, many teachers like to learn from other teachers (Crandall et al 1982). Working closely together can help to overcome the well-documented phenomenon of individual teachers feeling geographically and philosophically isolated (Hargreaves 1998). When teachers are pivotal, the processes of setting a collective agenda often become more readily transformative (Sachs 2003).

In addition to the potential benefits of developing pedagogical strategies around the use of GIS in classrooms, the Geographical Association (GA) believes that the 'Local Solutions' approach to is both vital and timely in reversing some of the negative perceptions of school geography in the UK (Lambert et al, 2005; Mitchell 2005).

Developing networks of users is an already proven positive approach to teacher's professional development and innovative curriculum change (Kent 1996; Rawling 2001). The Schools Mapping Project is a web-enabled GIS project that has been developed by Durham County Council. The project won the Association for Geographic Information (AGI) award for Innovation in 2003. Web-enabled GIS technologies provide interactive cross-curricular geographic information to over 300 participating schools via a curriculum extranet (CNET).

Teaching materials are provided on two levels, one introductory and one more advanced (Durham Schools Mapping Project).

Conclusion

'A classroom that uses GIS as a problem-solving tool is a classroom in which the walls are invisible and the teacher and student assume roles that are non-traditional….Adopting this technology is not for the fainthearted. But integrating GIS into the curriculum rewards teachers by creating intellectually challenging and demanding learning opportunities.'
(Audet & Ludwig 2000)

When used effectively, GIS can provide comprehensive learning environments with proven potential for problem solving of real world relevance. The 2004 Boxing Day tsunami tragedy and the impact of Hurricane Katrina in 2005 were graphically showcased through the public media often via GIS. These examples illustrate to educators and learners the potential of these technologies for transferring and displaying knowledge and making powerful connections between places. Fully realising this potential in schools will require careful stewardship.

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