

A world-wide geographical investigation using online GIS

Raphael demonstrates how the new functionality of online GIS enhances geographical investigations and promotes collaborative projects between schools.

A few years ago, at an open morning, a visiting parent asked about how we were using GIS in our teaching. At the time GIS was not easily accessible to schools and I sidestepped the question with mentions of using Google Earth and a few other mapping websites. However the question made me wonder if we could be making more use of computerised mapping to enhance our subject and invigorate our teaching. So I set about signing our school up, initially to ESRI's ArcGIS desktop and more recently to the online version. I know if you are new to GIS it can seem very intimidating – I was in that position only very recently – but it really does not take long to start using it in your teaching. I think GIS gives geography teaching a spark of innovation which positions the subject as both modern and relevant to young people. It also adds a good skills component to our palette of teaching methods. GIS is not just a fieldwork tool: it provides opportunities for students to interrogate up-to-date or live map data in an interactive way, for example looking at maps of live hurricane or earthquake data in ArcGIS online. In a few years I moved from knowing nothing about GIS to running an international GIS event and our school being recognised as one of ESRI UK's GIS Centres of Excellence!

GIS for collaborative projects

What has particularly interested me is how web-based GIS has provided great opportunities for collaborative investigations between schools. Typically, school geography fieldwork is confined to collecting small sets of primary data from a particular location, so it is hard to accumulate data sets large enough for sophisticated analysis. While such studies can be improved by incorporating valuable secondary sources of data, students are often most engaged with their own original data sets. Working alongside ESRI UK, and using freely available online GIS applications, I developed a simple quality of life survey and invited as many schools as possible to

On a scale of 1 to 10:

- 1 how peaceful and quiet are the streets in the area you live in?
- 2 how clean do you feel the air you breathe is in the area you live in?
- 3 how would you rate the quality of parks and public open spaces in the area you live in?
- 4 how clean and tidy are the streets and buildings in the area you live in?
- 5 how safe would you feel walking around your home area at night?
- 6 how would you rate the quality of medical facilities in your area?
- 7 do you think climate change over the next 50 years will bring more benefits or problems to the area you live in?
- 8 how would you rate the area you live in overall?

Figure 1: The questions used to investigate quality of life.

get their students involved: my aim was to create a new world record for the largest geography investigation.

The event, held in November 2014, was promoted by the GDST (Girls' Day School Trust) and ESRI UK, and attracted interest from around the world. Over 11,500 students participated in the investigation, creating a new ESRI world record and a challenge for us to beat in the future.

Methodology

I chose to survey variations in quality of life globally because I wanted something which everyone could easily get involved with. It would produce good spatial data for analysis and be relevant to topics such as deprivation, migration and environmental quality. After consulting with

Figure 2: The lesson titles for the scheme of work. A detailed version is available to download, plus full information and resource links, at <http://rhsb.maps.arcgis.com/apps/MapJournal/?appid=38cb13997c074c32a1fe0e7d44baa7ec> and resources for Lesson 7 at <http://bit.ly/1tHoe1R>

Lesson 1	What is GIS?
Lesson 2	What is the use of GIS?
Lesson 3	How is GIS being used in the real world?
Lesson 4	How does GIS help me understand my local area?
Lesson 5	How can GIS help solve problems?
Lesson 6	How can I start using GIS?
Lesson 7	What influences quality of life?
Lesson 8	How does quality of life vary locally and globally?
Lesson 9	Evaluating the study.



Figure 3: Year 8 students at Royal High School Bath analysing the fear of crime responses to the world record survey. **Photo:** Raphael Heath.

a small group of expert teachers I used a rating scale from 1 to 10, with 10 being the best score, on which students would rate a diverse range of factors relating to the quality of life in their home area (see Figure 1).

Teaching resources

The final element was to create a range of educational materials so both students and teachers could engage fully with the event and the investigation (Figure 2). I used the ESRI story map templates in ArcGIS online to create schemes of work based on introducing GIS uses to students. These contained a range of interactive resources and videos to explain what GIS is, how it is being used and to link to the world record event data entry and analysis. I used screen casting software to produce various 'how to' videos which explained key skills in using the GIS applications for inputting and processing data for the event.

How to collect GIS data

There are various ways to enter data into GIS maps including using mobile devices and tablet apps. For the global quality of life survey we used the recently released ArcGIS online 'form builder app' for data entry. This is a useful addition for fieldwork data input by students, as the form allows the questions to be clearly set out for each variable and provides a simple map interface for students to pinpoint the location to which their data refers. We invited schools to enter

data between 17 and 21 November 2014 (the week around GIS Day). All the data is publicly accessible on the ArcGIS platform by adding the layer called 'local data mapper' to any map. Schools can always perform their own quality of life surveys in the local area and compare their findings with this data set.

For my year 8 class I wanted to focus specifically on using GIS to study the geography of crime (Figure 3). Students focused on the findings for Question 5, on personal safety at night, and linked this to their knowledge of local crime patterns (see weblinks at the end of the article).

Using web tools to enhance data analysis

Analysing the large amount of spatially scattered data we collected is a real challenge. We do not often present students with such detailed and unprocessed data to examine, and getting them to consider how to process it is a really useful exercise. Normally data like this would be summarised into regional or local ward-scale summary maps: people who are confident with ArcGIS analysis tools can produce such analysis, but the majority will find it difficult. Fortunately ArcGIS have recently released a number of web apps designed to simplify the analysis process. One is called a 'summary viewer': it allows the user to zoom to any location and it continuously produces fresh calculation of the average scores for the data within the map view (Figure 4). For greater depth of analysis there is the custom web

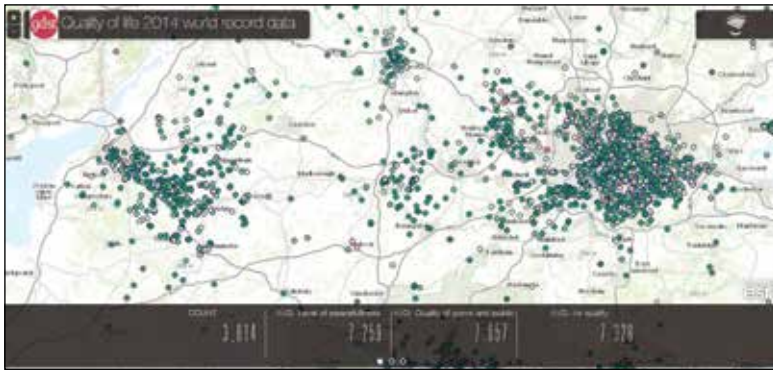


Figure 4: Southern England quality of life summary viewer.



Figure 5: Graph showing average quality of life scores for Norwich.

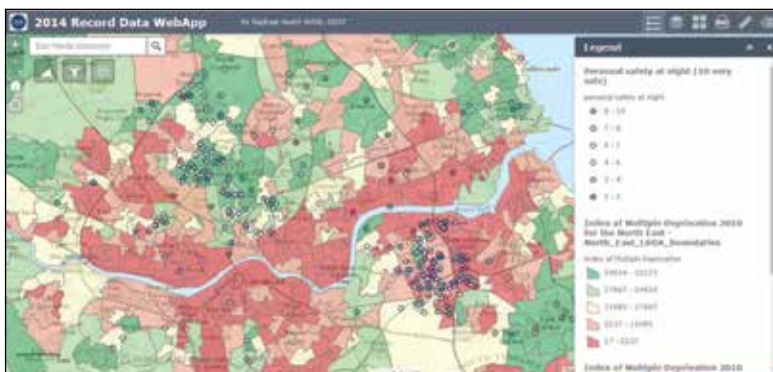


Figure 6: Safety at night scores over the index of multiple deprivation in Newcastle.

app builder, which we used to add a wider range of analytical tools. These include the facility to:

- query the data and highlight, for instance, locations which scored below 4 for personal safety at night
- produce a summary graph of the average scores for any area traced on the map (see Figure 5)
- select different layers from both the quality of life primary data responses and secondary data such as UK employment and multiple deprivation (Figure 6). This gives users considerable power to manipulate the data, seek comparisons and look at correlations with other secondary data.

Reflections and the future

I have focused on the process involved in setting up a GIS event and the various freely available tools to support it, rather than the data itself. There were, however many interesting results from the data. I also used ESRI's story map app to highlight some of the patterns and findings such as the levels of pollution identified in Chinese cities and the quality of life in Dubai. (See weblinks to find more about the data.)

Teachers and students in different schools are increasingly able to collaborate on a number of GIS projects to enrich our geography lessons. It is an exciting time: we are able to extend learning not just beyond the classroom but beyond our school groups. I see the world record event as part of a very positive movement towards increasing inter-school collaboration where geographers are naturally placed to lead the way.

Questions for departmental discussion

- Is your department making use of online GIS applications?
- What are the barriers to using GIS and how can they be overcome?
- Should GIS be taught as a distinct unit or incorporated within schemes of work?
- Does your department plan for progression in GIS skills across the key stages?
- What opportunities are there for collaborative projects with other schools? | **TG**

Note

If you would like to find out more about the November 2015 GIS Day global event 'Ashcloud Apocalypse' go to www.gisevent.wix.com/gisday2015

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Useful weblinks

<http://arg.is/1KV03Ce> Link to live earthquake map in ArcGIS online (last accessed 27 August 2015).

<http://bit.ly/1103VA9> Link to live hurricane map in ArcGIS online (last accessed 15 March 2015).

<http://gisrecord2014.jimdo.com> Website to support the world record event (last accessed 15 March 2015).

<http://gisrecord2014.jimdo.com/how-to-videos> Screen cast on how to produce videos showing GIS skills for data entry and analysis (last accessed 15 March 2015).

<http://rhsb.maps.arcgis.com/apps/MapJournal?appid=38cb13997c074c32a1fe0e7d44baa7ec> Story map developing a scheme of work around introducing GIS and the world record event (last accessed 15 March 2015).

<http://bit.ly/1tHoe1R> Story map with resources relating to data entry for the world record event (last accessed 15 March 2015).

<http://esriukeducation.maps.arcgis.com/apps/GeoForm/index.html?appid=e74958ddd70a4f57841d2f66ef689a8c&webmap=2da5aa03af3d4139890b3bd49e0e24fb> The data entry form application linked to ArcGIS online for the world record event (last accessed 15 March 2015).

<http://rhsb.maps.arcgis.com/apps/MapJournal/index.html?appid=88c3f711658948a6b2e0a28511b83ee6> Story map highlighting some key results and patterns from the world record data (last accessed 15 March 2015).

www.blendspace.com/lessons/qvE52MNvpTjddA/geography-of-crime-rhsb-lessons Link to blendspace lesson resources on using GIS for the study of crime (last accessed 15 March 2015).