Integrating spatial technologies into the Geography Classroom

Lorraine Chaffer
Vice President GTA NSW
Geography Education Consultant

Spatial technologies are specifically referred to in the Australian Curriculum: Geography and NSW Geography Syllabus K–10 (2015). They are geographical tools, to be used by students along with maps; graphs and statistics, fieldwork and visual representations to acquire, process and communicate geographical information.

What are spatial technologies?

"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/

The NSW K–10 Geography Syllabus "Continuum of Tools" gives examples of spatial technologies that could be used at each stage of geographical study. It is intended that students will become familiar with a range of tools at each stage, progressing from their use for acquiring geographical information in early stages of learning to representing, analysing and communicating geographical data and their findings from geographical inquiry in later years.

Continuum of Tools NSW K–10 Geography 2015

Stage	Spatial Technologies
1	Virtual maps Satellite images
2 & 3	Virtual maps Satellite images Global positioning systems (GPS)
4	Virtual maps Satellite images Global positioning systems (GPS) Geographic information systems (GIS)
5	Virtual maps Satellite images Global positioning systems (GPS) Geographic information systems (GIS) Remote sensing data Augmented reality

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

Challenges for teachers

The challenge for many teachers is overcoming a lack of confidence with spatial technologies, a shortage of time to learn and a fear of failure.

I have found that most spatial technologies applicable for use in schools can be mastered given time and perseverance. Teachers can build skills and confidence slowly by

1. Choosing one tool at a time eg. Google Maps, NSW Globe, Google Earth, National Geographic Mapmaker Interactive

2. Using one selected tool wherever possible until confident in the ability to integrate its use into topics currently being taught

3. Using online tutorials

4. Limiting activities to one aspect of the selected tool at a time

5. Implementing for the first time into classes with students quick to learn and willing to help each other and their teacher.

6. Ensuring computers have the required software and the school system supports its operation

7. Always having a PLAN B in case of issues with ICT (Making this a practical activity eg a simple fieldwork activity in the school grounds using pre-prepared worksheets and toolkits will limit student disappointment)

"The introduction of spatial technology into the curriculum is more than just about the introduction and use of a new technology but really is concerned with engaging students in meaningful spatial learning."

"By now most teachers have heard, if not participated in spatial technology activities. However for many the steps towards introducing spatial technology and related concepts into their classroom are daunting, if not insurmountable. There is a range of impediments to the introduction of spatial technology in the classroom. They included factors such as software

and data access, hardware availability, computer room access and teacher expertise. While not denying the existence of these very real implementation stumbling blocks, there is a need to develop a strategy at teacher and system level to enhance the use of spatial technology in the curriculum. This website and associated Spatialworlds blog sets out to "demystify" the area of spatial education for teachers, who in the majority are untrained in the area. The website also aims to give some practical across the curriculum starting points that can be employed to introduce spatial technology into the curriculum."

Spatial technologies and the Australian Curriculum
From Spatialworlds at https://sites.google.com/site/malcolmmcinerney/home

Relevance of Spatial Technologies

Contemporary tools for geographical inquiry

Spatial patterns of natural and human features of environments can be analysed using maps and images already created by others eg using Google Earth to observe the characteristics of mountain or desert landscapes.

Maps can also be created to communicate observations or data collected during geographical inquiry, including fieldwork. For example

– using Google Maps to create a local (large scale) map showing changes in water quality along a creek or Google Tour Builder to show features of an environment or community

– using National Geographic Mapmaker Interactive to create a national or global (small scale) map showing settlement patterns or the location of different types of food production.

– creating maps using Google Earth with several layers of information to show relationships between geographical features such as settlement and transport or landuse and topography.

1. Select a base map

2. Select the map scale eg World, Australia

3. Select layers to create a map – human or natural features

National Geographic Mapmaker Interactive

http://mapmaker.education.nationalgeographic.com/?ls=000000000000#/

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Life and career links

Spatial technologies are an integral part of the everyday life of students. Computer, tablet and smartphone applications such as Facebook, interactive maps and games all have spatial components. Spatial technologies were recently used in emergency responses to the Nepal Earthquake and now play an integral part in disaster planning and management within Australia.

Spatial technology is creating employment opportunities in many industries. Educational institutions in Australia and online are offering courses with a focus on spatial technologies as the demand for trained employees.

Websites such as *Geospatial Revolution* (videos showing the use of spatial technologies) and *Destination Spatial* http://www.destinationspatial.org/Home.aspx (links to study options in different Australian states) illustrate and reflect the growing importance of spatial technologies in understanding, analysing and managing our lives and Earth's environments.

Geospatial Revolution website illustrates the application of spatial technologies to address real world problems

http://geospatialrevolution.psu.edu

Destination Spatial explanation for students

http://www.destinationspatial.org/CMS-Teachers.aspx#1

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Destination Spatial site map

http://www.destinationspatial.org/Home.aspx

Integrating Spatial Technologies at St Ignatius College, Riverview

In May 2015, Mick Law from *Contour Education* spent a week at St Ignatius College, Riverview as "*Geographer in Residence*" assisting teachers and students with the integration of spatial technologies into Geography classes from 7–12. Google maps, Google Earth, NSW Globe and Google Tour Builder were applied to units of work being studied, including fieldwork.

I visited St Ignatius College during Mick Law's visit with the aim of building my own confidence with spatial technologies. Encouraged by what I saw, and with practice and the help of online tutorials I am now confidently using Google Earth to create cross sections, Google Maps to plot quantitative data collected during fieldwork and Google Tour Builder to incorporate images and qualitative information collected during fieldwork.

Creating elevation profiles using Google Earth

Stage 4 students studying mountain environments were taught to use Google Earth to create topographic profiles of mountainous regions of the world. Following a quick demonstration, students were able to create their own transects and profiles. Mount Everest and the Himalayas, Mt Fuji in Japan and the Andes Mountains in South America were popular choices among students. By moving a marker on the transect they had created, students could read the altitude at different locations across their transect. This activity could be extended to include calculating local relief and gradient in follow up lessons using the vertical and horizontal scales on the images.

Students were able to navigate (zoom over) their chosen location to see the landscape in 3D and in doing so identify valleys, ranges and other features of the mountain terrain.

Integrating spatial technologies into the Geography Classroom
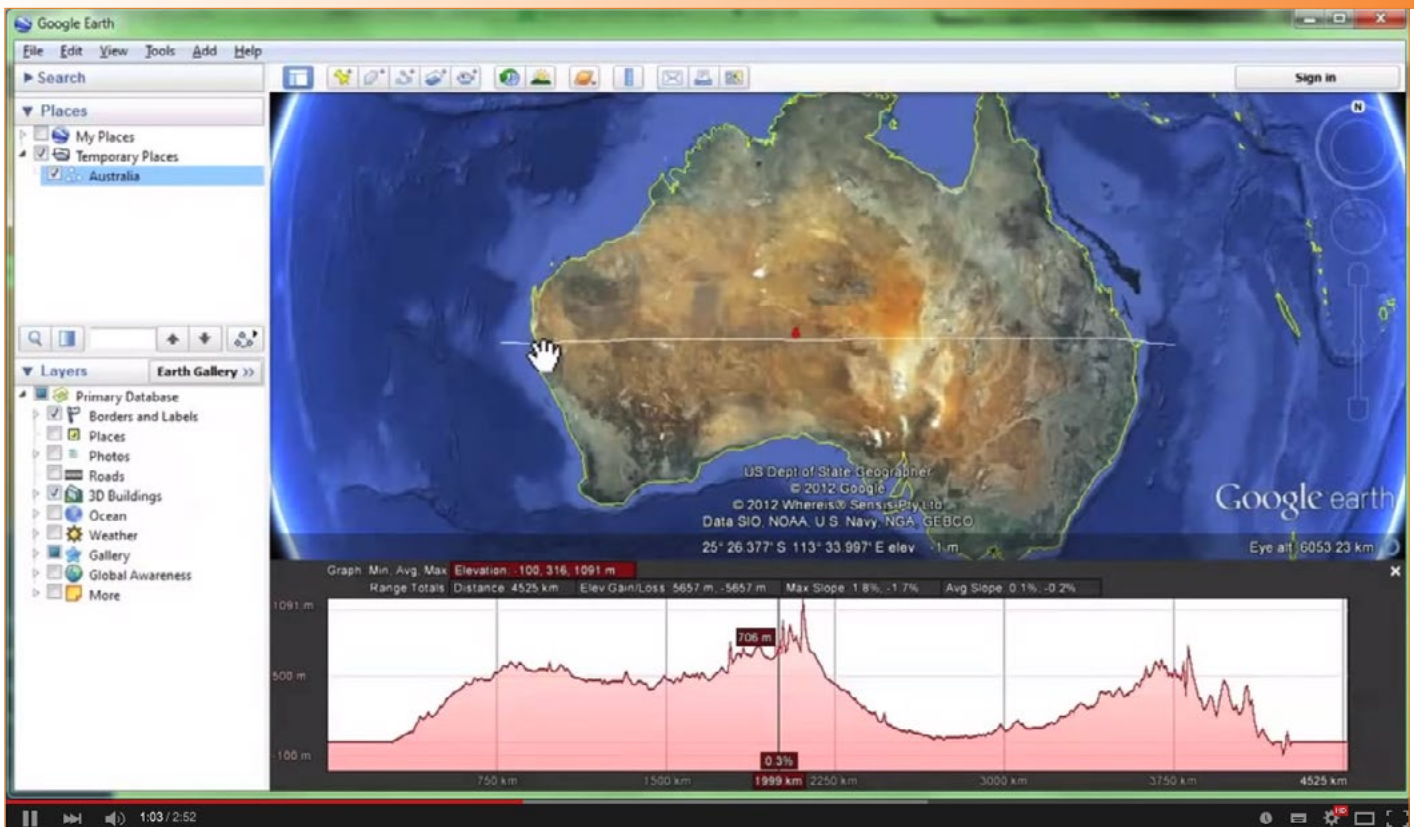
Screen capture showing a transect across Australia and associated profile – from Contour Education tutorial "Google Earth for educators: Visualising elevation".

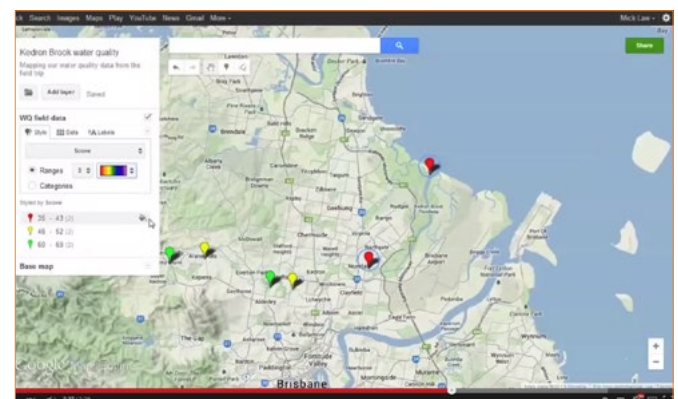*https://www.youtube.com/watch?v=mjSwzazVkQ8*

Creating a map using Google Maps

Stage 5 (year 9) students studying catchments also learned to create elevation profiles and to identify catchments using *Google Earth* before moving on to create a My Map using *Google Maps*. The map was to show variations in water quality along a section of creek. For this activity the students did not complete their own water quality testing but were given a table of results from another school. After an explanation by Mick Law on the spatial information needed to create a map e.g. place names, latitude & longitude the students were able to show the locations where water was tested, and assign different coloured markers to each place based on the water quality scores in the table.

An example of a My Map in Google Maps showing variations in water quality.

Tutorials for each of these activities are available for teachers and students on the *Contour Education YouTube* channel – with excellent step-by-step instructions.

Site	Lat.	Long.	Score 1 Salinity	Score 2 Turbidity
1				
2				
3				
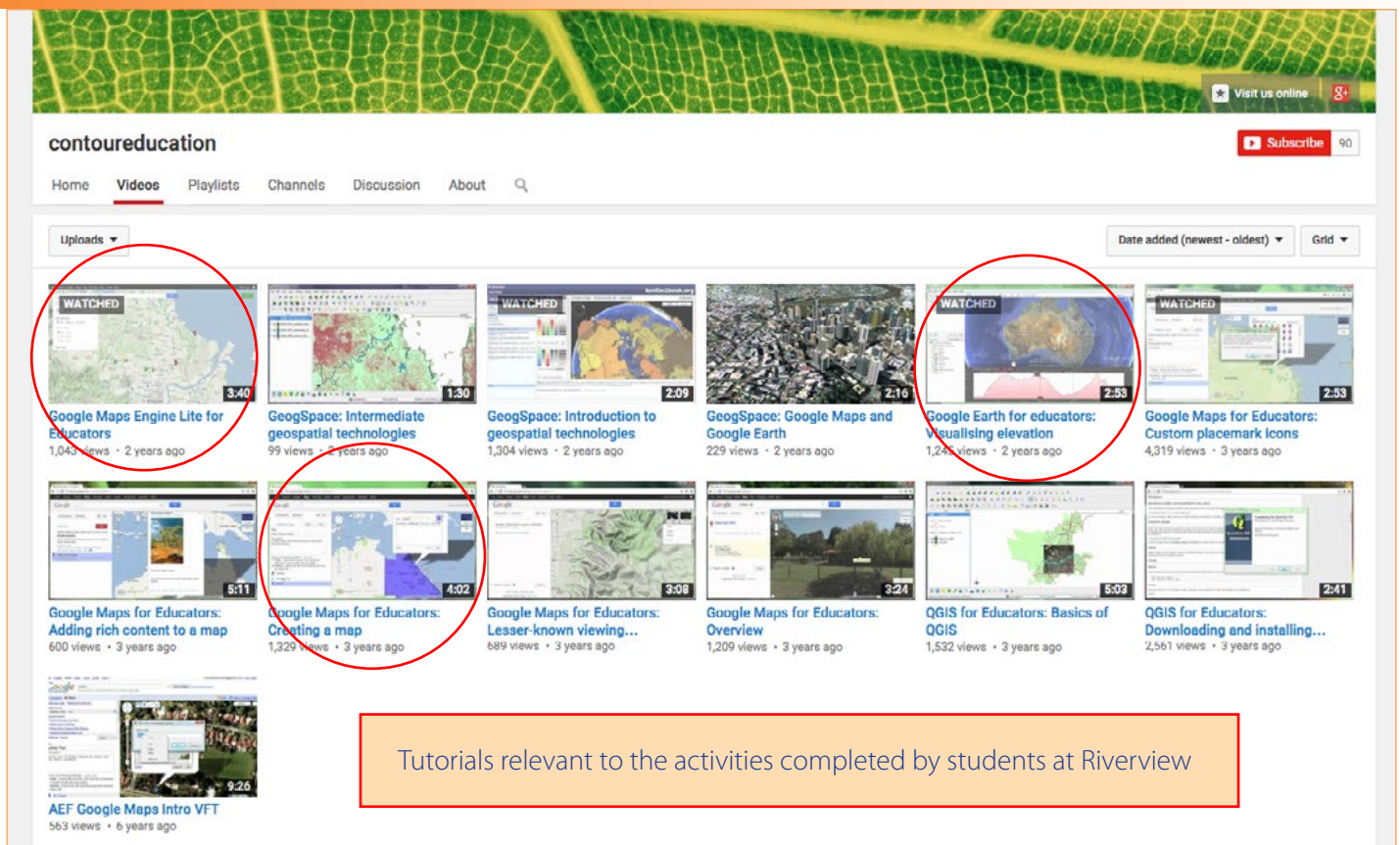
Example of a simple data table used to create a map using Google Maps

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Tutorials relevant to the activities completed by students at Riverview
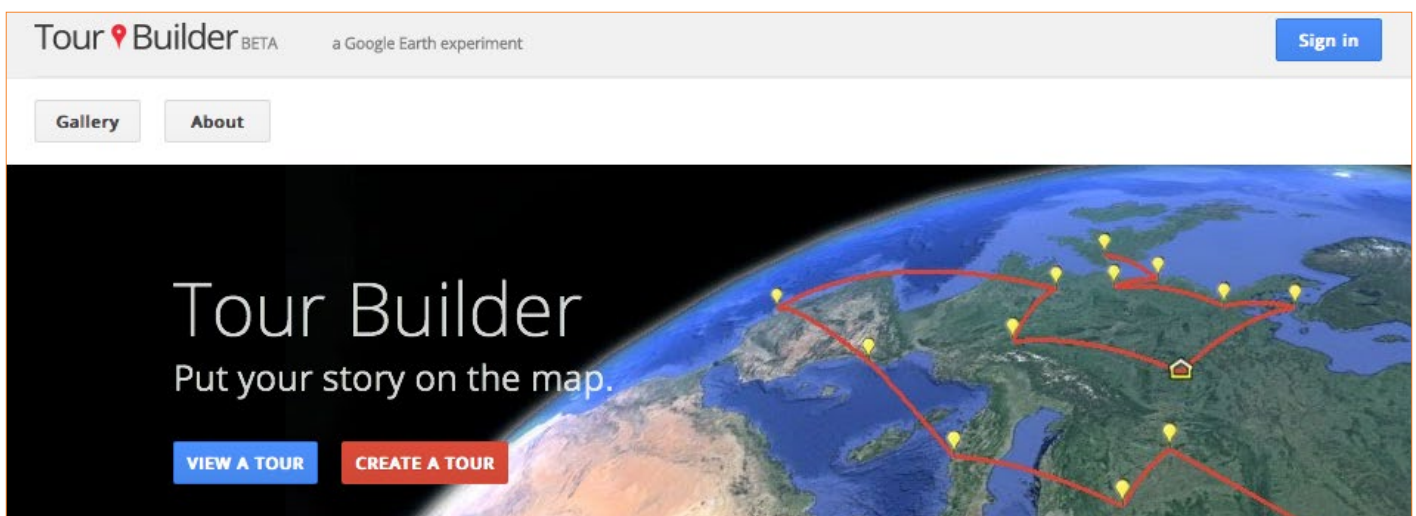
Contour Education YouTube Channel site map

Fieldwork and Google Tour builder

Stage 5 (Year 10) students at Riverview were studying Changing Australian Communities. They completed fieldwork in the suburb of Pyrmont in Sydney that involved visiting 17 different sites to *observe*, *record* and *photograph* current and past landuse activities. Students were required to identify evidence of changes to the character of the suburb (social, economic and environmental) and to propose reasons for the changes.

They assessed the role of different indicators of change on the current characteristics of the suburb. Students worked in small groups to follow a route mapped for them. At the completion of the fieldwork, students were required to integrate their findings and photographs into a story map using *Google Tour Builder*. This activity formed part of an assessment along with written responses to several short answer questions about the changing community of Pyrmont.

"Tour Builder is a new way to show people the places you've visited and the experiences you had along the way using Google Earth. It lets you pick the locations right on the map, add in photos, text, and video, and then share your creation."

https://tourbuilder.withgoogle.com/

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Riverview students observing real estate values Jackson's Landing

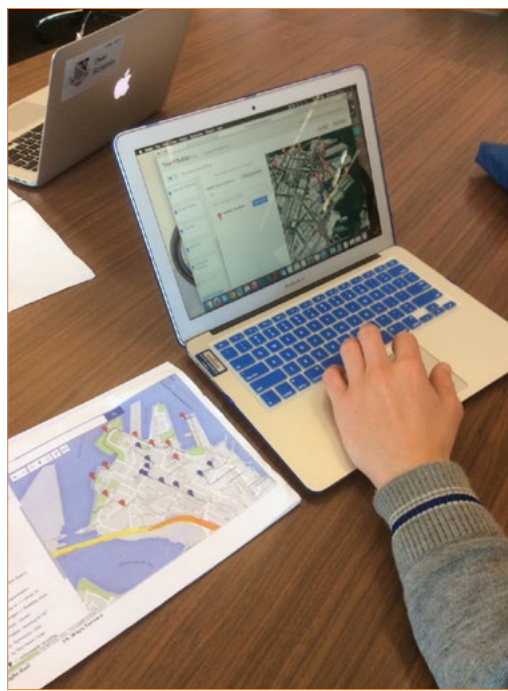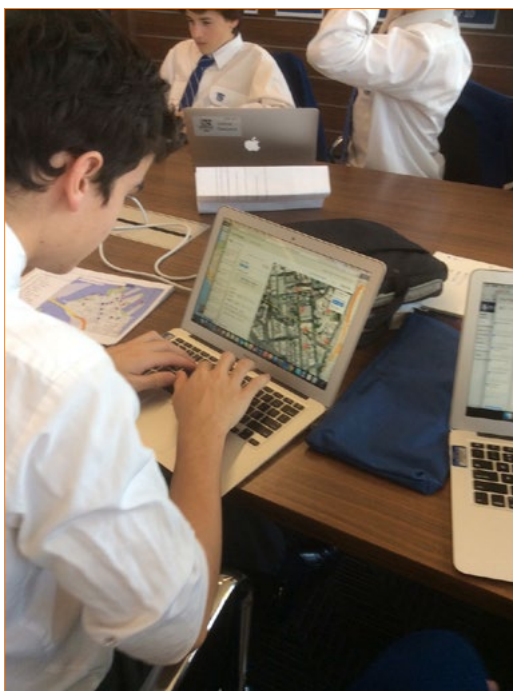**Evidence of old and new landuses observed along the harbour**

Taking photographs at the old quarry site as evidence of change
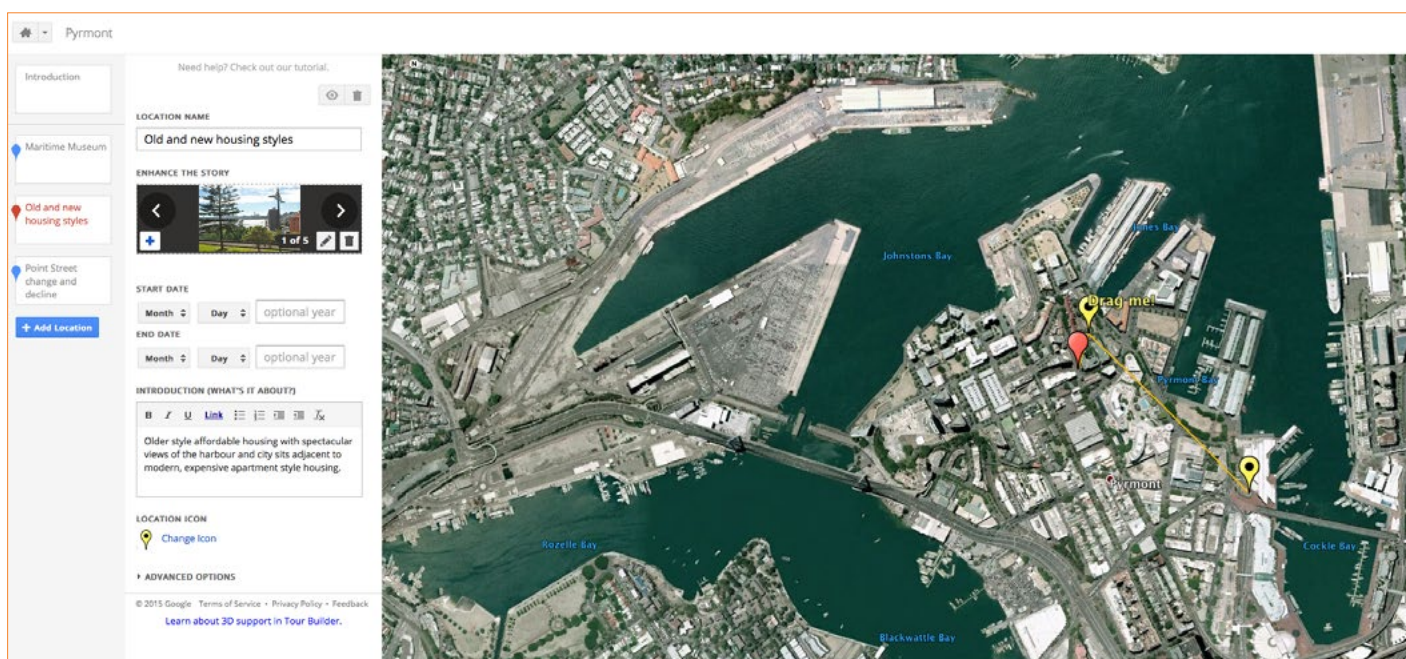

Observing and discussing different housing options – in this case old style social housing beside expensive apartments – all with harbour and city views

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Plotting locations and uploading photographs using Google Tour Builder

Sample of work in Tour Builder - plotting and naming locations and adding images and observations to illustrate Pyrmont's changing community.

I found Tour Builder very user friendly and easy to navigate. Most students were quick to learn how to use the program and assisted those needing more guidance. Once again there are tutorials available on YouTube and other education websites such as *Free Technology for Teachers: How to Create Tours With Google Earth Tour Builder.*

Many thanks to St Ignatius College, Riverview for facilitating my visit to Geography classes and Year 10 fieldwork activity at Pyrmont and also to Mick Law for making the integration of spatial technologies all seem

so easy. Google Earth, Google maps and Tour Builder are easy to learn spatial technologies that engage students through technology and the link to real world places. The skills students will learn using these applications have workplace and career relevance and add to the contemporary relevance of Geography in the curriculum.

Note: NSW Globe is newer spatial technology resource worth investigating for its quality satellite imagery, links to NSW government data such as land values and GIS capabilities.

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View of Pyrmont from the Anzac Bridge . Source: Wikimedia Commons

Frequently asked questions about using Google Tour Builder

Why do I need to sign in with a Google account to create tours?

Your Google account gives you a place to save your tours and share them with your friends and family.

How do I upload images or videos to my tour?

In both the Introduction panel and the Placemark panels, you have the ability to add multiple images and videos via the large field labeled "Add Photo". From here you can upload from your local computer, from your Google Drive or from anywhere on the Internet via Google Search.

Who can see my tour once I've made it?

Only you: your tour is private by default. Once you've finished your tour, just click "share tour" to share it with your friends and family or make it public for anyone to see.

Can I update my tour after creating it?

Yes. You can always can go back and edit your tour on the map: add pins, delete pins, make pins private, etc.

Once I've shared a tour, can I go back and make it private?

Yes. You can always go back and mark your tour as private after sharing it. Anyone who received a link to your tour before you marked it private will be notified that the tour settings have changed

https://tourbuilder.withgoogle.com/

Weblinks

Contour Education
http://www.contoureducation.com

Contour Education YouTube channel
 http://www.contoureducation.com/links

Interactive Geospatial Technologies Blog
http://geogspaceinteractivegeospatial.blogspot.com.au/p/googles-geospatial-tools.html

Geospatial Revolution
http://geospatialrevolution.psu.edu

Google Maps
https://www.google.com.au/maps/@-46.0263178,106.6955827,4z?hl=en

Google Tour Builder
https://tourbuilder.withgoogle.com

Geographic Mapmaker Interactive
http://mapmaker.education.nationalgeographic.com/?ls=000000000000#/

GIS Mapping your world video
https://youtu.be/6AlH5TvFoLw

Introduction to Spatial Technologies video
https://youtu.be/z6lzhePkuxc

Spatialworlds
https://sites.google.com/site/malcolmmcinerney/home

Spatial World's Blog
http://spatialworlds.blogspot.com.au/2011/09/more-than-tool.html

The Story Map Gallery - students can see the power of maps to tell a geographical story.
http://storymaps.arcgis.com/en/gallery/#s=0

NSW Globe
http://globe.six.nsw.gov.au/
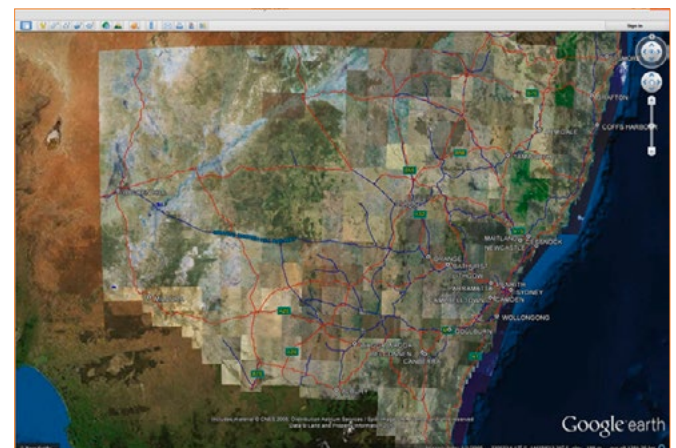
NSW Globe, Tutorial Figure 17.