"I WANT TO GET PHYSICAL, PHYSICAL": SPATIAL TECHNOLOGIES INSIDE AND OUTSIDE YOUR GEOGRAPHY CLASSROOM

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Lorraine Chaffer encourages you to confidently use spatial technologies in your classroom…

What is Geography like in your classroom?

With the new K-10 Geography syllabus implemented in all schools from 2017, it may well be timely to stop and ask ourselves a couple of reflective questions such as: What have the students been doing? What have we been doing? Is it working? What should we try next?

I have been looking inside many Geography classrooms across NSW and I have noticed students using spatial technologies to create digital tours, plot information from fieldwork activities, create digital elevation profiles, contribute to citizen science projects and examine or analyse real-time data.

The students like it. Increasingly, I think their teachers do too.

Outside the classroom, governments, organisations and individuals are using spatial technologies to analyse spatial data, create visual representations and make predictions in fields as wide ranging as urban planning, disaster management, agricultural production and climate change.

Spatial technology is creating significant and interesting employment opportunities in many industries, leading to a growing demand for trained technologists with spatial analysis skills. Geography has always been the subject that is relevant to all other fields. Now, the skills of geographers in both the humanities and technical industries are in increasing demand.

Spatial technologies include any technology that enables us to collect data about a location (place) and organise that data to show spatial patterns, usually on a map or satellite image.
We may not realise it but this technology has become an integral part of our lives through the devices we use, such as our computers, tablets and smartphones. All online programs, including social media applications, maps and games, have spatial components built into them.

Despite the prevalence of spatial technologies in our daily lives there remains a range of impediments to their use in the classroom. These include software and data access, hardware availability, computer room access and teacher expertise. This article seeks to build confidence and awareness of some of the practical applications teachers are using successfully now, whilst acknowledging that improved resources will also be essential for effective teaching of many of the positive aspects of our new syllabuses.

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What does the Geography K-10 syllabus have to say about spatial technologies?

In the NSW Geography Syllabus 7-10, spatial technologies is one of the tools students use in geographical inquiry to gather, interpret, analyse and communicate geographical information.

The syllabus glossary states:

> Spatial technologies include any software or hardware that interacts with real world locations. Examples include, but are not limited to, virtual maps, satellite images, global positioning systems (GPS), geographic information systems (GIS), remote sensing and augmented reality. Spatial technologies are used to visualise, manipulate, analyse, display and record spatial data.

http://syllabus.bos.nsw.edu.au/hsie/geography-k10/geographical-tools/

In the Continuum of Tools, examples of spatial technologies are listed to provide teachers with options when selecting technologies that are content and stage appropriate. For instance,

- Stages 1 to 3 - virtual maps, satellite images and global positioning systems (GPS);
- Stages 4 and 5 - virtual maps, satellite images and global positioning systems (GPS); remote sensing, Augmented Reality (AR) and Geographic Information Systems (GIS).

Over time it is expected that students will experience a range of these spatial tools in the context of asking and answer key geographical questions. By the end of Stage 5 students should feel confident enough to independently choose a spatial technology application for geographical inquiry tasks.

We still need to ask important questions

At Stage 1, students might experience spatial technologies when examining a digital map or using Google Earth to find their suburb or their house. The aim is not only to have students play with the technology but to learn its value in answering questions they have about their world. These questions may include: Where is it? How are places organised?

Continuing with this rationale in mind, by Stage 4, students could be using Geographic Information Systems (GIS) to answer questions such as: What patterns can be observed? How can these spatial patterns be explained? What relationships can you see between features?

The technology can then be used to represent their data as layers of information on a map or image. The layers can be turned on and off, allowing choices to be made about the information relevant to a geographical investigation. For example, a layer that shows areas susceptible to flooding in a local area

or where rice is grown on a map of the world could help students understand and plan for questions around water as a resource or the impact of hydrological hazards.

At a basic level, a student will use data sets which already exist in an application such as the different layers in Google Earth or Geographic Map Maker. At a more sophisticated level, students will add their own data to create a layer on a map or image using programs such as Esri Story Maps or Google My Maps.

The big five spatial tools

GPS - a global navigation system that uses satellites and ground monitoring stations to locate places using a system of geographic coordinates. The most common application is the use of GPS in cars.

GIS is the system that captures, stores and manipulates geographical data linked to geographic coordinates. It creates data layers in a visual format, such a map, for analysis. In your car, the GPS data collected from the satellite is plotted onto a map that shows where you are.

Remote sensing is a way of obtaining information about places from a distance, usually using aircraft or satellites as well as instruments such as drones, remote cameras, thermal scanners, atmospheric balloons and ocean buoys.

Augmented reality (AR) provides an enhanced version of reality in which computer-generated images (virtual elements) are superimposed onto real world views. In the Geography classroom, the use of AR allows students to obtain extra information about a place or environment from the augmented image. A good example is an Augmented Reality Sandbox in which contour lines are superimposed over landforms created in the sandbox and rain can be simulated to allow a study of runoff and river flow.

Virtual reality (VR) is a digital recreation of an environment or situation. Users feel like they are experiencing the place or event. In the Geography classroom, the use of VR allows students to experience real environments they may never visit in person by using a headset (goggles) and a smartphone.

Real time data visualisations show environmental change as it happens. Satellites capture and analyse global data instantaneously. This data is used to create real time visualisations. Examples include applications that show the movement of fishing vessels and container ships at sea and monitor weather systems as they occur.

Introducing spatial technologies in the Geography classroom

Confidence is the key to the successful use of spatial technologies in a classroom, but it is also the reality that many students will pick up the skills they need to use these technologies very quickly. For teachers and students, there are free online tutorials for most spatial technology applications used in Geography classrooms worldwide.

My suggestion is to select one spatial tool at a time to develop your skills, and integrate that tool into as many places in your curriculum as possible. Do not feel you need to learn everything a spatial technology tool can do at once; build your skills over time. Most importantly, have a 'Plan B' for those days the technology is not working or a problem arises during your lessons.

Importantly, student activities integrating the use of spatial technologies should have a purpose, be planned and have clear links to the syllabus content and outcomes. Use an inquiry question to focus student learning and provide clear instructions for students to follow. A planning template can be useful when developing activities that could be used as Assessments 'as' or 'for' Learning.

See Attachment 1 for Spatial Technology Activity Planning Document

Getting started or moving forward

To develop your own confidence, try getting together with colleagues to experiment with some of the following examples, beginning with some real-time data visualisations first, then moving on to creating maps using programs with inbuilt layers of data. When your team is more confident, start using applications that require you to add your own data layers. Try one at a time and get 'bang for your buck' by trying out your new ideas across your classes for 7-10 or possibly across KLAs for K-6.

And, have some fun together!

1. Real-time data visualisations:
   - Earth (global wind map) https://earth.nullschool.net/
   - Global Fishing Watch http://globalfishingwatch.org/
   - Flights / Flightradar https://www.flightradar24.com/multiview/60,15/6
   - Australian Bureau of Meteorology Radar loop http://www.bom.gov.au/products/national_radar_sat.loop.shtml

2. Applications with inbuilt layers of geographical data:
   - Google Earth, to create an elevation profile https://www.youtube.com/watch?v=TZZ-dKOp8NY

- Geographic Mapmaker Interactive http://mapmaker.nationalgeographic.org/
- Global Forest Watch https://www.globalforestwatch.org
- The Story Map Gallery https://storymaps.arcgis.com/en/gallery/#s=0

3. Application to create a GIS map:
    - Scribble Maps https://www.scribblemaps.com
    - Google Tour Builder https://tourbuilder.withgoogle.com
    - Story Map https://storymaps.arcgis.com/en/
    - Getting started with Story Map https://learn.arcgis.com/en/projects/get-started-with-story-maps/
    - Visualize your data on a custom map using Google My Maps https://www.google.com/earth/outreach/learn/visualize-your-data-on-a-custom-map-using-google-my-maps/
    - GIS for schools ESRI Australia https://esriaustralia.com.au/gis-for-schools

The foundations of successful Geography teaching remain a strong emphasis on inquiry and skill development to better understand and affect our world. When we keep strong pedagogy and content knowledge at the heart of our teaching, including a little new technology to investigate some very big questions could well be the next thing we should try.

Lorraine Chaffer has 38 years' experience as a Geography teacher in NSW public schools and has been heavily involved in the professional development of teachers. Lorraine was a consultant in the development of the NSW Geography Syllabus K-10, has written textbooks for the Australian Curriculum Geography and the NSW Geography Syllabus K-10 and has worked with K-6 teachers across NSW to unpack the new syllabus and develop the essential knowledge, understanding and skills to deliver the syllabus effectively. Lorraine is the President of the Geography Teachers Association of NSW (GTANSW) and a board member of the Professional Teachers Council, and she provides professional learning for teachers of K-10 Geography Syllabus and Stage 6. Lorraine is editor of the GTANSW Geography Bulletin, has written articles for the CPL and presented on the new Geography Syllabus for CPL in 2017.