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Integrating spatial technologies with Senior Geography syllabus requirements

This document contains practical ideas and examples of how schools are using ArcGIS as a spatial technology to meet syllabus requirements in Senior Geography.

Senior Geography (Years 11 and 12)

Context

Each Australian state has its own Senior Geography syllabus documents however, all syllabus documents stipulate that students must be assessed on their understanding and use of spatial technologies.

For example, Queensland's Senior Geography syllabus (2019) states that, 'maps must be student-generated using spatial technologies…maps that are downloaded or photocopied must be adapted to the student's own information; this may be achieved effectively by overlays and annotations' (p.42).

Similarly, South Australia's Stage 1 Geography outline states that for students to achieve an 'A' achievement for 'Application', students must demonstrate, 'purposeful and well-considered application of a variety of geographical and fieldwork skills, including the use of spatial technologies, to identify and examine geographical issues' (p.15).

With this in mind, teachers and students need to become well-versed in the use of spatial technologies.

Considering the fact that schools have a large amount of freedom in designing their teaching and learning plans, in accordance with syllabus requirements, this document will provide educators with some key ideas that will help students to demonstrate purposeful, effective and well-considered use and application of spatial technologies.

Available applications in the *GIS for Schools* program

There are a host of available applications that come as a part of the *GIS for Schools* program. Three applications are particularly useful – and easy to navigate – for teaching and delivery purposes:

1. **ArcGIS Online** allows you to quickly create maps, with either your own data or hosted feature layers. Users can share maps and analyse data too e.g. create choropleth maps.

   For assessment purposes, this should be the primary application used for the creation of students' maps.

2. **Survey123** provides you with the ability to create and design your own surveys. Once survey data has been collected, users can analyse and map their results. This application is great for supporting field trips.

3. **StoryMaps** is a great application for delivering storytelling, or knowledge and content, with the support of custom maps. It is effective in delivering content, similar to a PowerPoint, but enhances this delivery with interactive custom maps and other media, including text, photos, and videos.

   StoryMaps also allows for teachers – the designers of assessment – to provide an alternative presentation option. Instead of a PowerPoint, or essay, a task may be suitably presented in a Story Map.

Skills to consider for demonstrating purposeful, effective and well-considered use and application of spatial technologies

1. **Adding your own point data to a map**

For some assessment pieces, research or field work is necessary. These processes always involve the collection of data. Students can import class field data, or data they have located during research, into ArcGIS Online as point data. Point data is used to represent a single piece of data on a map e.g. police stations in Queensland or Coronavirus cases per country.

Before adding data to a new or existing ArcGIS Online map, students must clean and format the data. To learn how to do so, click here and search according to the image below:

Choose the 'Data Cleaning' skill to open a step-by-step guide.

Once students have cleaned their data, they can import their data into ArcGIS Online. Following the same steps as above, visit our website and select the 'Adding point data' skill to open a step-by-step guide.

2. Adding feature layers from ArcGIS Online and Living Atlas

Students can also find a number of feature layers readily available on ArcGIS Online and Living Atlas. These map layers can be added to a new map. An added benefit is that details exist for each map layer (e.g. origin, context) for referencing purposes.

Remember, students can add these map overlays to a new map but must either use them in conjunction with their own feature layers or annotate them.
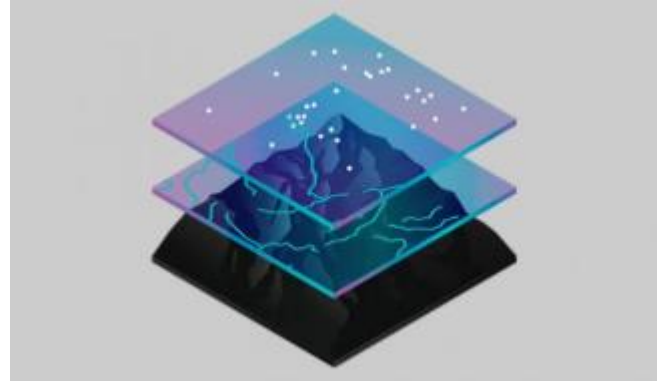
To access a step-by-step guide on how to add layers from ArcGIS Online, visit our website and follow the search parameters pictured below.

Select the 'Adding layers from ArcGIS Online' skill to open up a step-by-step guide.

3. Creating choropleth maps

When creating maps, students need to meet specified criteria in order to achieve high grades. These criteria usually involve words like *proficient, sophisticated, accomplished, purposeful* and *insightful*, among others.

One way that students can begin to demonstrate that their skills are reflective of these characteristics is to create a choropleth map. Choropleth maps can be created at local, state and national levels, providing one has the appropriate data.

We have created a skills-based resource, designed at guiding both teachers and students through the process of creating a choropleth map at a global level and at a national level.

To access these step-by-step guides, visit our website and search for 'Creating a choropleth map of the world' or 'Make a choropleth map of Australia.

Case study: school assessment on ecological hazards (Malaria)

Below is an example of how these skills were utilised in a school assignment. Esri Australia's Education Program Manager supported the teachers and students in the process. Students were required to conduct a case study into factors that contributed to the spread of Malaria, and analyse the primary, secondary and tertiary effects this ecological hazard had on communities. As a part of this case study, students were required to transform primary data, using spatial technologies, to create cartographic and graphical representations (maps and graphs).

Step 1: Collection and cleaning of primary data

Students were required to locate primary data on malaria in African countries at both national and international levels. Then, students cleaned and formatted their data by removing unwanted data, rectifying existing errors and ensuring that location data was present so that it could be accurately mapped. For example, see the image below:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	African_Country	Latitude	Longitude	2010	2011	2012	2013	2014	2015	2016	2017	Total_Cases	Population_2017
2	Algeria	28.033886	1.659626	1	0	0	0	0	0	0	0	1	41,318,142
3	Angola	-12.444917	17.440965	8,114	6,909	5,736	7,300	5,714	7,832	15,997	13,967	71,569	29,784,193
4	Benin	9.715943	2.704492	964	1,753	2,261	2,288	1,869	1,416	1,646	2,182	14379	11,175,692
5	Botswana	-22.328474	24.684866	8	8	3	7	22	5	3	17	73	2,291,661
6	Burkina Faso	12.238333	-1.561593	9,024	7,001	7,963	6,294	5,632	5,379	3,974	4,144	49,411	19,193,382
7	Burundi	-3.373056	29.918886	2,677	2,233	2,263	3,411	2,974	3,799	5,853	4,414	27,624	10,864,245
8	Cabo Verde	15.075508	-16.25083	1	1	0	0	2	0	1	1	6	546,388
9	Cameroon	7.369722	12.354722	4,536	3,808	3,209	4,349	4,398	3,440	2,639	3,195	29,574	24,053,727
10	Central African Republic	6.611111	20.939444	526	858	1,442	1,026	635	1,763	2,668	3,689	12,607	4,659,080

Note that this example has location data present in two formats – by country and by coordinates. Either is fine providing that the location fields are accurate. Coordinates may be better suited to a task where students were required to look at the distribution of malaria in a single African country e.g. The Democratic Republic of the Congo.

Step 2: Adding point data to an ArcGIS Online map

After cleaning their data, students were able to import their data into ArcGIS Online as point data and manipulate the way the data was presented on the map (e.g. number of data classes, class sizes, symbols and colours). See the image below for an example of what the point data looked like after it was manipulated:
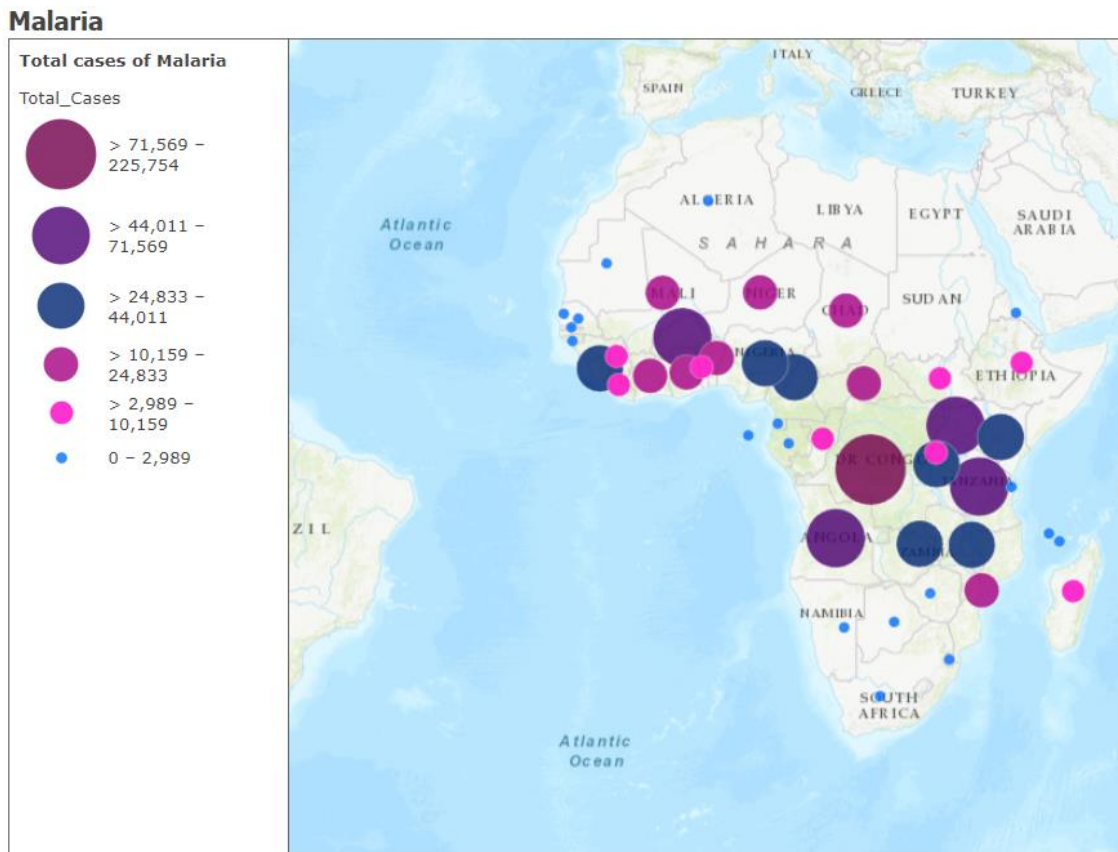
Step 3: Adding layers from ArcGIS Online and Living Atlas

Students then added further map layers to their existing map, with the purpose of using this in conjunction with their own imported data sets.
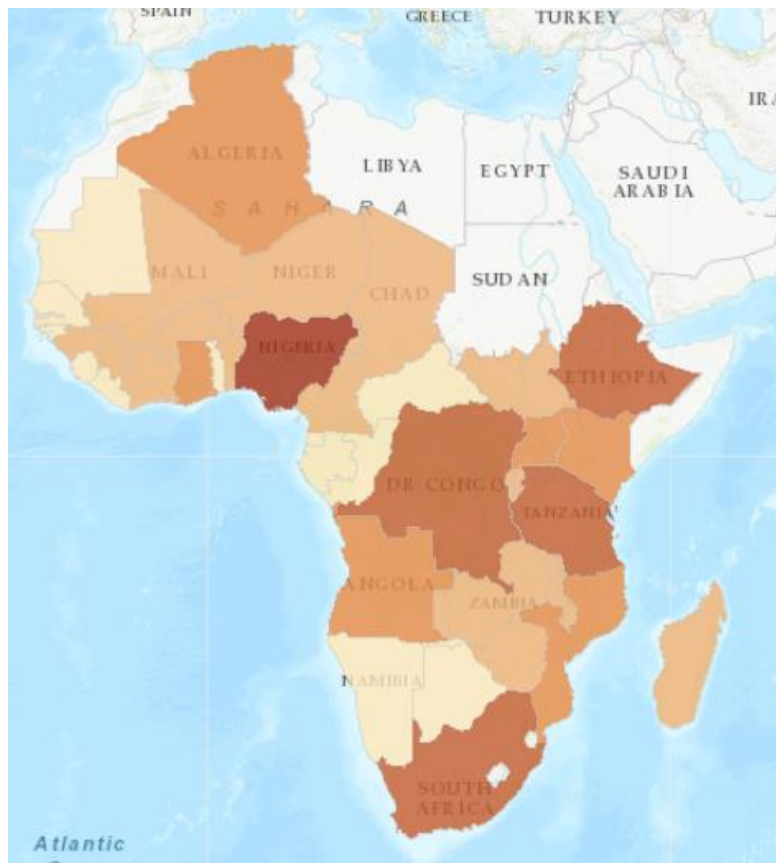
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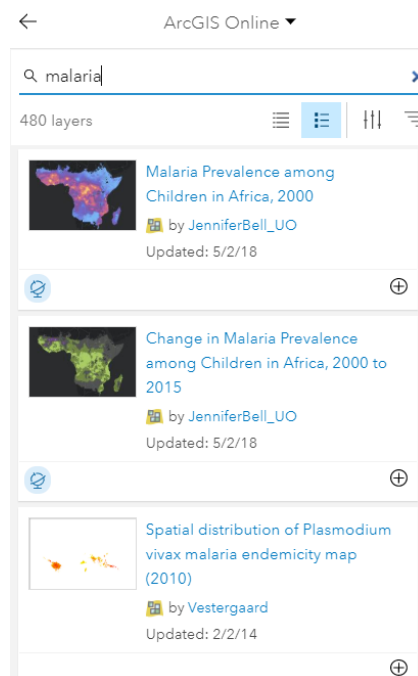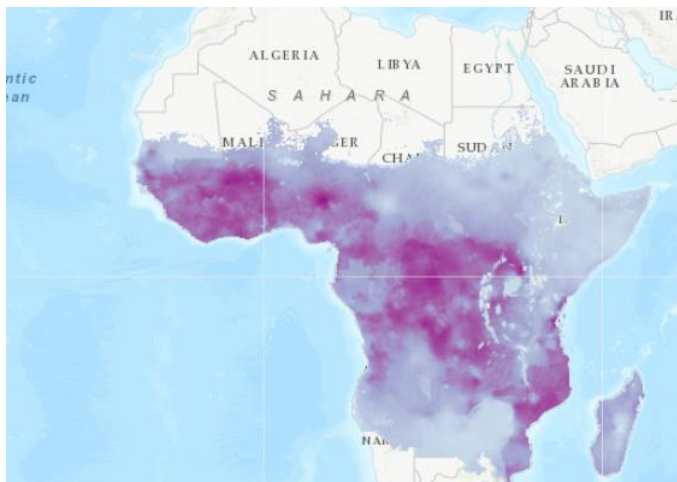
Step 4: Creating a choropleth map

In addition to primary data on malaria, some students also chose to locate population data for each African country and include it in their spreadsheet:

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	African_Country	Latitude	Longitude	2010	2011	2012	2013	2014	2015	2016	2017	Total_Cases	Population_2017
2	Algeria	28.033886	1.659626	1	0	0	0	0	0	0	0	1	41,318,142

These students then created a choropleth map for their population data. This process could have been carried out for their existing data on malaria too.

ArcGIS Online has a range of tools that can perform other analyses including creating buffer zones, drive-time areas and watersheds.

Next Steps:

Request a free ArcGIS Online Account for your school:

Australian schools can request a free ArcGIS Online account as part of Esri Australia's Classroom GIS Initiative. A school subscription provides additional map layers, content, features and privacy. Learn more about ArcGIS Online, and apply for your ArcGIS Online School subscription at http://esriaustralia.com.au/education

Speak to Esri Australia's Education Program Manager:

Australian schools can seek additional support or speak to our Education Program Manager by emailing education@esriaustralia.com.au.