TOOLS and APPS FOR GEOGRAPHICAL INQUIRY

Fieldwork

Created by
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GTANSW & ACT

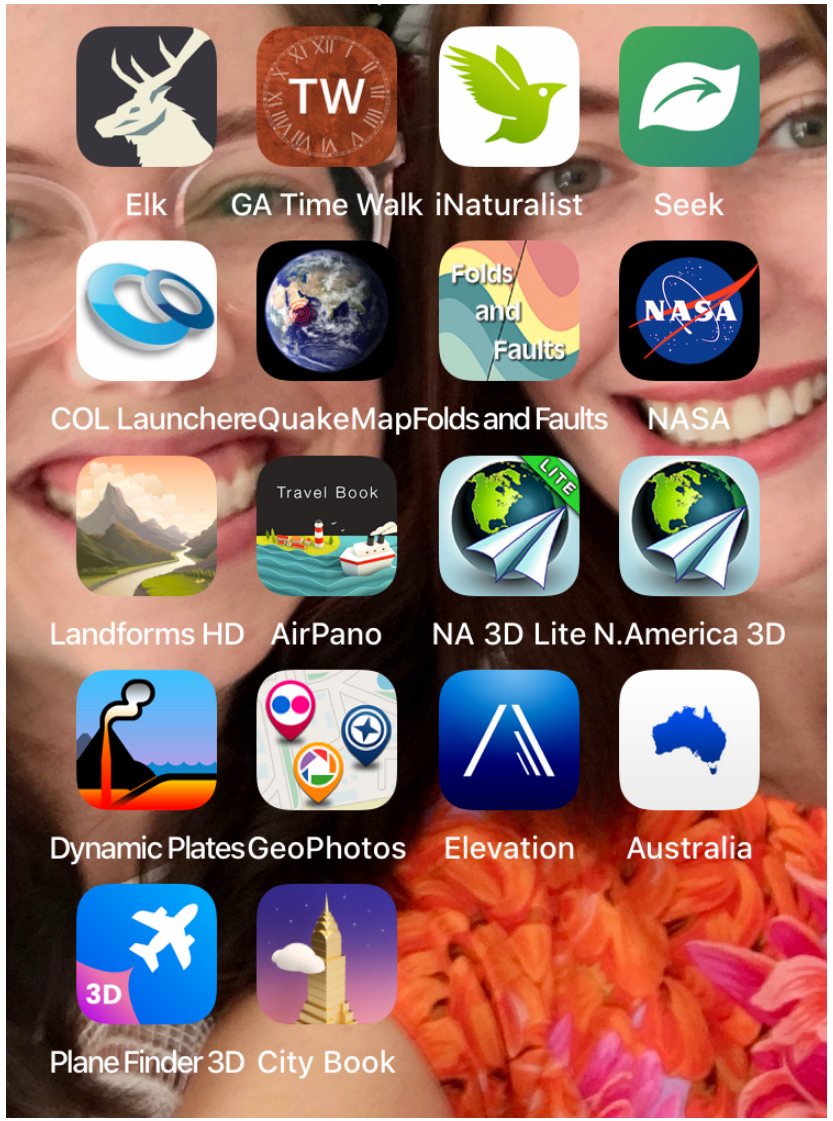
WHY?

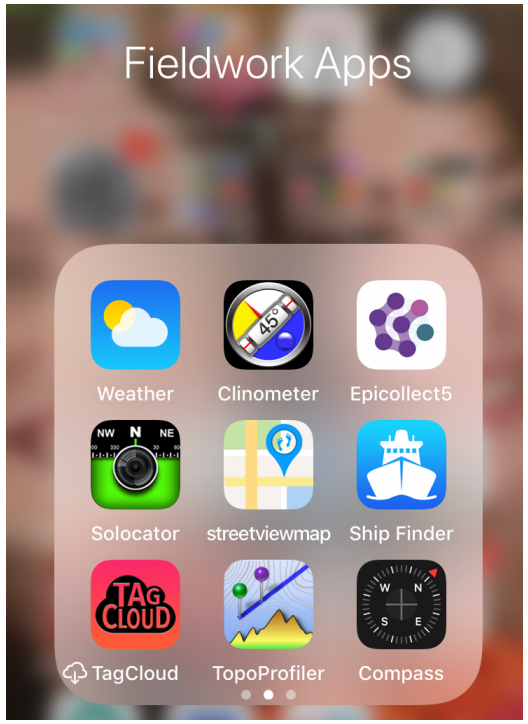
WHAT DO YOU WANT APPS FOR?

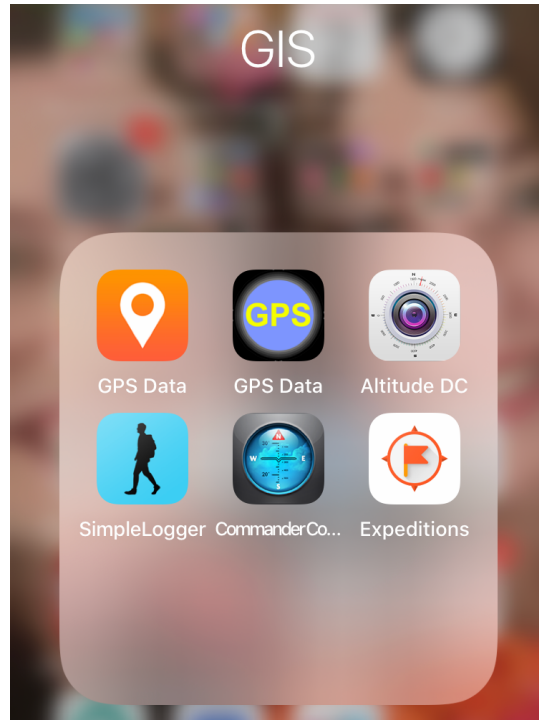
- CONTENT / INFORMATION / RESEARCH
  - REAL TIME DATA
- ILLUSTRATE CONCEPTS / VISUAL INQUIRY
- PRIMARY DATA COLLECTION
  - CITIZENS SCIENCE
- FORMATIVE ASSESSMENT/ SELF TESTING
  - GAMES / DECISION MAKING
- COMMUNICATING GEOGRAPHICAL INFORMATION

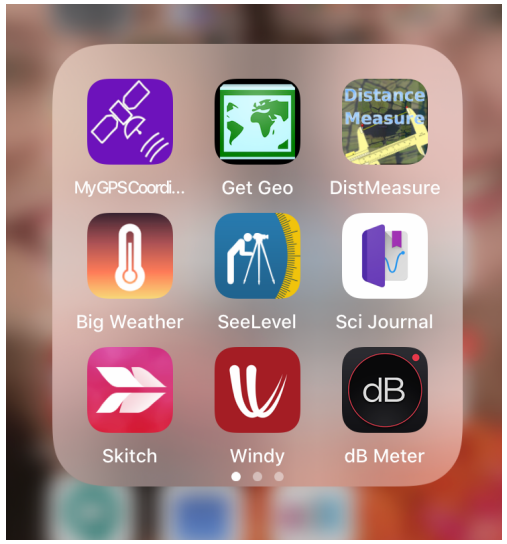
PLANNING TO USE APPS AS A CURRICULUM TOOL

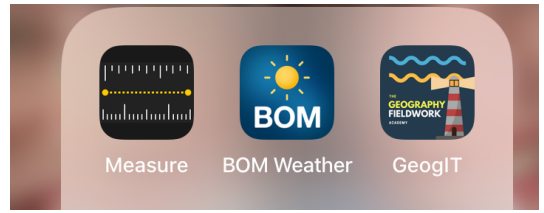
HAVE AN INQUIRY FOCUS – INQUIRY QUESTION











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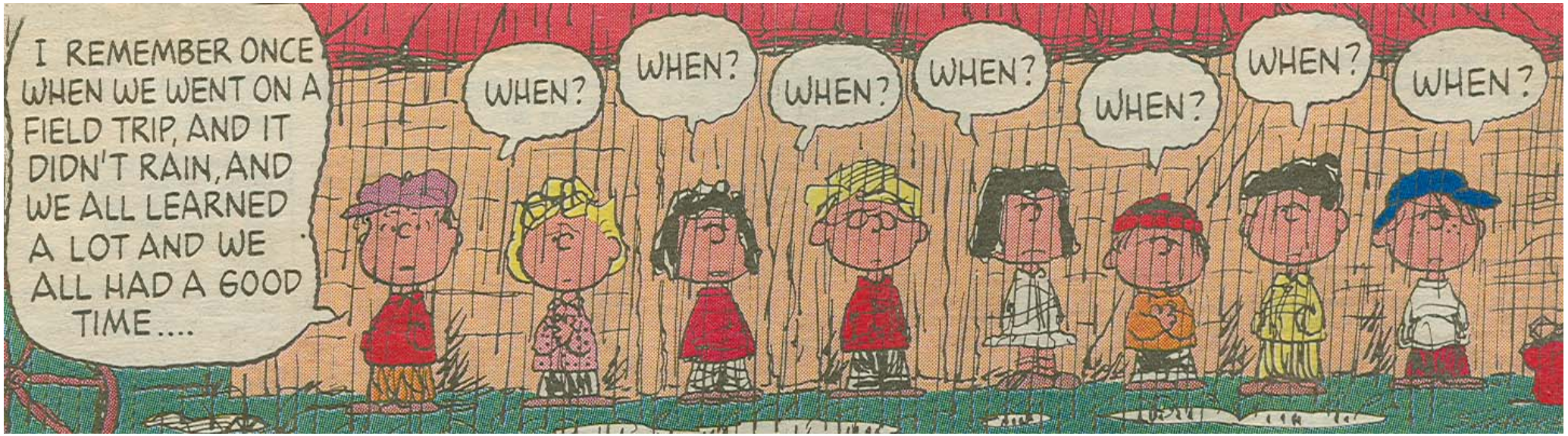
Fieldwork tools



Choosing the right fieldwork **tools / tools for a purpose**

Low tech vs. High tech fieldwork tools - **THE APPS**

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Collect data – locate, observe, measure, record …

FIELDWORK … MEANS WORKING TO COLLECT DATA - USING EQUIPMENT OR AN APP

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Apps for fieldwork: Location data

Location Apps

Record location points (10 m accuracy)

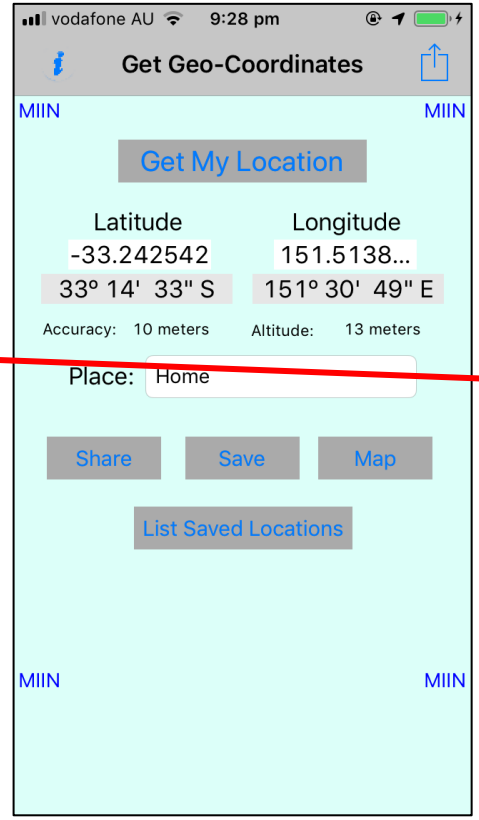
Examples: My GPS coordinates (iOS)

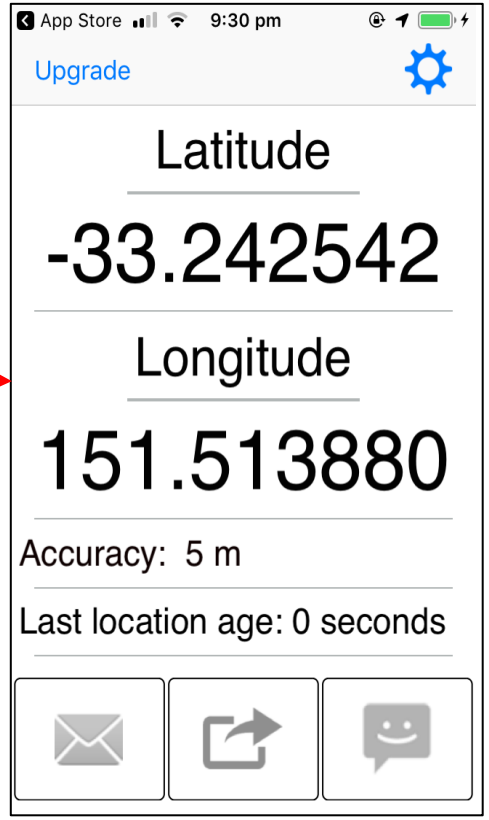
GPS Essentials (Android)

Get Geo-coordinates (iOS)

GPS Data

Google Maps App





* These data sets can be saved in the App, imported (Excel) and mapped later in Google MyMaps

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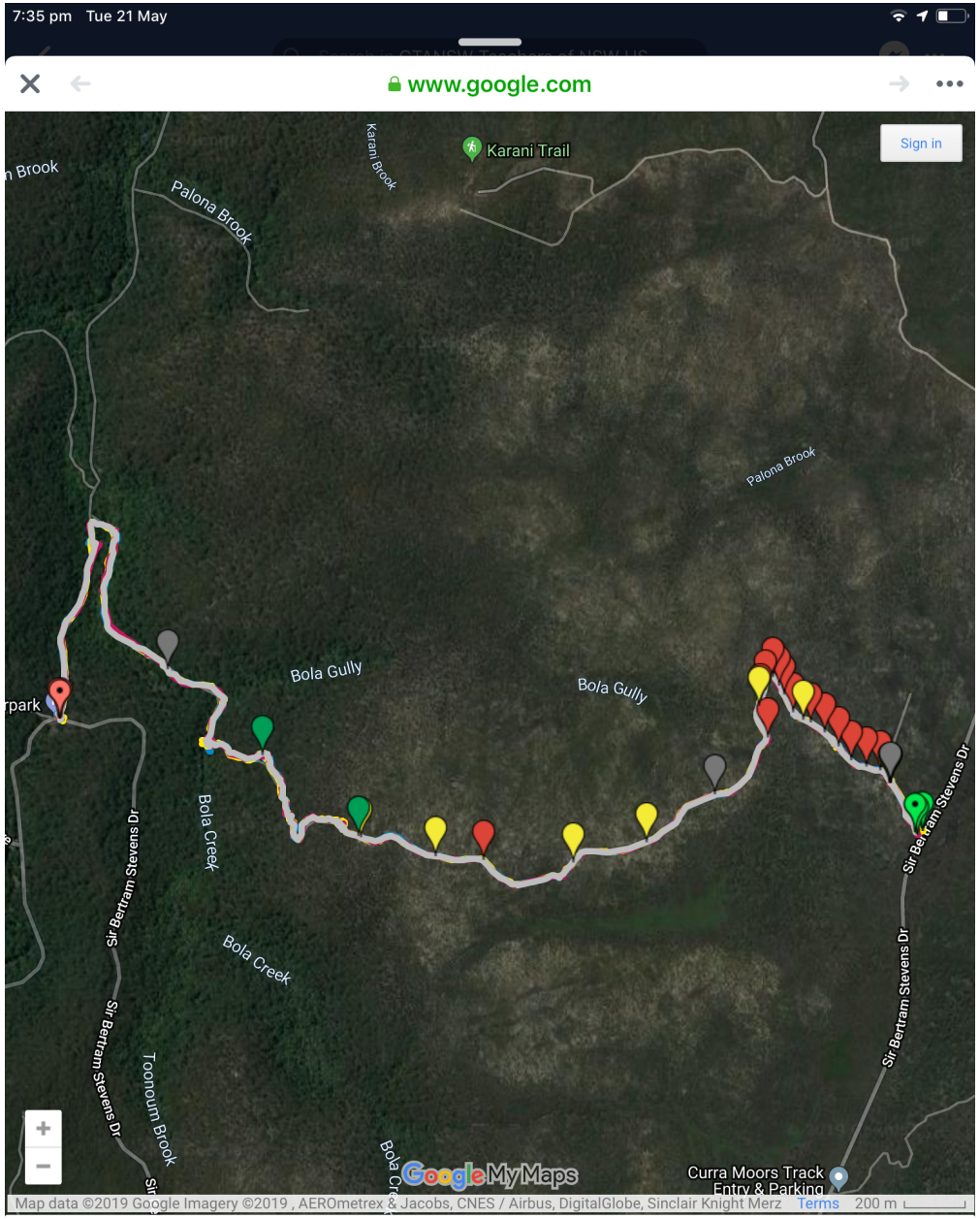

Oatley Snr College - Wallumarra Track 09 May 2019

Locations can be mapped on return to school

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Apps for fieldwork: Data collection

COLLECTING SPECIFIC TYPES OF DATA

- Altitude / Elevation
- Slope / gradient/ height (Clinometer, SeeLevel*, iLevelLite*)
- Sound (Decibel)
- Light (Pocket Light Meter)
- Temperature / Air pressure (Big Weather)
- Distance (DistMeasure / SeeLevel)
- Area (Geomeasure)
- Direction (Compass)

* iOS only

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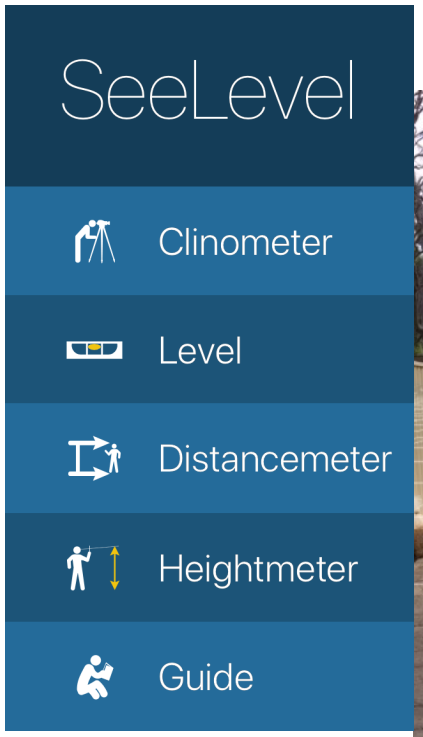
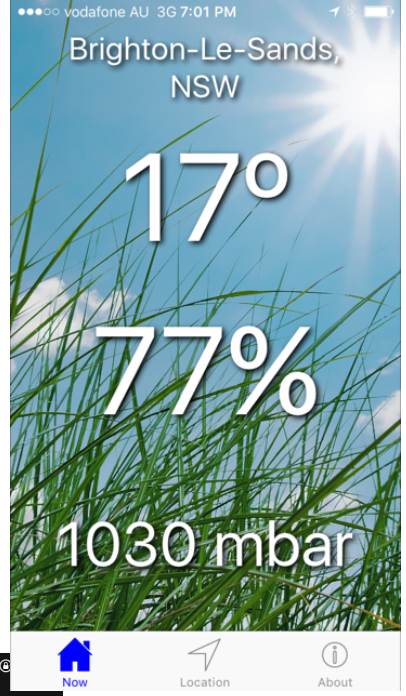


SeeLevel

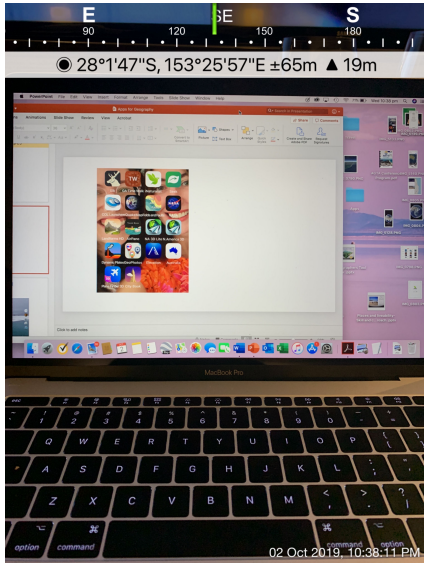
DistMeasure

Decibel



Clinometer

Big Weather



Solocator

Data collection Apps

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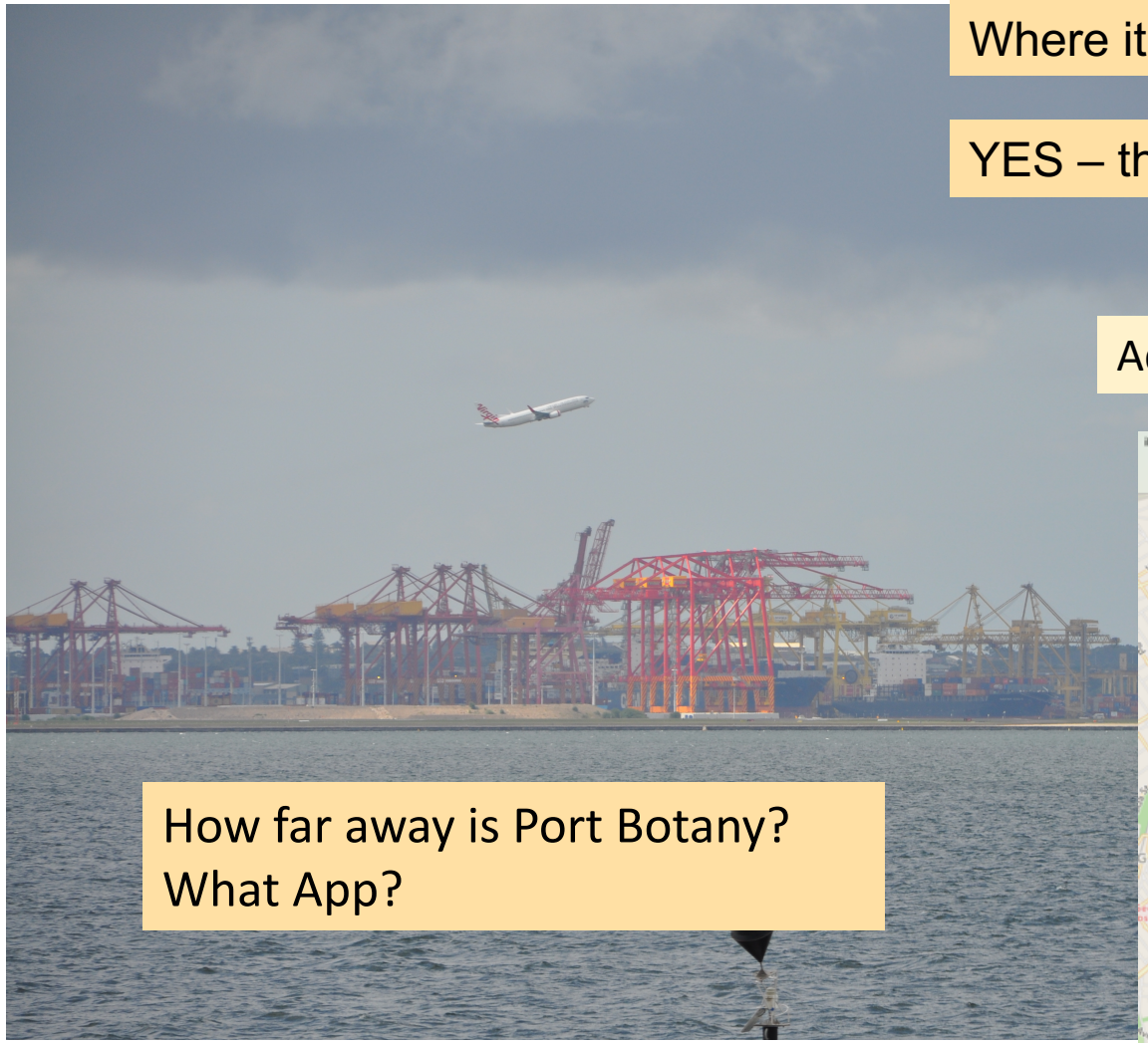
- Plane finder / Ship finder



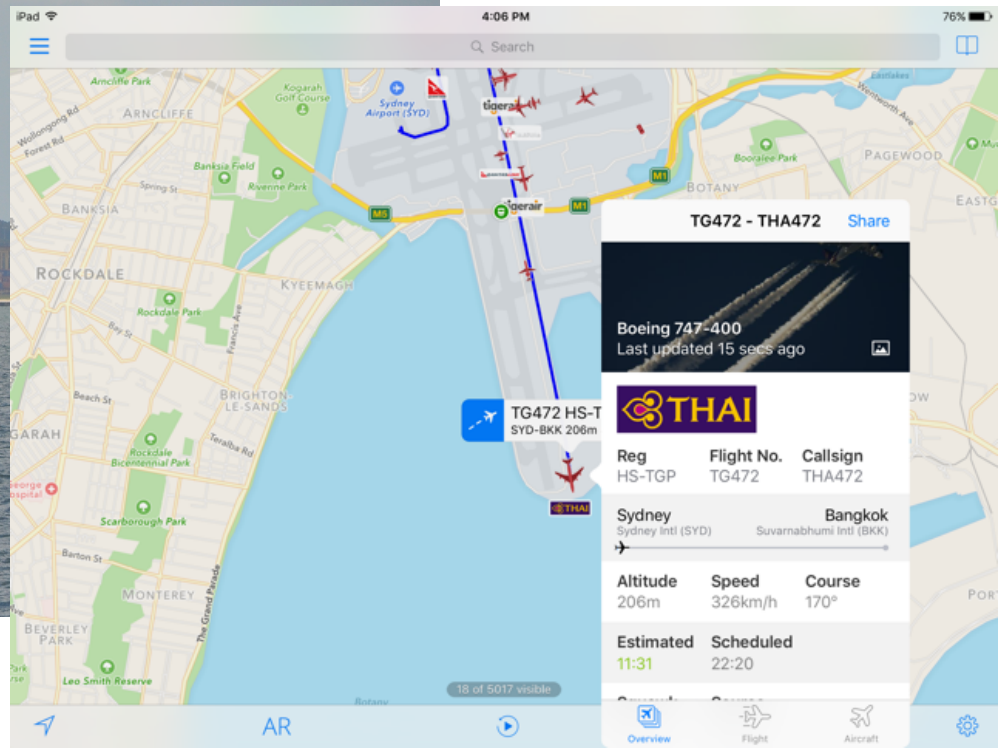
How far away is Port Botany?
What App?

Where it the plane going?

YES – there's an App for that !

Real time Apps

Add interest to a field day ..try to link to the fieldwork topic



Use these during fieldwork using phones or tablets
May need an internet connection!

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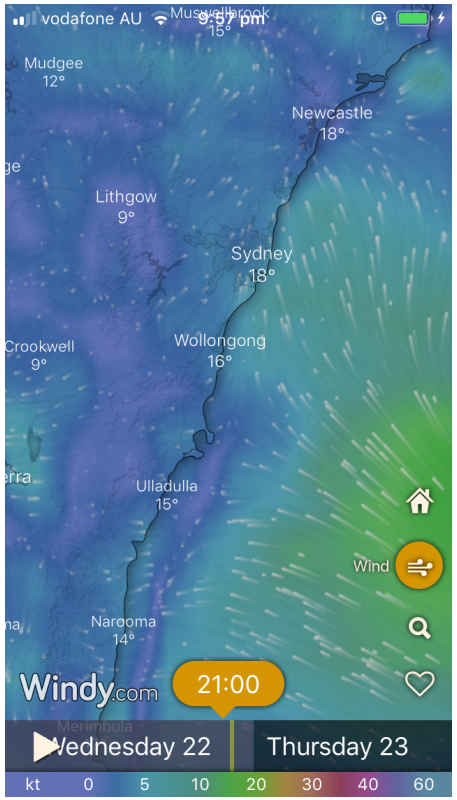
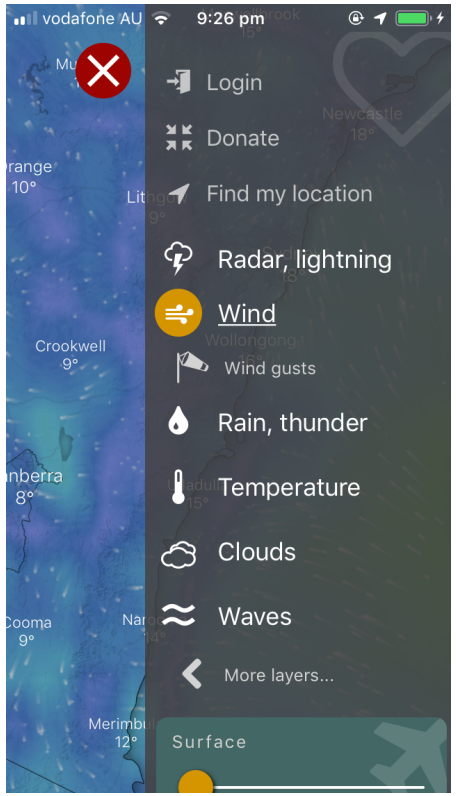
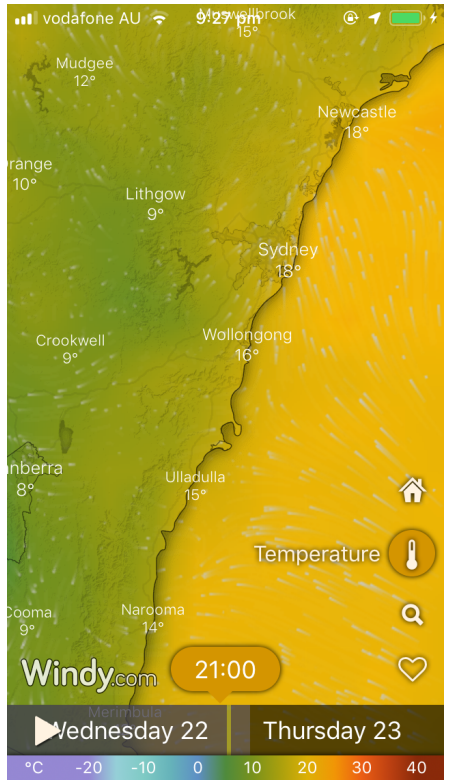
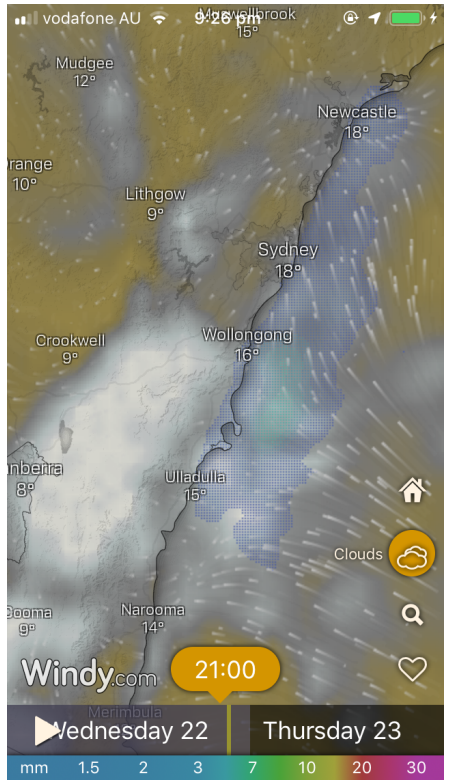
- Windy

What fieldwork equipment could this App replace?









What is the trade off when using apps?

Real time Apps

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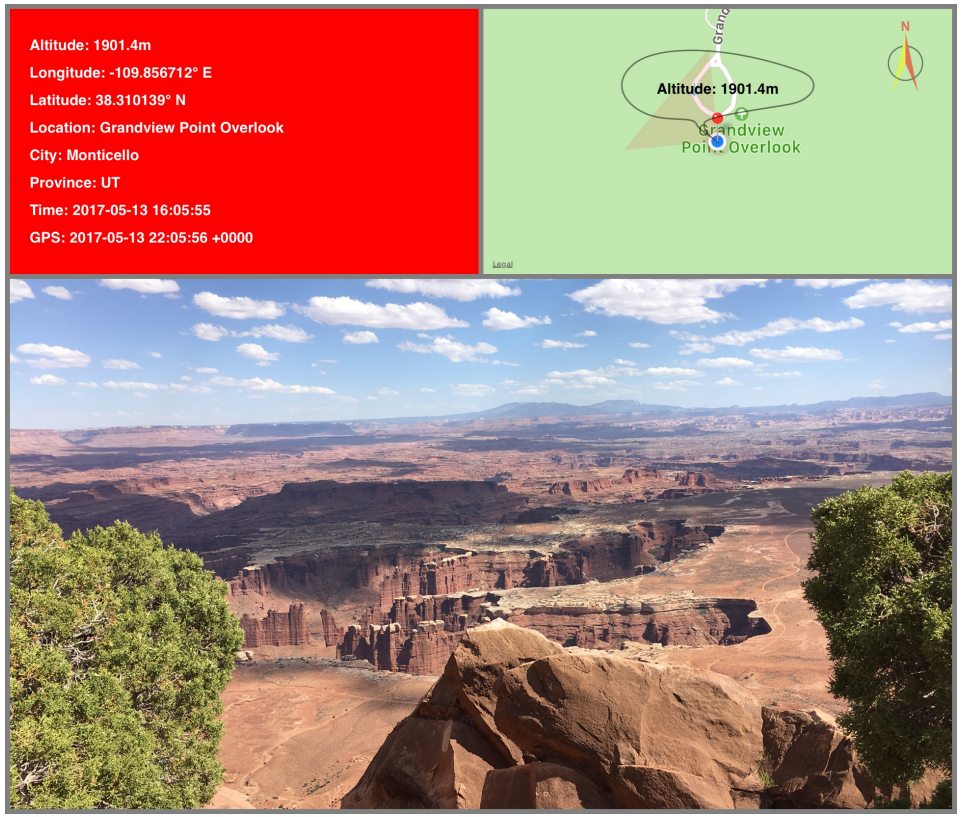
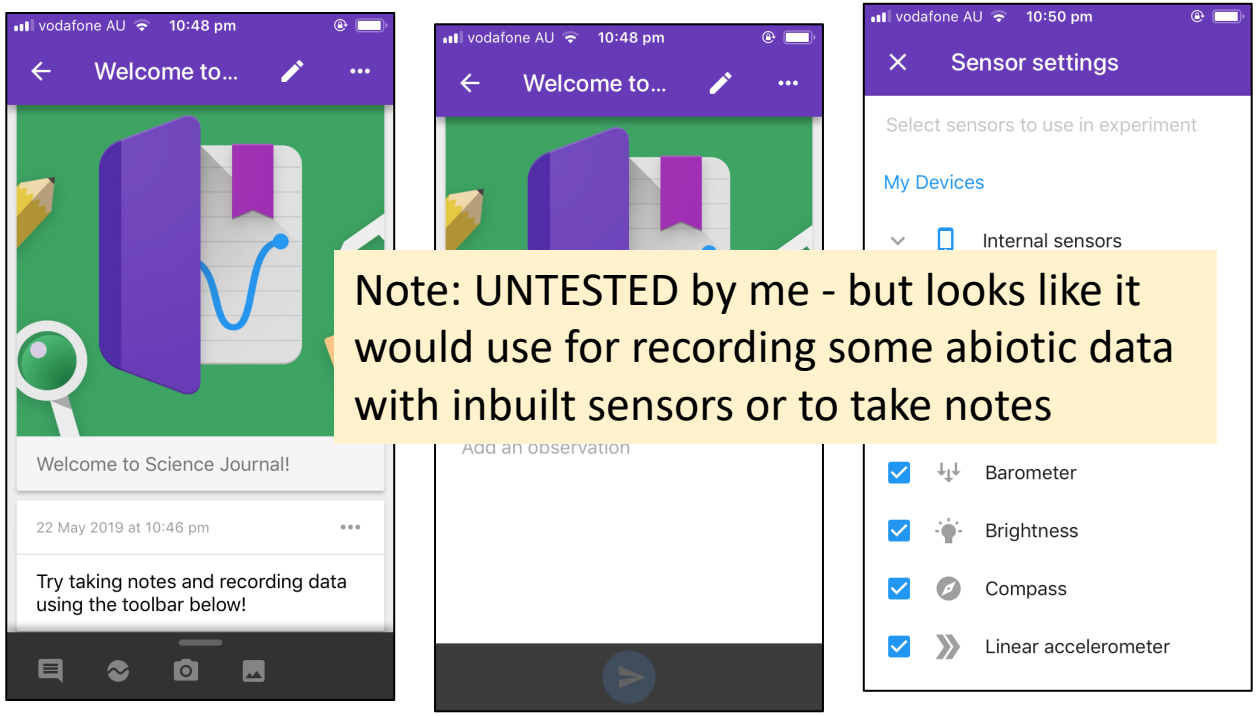
APPS COLLECTING MULTIPLE DATA TYPES

- Altitude DC / My Altitude
  (photo, Lat, Long, Alt)
- Science Journal - collecting & recording
- GEOGIT
- Survey based apps

A personal favourite – used on all my holidays





Note: UNTESTED by me - but looks like it would use for recording some abiotic data with inbuilt sensors or to take notes

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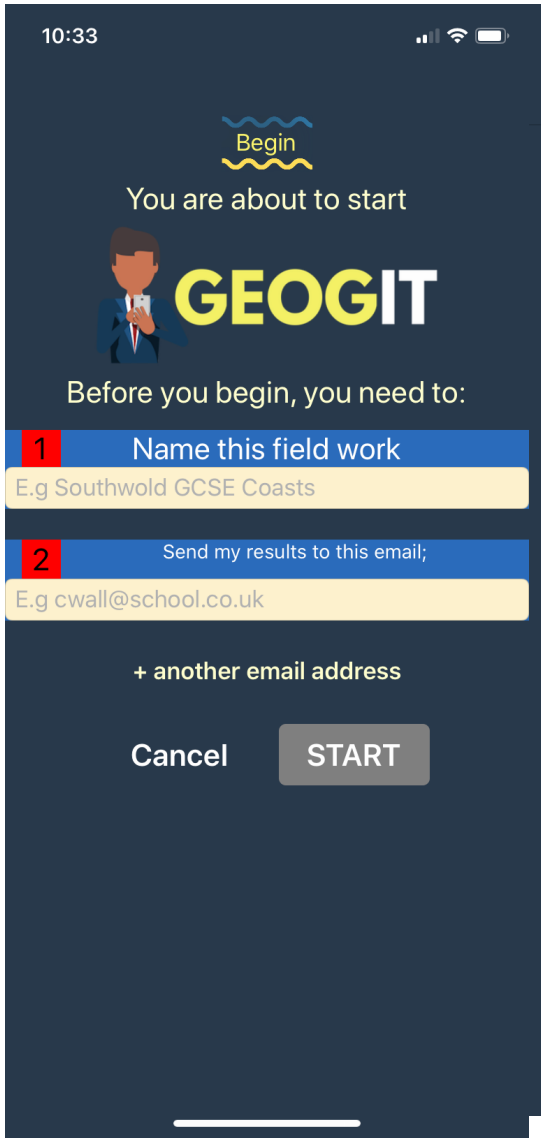

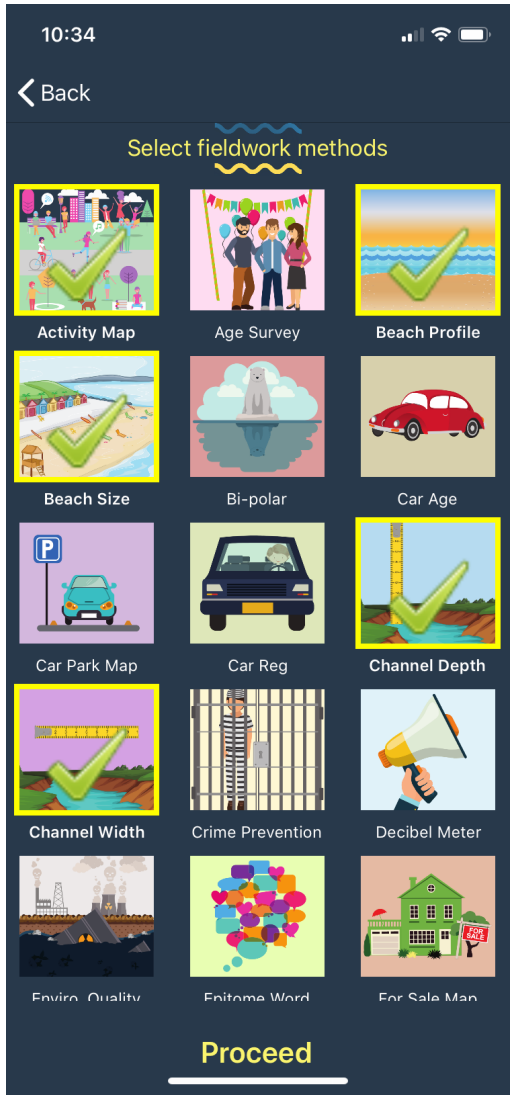

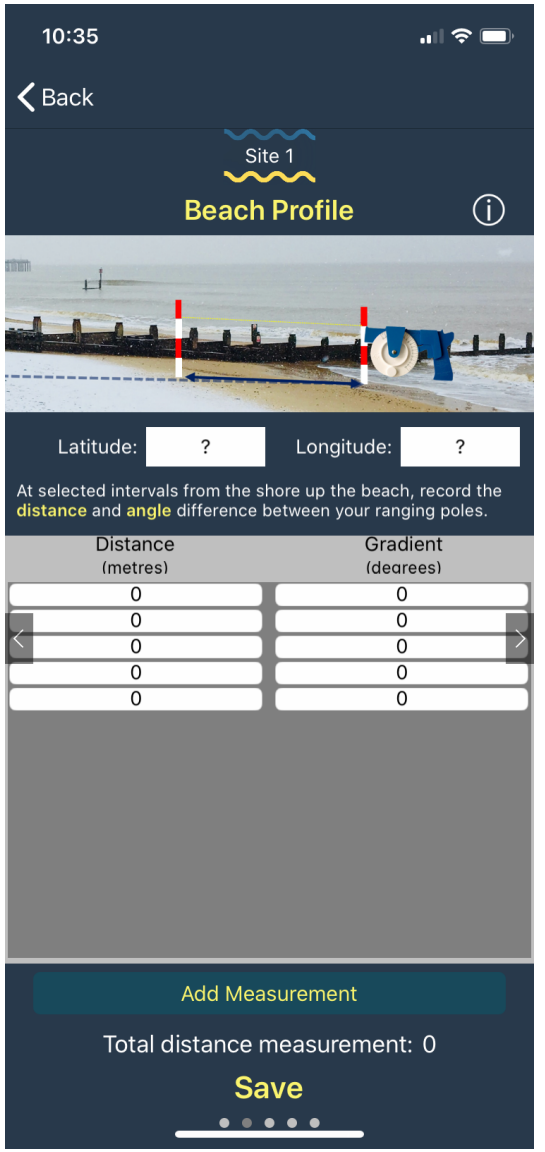

Note: UNTESTED and UK developed but looks OK for selected activities

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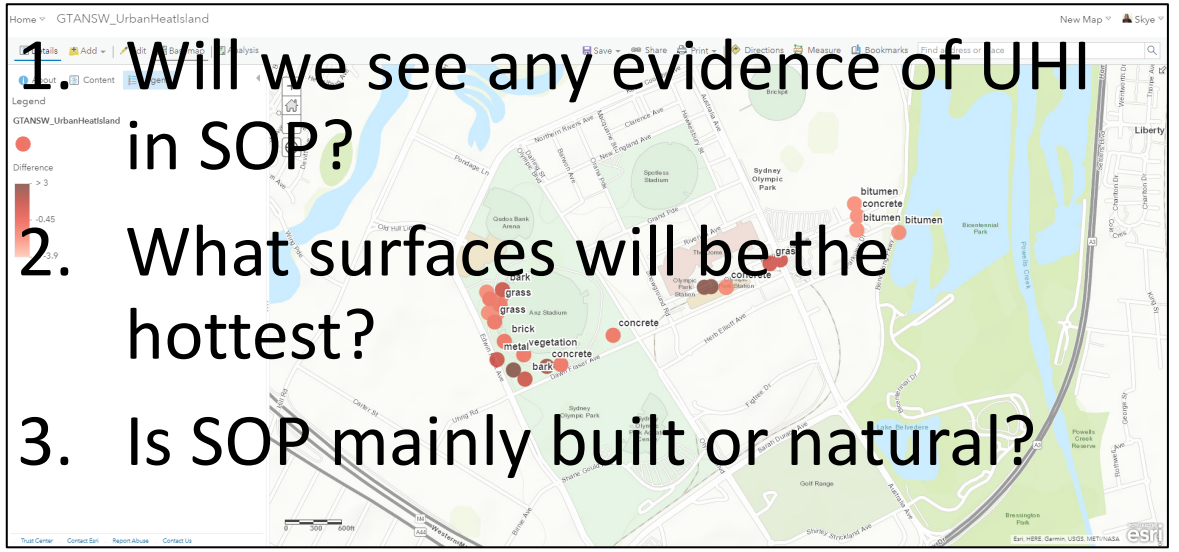
SURVEY BASED APPS

- Survey123 and Collector (RSRI ArcGIS*)
- Epicollect5 **

Surveys are created and students enter data from each location by answering the same questions at each place.

infrared surface temperature readers



1. Will we see any evidence of UHI in SOP?
2. What surfaces will be the hottest?
3. Is SOP mainly built or natural?

* ESRI Account needed (Free but needs login, automatically graphs and maps results)

** Free, no account, works without mobile reception

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Apps could replace these observation checklists

Questions from existing checklists can be added to survey-based Apps)

A Waterways Health Check

rating your local waterway




Each waterway pictured here is different. How would you rate them for health? This document gives you a system that helps you score a waterway by examining it in a number of different ways.

How healthy is your local creek, stream, lake or wetland? Here's a simple guide that will help you rate the health of your local waterway. It's easy, doesn't take too much time or require complex equipment, and it will allow you to tune into a vital component of our environment.

How's your local creek? Is it a place of thriving life, clear water and healthy bush? Is it an area that you enjoy visiting or walking by? Or is it a smelly, dirty trickle that's best avoided?

Our wetlands, creeks, streams and lakes (which we'll refer collectively to as waterways) are far more than just a part of the scenery – they're the lifeblood of the environment. They provide homes for wildlife and plants, water supplies for homes, industries and farms, and places of recreation and enjoyment for us all.

Besides being important environments themselves, our waterways and wetlands also reflect the health of the surrounding land because they're the collection point for water coming from all around. A healthy waterway usually reflects that the local environment is in good shape, whereas an unhealthy waterway often means other things are going wrong somewhere in the catchment.

But how can you tell if a waterway is healthy? It's actually quite simple to estimate the overall condition of these environments. You don't need high-tech equipment or chemicals, but you will need your senses, your common senses and a genuine concern for the waterway.

What's in a feeling?

When you visit a waterway you very quickly form an opinion on whether it's healthy. It's more of a feeling than a detailed understanding; but ask yourself what goes into creating that feeling. Clearly it's based on what you see, smell, and touch (it's not wise to taste water from waterways).

Of course, most of your judgement is based on what you see, but you can break this down into a number of areas as well. How much litter is around? How health and mixed is the vegetation? How clear is the water? All these things add up to a 'feeling' for the waterway's health. To convert your 'feeling' into some form of health rating you could consider each of these areas separately, giving each a mark.

Over the next couple of pages we've proposed areas or categories in which you can make judgements on your local waterway. In each category you can rate your waterway and then combine your scores to come up with an overall rating for the area. In this way you've converted your 'feeling' into a series of numbers you can use to compare different waterways or different places on the same waterway.

This approach is not completely objective (based only on fact) because it's still using your senses and your judgements, not machines and monitors that measure absolute quantities. On some days you might be happy with the world and give a waterway high marks. On another day you might have had a bad time at school and your gloomy mood might have you scoring low marks. However, it's a good start to breaking down your 'feeling' and it's also getting you to examine components of the waterway.

Once you've tried a few ratings of your own, there are ways of making your scores more objective and meaningful. Then we'll discuss ways of actually improving the score itself – that is, improving the health of your waterway.

What rates?

We've suggested nine areas or categories you might like to consider. Each category is rated out of 10, and the lower the mark the poorer the condition of the waterway in that category. We've also suggested things you might look for when making your rating, but it's impossible to come up with indicators that will work in every situation and in many cases you'll need to come up with your own indicators or modify the ones we've suggested. In general, keep in mind that 10 is the best possible rating you can hope for with your waterway, and zero is the worst. Then judge where your waterway might fall on this scale.

You might like to use the next two pages as a master score card. Make photocopies of them for every waterway site you score. Keep good notes on each site, recording the location, date and details on anything special that might vary from visit to visit. This is important so you can more meaningfully compare your scores if you visit the site over time. For example, if you visit after a large storm the water might be quite stirred up and murky, and you need to know this when comparing the site with a visit at a time when no rain has fallen.

Try rating your own local waterway and then turn to the final page for a discussion on how you can use these results. Next to each category is a box with a tip on how you might try to make your monitoring more objective.

CATEGORY 5

smell

Sit by the waterway and record any smells. Take a sample of water and record its smell (don't taste it). A strong natural smell in wetlands and estuaries should be recorded as 6 or more.

Take a sample of water in a glass jar and ask other people how they would judge the smell. Is it the water that smells or something else at the waterway?

Rating Category 5

0. Very strong, unnatural chemical smell
1.
2. Strong unnatural smell
3.
4.
5. Stronger decaying smell or slight unnatural smell
6.
7.
8. Very slight smell, perhaps natural decay
9.
10. No smell / natural smell

YOUR RATING ☐

The water is clear but doesn't smell very nice!

CATEGORY 6

water clarity

Collect a water sample in a clear container. Hold it up to the light. Record how clear the sample is.

If your water sample is murky, allow it to stand for a couple of days. Do particles settle out of it, causing it to become clearer?

Rating Category 6

0. Milky brown or green colour with particles and scum. You can hardly see through it!
1.
2. Cloudiness and/or greenish colour, with some particles or film
3.
4.
5. Some colour and particles
6.
7.
8. A little colour
9.
10. Colourless and clear as tap water

YOUR RATING ☐

It's looking good!

CATEGORY 7

vegetation

Look at the banks and the land extending from the waterway. Note if the vegetation is natural or introduced, and if the soil is eroded or stable.

Using flora books or consulting local experts, learn the names of your local plants. Create a list of species growing around your waterway.

There's vegetation around but the banks themselves are eroded and appear unstable.

YOUR RATING ☐

Rating Category 7

0. Lots of introduced plants, much clearing, bare ground, pasture, extensive erosion
1.
2. Mixed plants, much clearing, large eroded areas
3.
4.
5. Mixed native and introduced plants. Some clearing. Small corridor of vegetation. Some minor erosion.
6.
7.
8. Mainly native plants. Natural vegetation extends up to 30m from water, no erosion
9.
10.

CATEGORY 8

invertebrate animals

(insects, crustaceans, molluscs and so on)

Sit by your waterway and look for invertebrate animal activity. Run a scoop net through the water and see if you can catch insects or other invertebrates.

Scrape up the first centimetre of sediment with a tin. Put it into an ice cream container and wash it with lots of water. Draw any animals you find.

Rating Category 8

0. No invertebrate animal life visible at all
1.
2. Only one or two types of animal life visible (probably snails leeches or worms)
3.
4.
5. Fewer than five types of animals found
6.
7.
8. At least seven types of animals found
9.
10. Many types of animals found including insect larvae and nymphs

YOUR RATING ☐

Run a scoop net through the water and see what you catch.

CATEGORY 9

vertebrate animal life

(birds, reptiles, fish, amphibians and mammals)

Sit by you waterway and look for vertebrate animal activity. Note both the variety and number of birds. Look for fish, listen for frogs and record any animal tracks

Using bird books, learn the names of birds around your waterway and compile a list. Keep a chart of what birds are around at what times of year.

Rating Category 9

0. No vertebrate animal life visible at all
1.
2.
3. One type of animal life (birds)
4.
5.
6. Two types of animals found
7.
8.
9.
10. Many types of vertebrate animals found

YOUR RATING ☐

What birds are using the waterway near you?

total score

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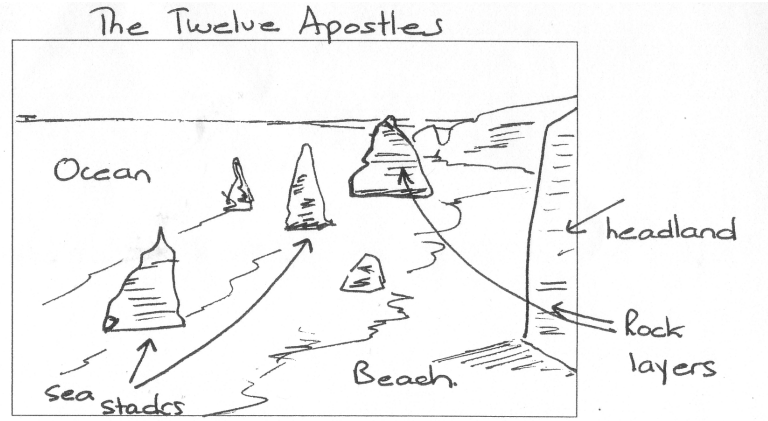
Apps for field sketching

- **Skitch** Replace field sketches with annotated photographs



Create 360 Degree photographs – Google Street View

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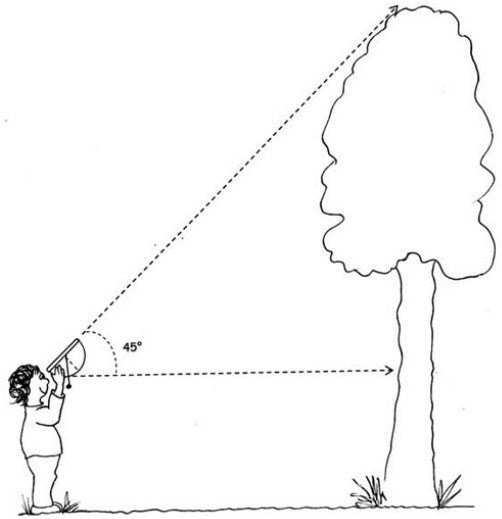
Slope & height: Simple equipment or an App



What Apps could be used here?

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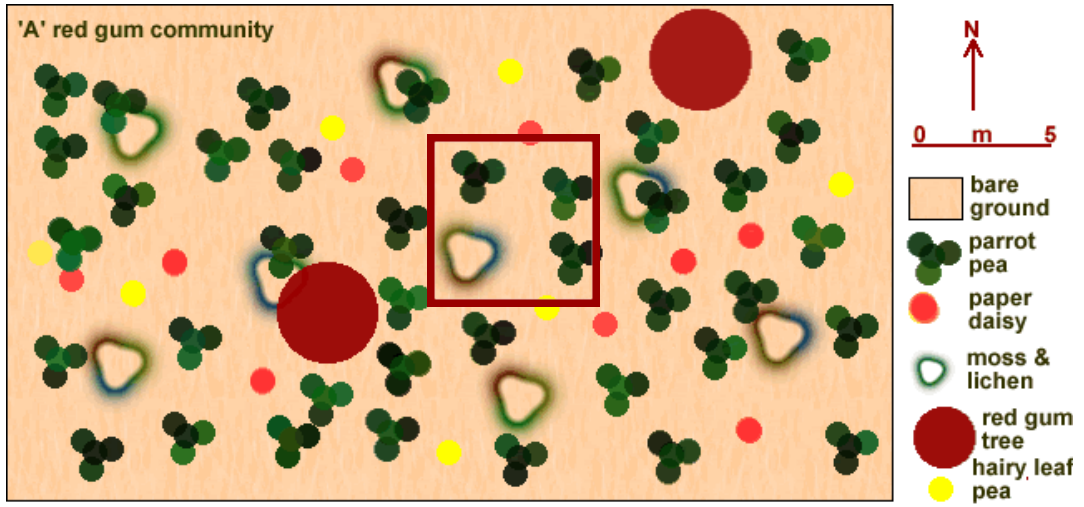
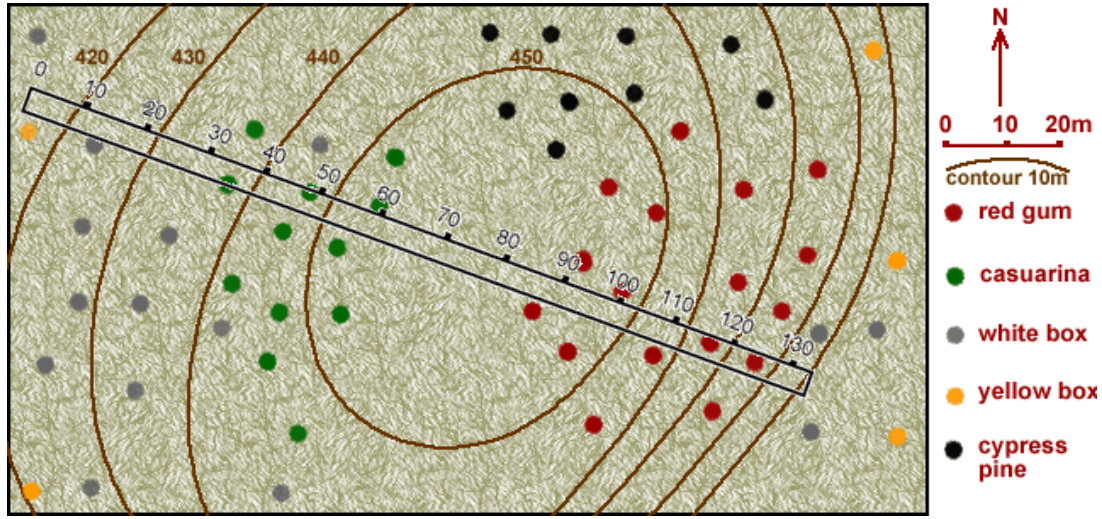
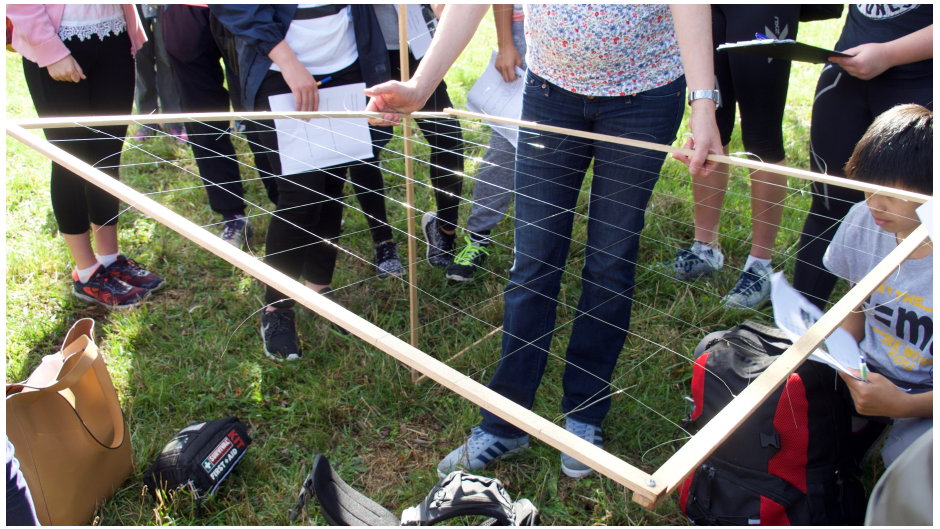
VEGETATION Line transect and Quadrat







Sometimes there is no App for that!

http://www.reec.nsw.edu.au/geo/woodland/text/wod8.htm

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Chemical testing & water quality

Photos: L Chaffer

Use Apps for recording data

Test	Units	Results	Results according to the ANZECC guidelines *(tick the box)*	
Temperature	°C		-	
pH	pH units		<6	☐ POOR
			7 6 - 8	☐ IDEAL ☐ GOOD
			>8	☐ POOR
Electrical Conductivity (Salinity)	µS/cm		< 400 µS/cm	☐ VERY GOOD
			400 – 800 µS/cm	☐ FAIR
			> 800 µS/cm m	☐ POOR
Turbidity	NTU		≤ 10 NTU	☐ VERY GOOD
			15 – 30 NTU	☐ FAIR
			>30 NTU	☐ POOR

Key

< = Less than

> = More than

≤ = Less than or equal to

µS/cm = MicroSiemens per Centimetre

NTU = Nephelometric Turbidity Units

What do the results mean?

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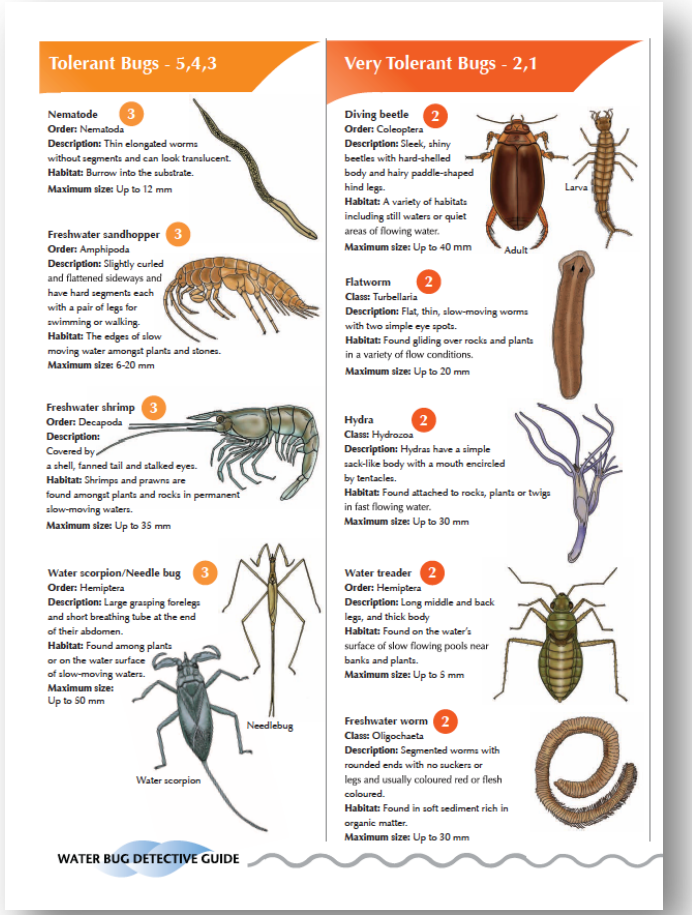
Water bugs survey: water quality



Tolerant Bugs - 5,4,3

Nematode 3
Order: Nematoda
Description: Thin elongated worms without segments and can look translucent.
Habitat: Burrow into the substrate.
Maximum size: Up to 12 mm

Freshwater sandhopper 3
Order: Amphipoda
Description: Slightly curled and flattened sideways and have hard segments each with a pair of legs for swimming or walking.
Habitat: The edges of slow moving water amongst plants and stones.
Maximum size: 6-20 mm

Freshwater shrimp 3
Order: Decapoda
Description: Covered by a shell, fanned tail and stalked eyes.
Habitat: Shrimps and prawns are found amongst plants and rocks in permanent slow-moving waters.
Maximum size: Up to 35 mm

Water scorpion/Needle bug 3
Order: Hemiptera
Description: Large grasping forelegs and short breathing tube at the end of their abdomen.
Habitat: Found among plants or on the water surface of slow-moving waters.
Maximum size: Up to 50 mm

Needlebug
Water scorpion

Very Tolerant Bugs - 2,1

Diving beetle 2
Order: Coleoptera
Description: Sleek, shiny beetles with hard-shelled body and hairy paddle-shaped hind legs.
Habitat: A variety of habitats including still waters or quiet areas of flowing water.
Maximum size: Up to 40 mm

Larva
Adult

Flatworm 2
Class: Turbellaria
Description: Flat, thin, slow-moving worms with two simple eye spots.
Habitat: Found gliding over rocks and plants in a variety of flow conditions.
Maximum size: Up to 20 mm

Hydra 2
Class: Hydrozoa
Description: Hydras have a simple sack-like body with a mouth encircled by tentacles.
Habitat: Found attached to rocks, plants or twigs in fast flowing water.
Maximum size: Up to 30 mm

Water treader 2
Order: Hemiptera
Description: Long middle and back legs, and thick body
Habitat: Found on the water's surface of slow flowing pools near banks and plants.
Maximum size: Up to 5 mm

Freshwater worm 2
Class: Oligochaeta
Description: Segmented worms with rounded ends with no suckers or legs and usually coloured red or flesh coloured.
Habitat: Found in soft sediment rich in organic matter.
Maximum size: Up to 30 mm

WATER BUG DETECTIVE GUIDE

Water Bug Survey Result Sheet: SIGNAL 2 & calculating SPI

waterwatch NEW SOUTH WALES

Survey site name: _____

Survey date: _____ **No. of participants in group:** _____

Water bug recording table – record the number of water bugs per type you found in column B. Refer to next page for instructions to calculate the Stream Pollution Index (SPI).

Macroinvertebrate types		A	B	C	D
Sensitivity rating	**Bug types**	**Sensitivity rating**	**Number of bugs found**	**Weight factor**	**Column A X Column C**
Very sensitive	Stonefly nymph	10			
	Mayfly	9			
Sensitive bugs	Alderfly larva	8			
	Caddisfly larva	8			
	Riffle Beetle & larva	7			
	Water mite	6			
Tolerant bugs	Beetle larva	5			
	Dragonfly nymph	4			
	Water strider	4			
	Whirligig beetle & larva	4			
	Freshwater yabby/crayfish	4			
	Damselfly nymph	3			
	Fly larva & pupa	3			
	Midge larva & pupa	3			
	Freshwater mussel	3			
	Nematode	3			
	Freshwater sandhopper	3			
	Freshwater shrimp	3			
	Water scorpion/needle bug	3			
Very tolerant bugs	Diving beetle & larva	2			
	Flatworm	2			
	Hydra	2			
	Water treader	2			
	Freshwater worm	2			
	Freshwater slater	2			
	Water boatman	2			
	Backswimmer	1			
	Bloodworm	1			
	Leech	1			

	Mosquito larva & pupa	1	
	Freshwater snail	1	
	TOTALS		

Did you catch Gambusia at your site? ☐Yes ☐ No ☐ Di

How to calculate the health of your site

Method of calculation:

Step 1. Tally and count the number found of each bug type in Column B.

Step 2: Refer to the Weight Table for the correct weight factor for the number found.

Step 3: Write the correct Weight Factor for each bug type in Column C.

Step 5: Next, multiply the Bug Sensitivity Rating (Column A) by the Weight Factor (Column C) for each bug type and enter the answer in Column D cell.

Step 6: Add up all Column C (Weight Factors).

Step 7: Add up all Column D (Sensitivity Rating x Weight Factor).

Step 8: Calculate the SPI value number, and record the Stream Quality Rating (Good/Fair/Poor).

Step 9: Count the number of bug types found and record.

No. of each bug found (Column B)	factor (Column C)
1–2	1
3–5	2
6–10	3
11–20	4
>20	5

Calculate the **SPI** = Total of column D / Total column C = ☐ / ☐ = SPI = ☐

Stream Quality Rating = _____

No. o f types of bugs (biodiversity) found = _____

What your Stream Pollution Index (SPI) score means	
Stream Pollution Index	**Stream Quality Rating**
Less than 3.0	Poor
3.0 to 4.0	Fair
>4.0 to 6.0	Good
>6.0	Excellent

Could / Would you use Apps for recording this data ?

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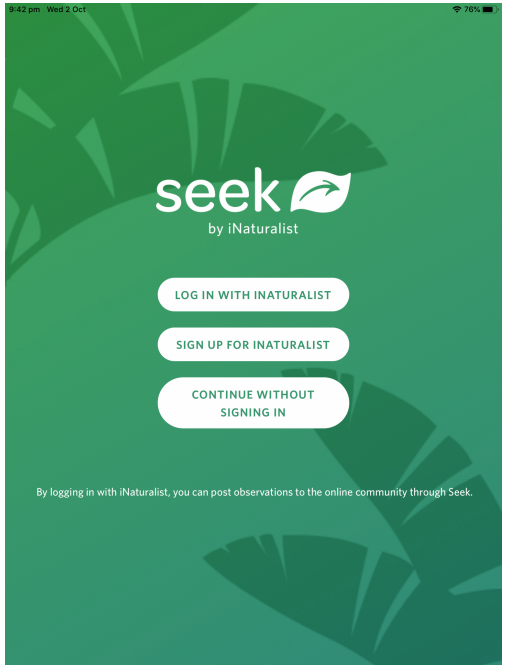
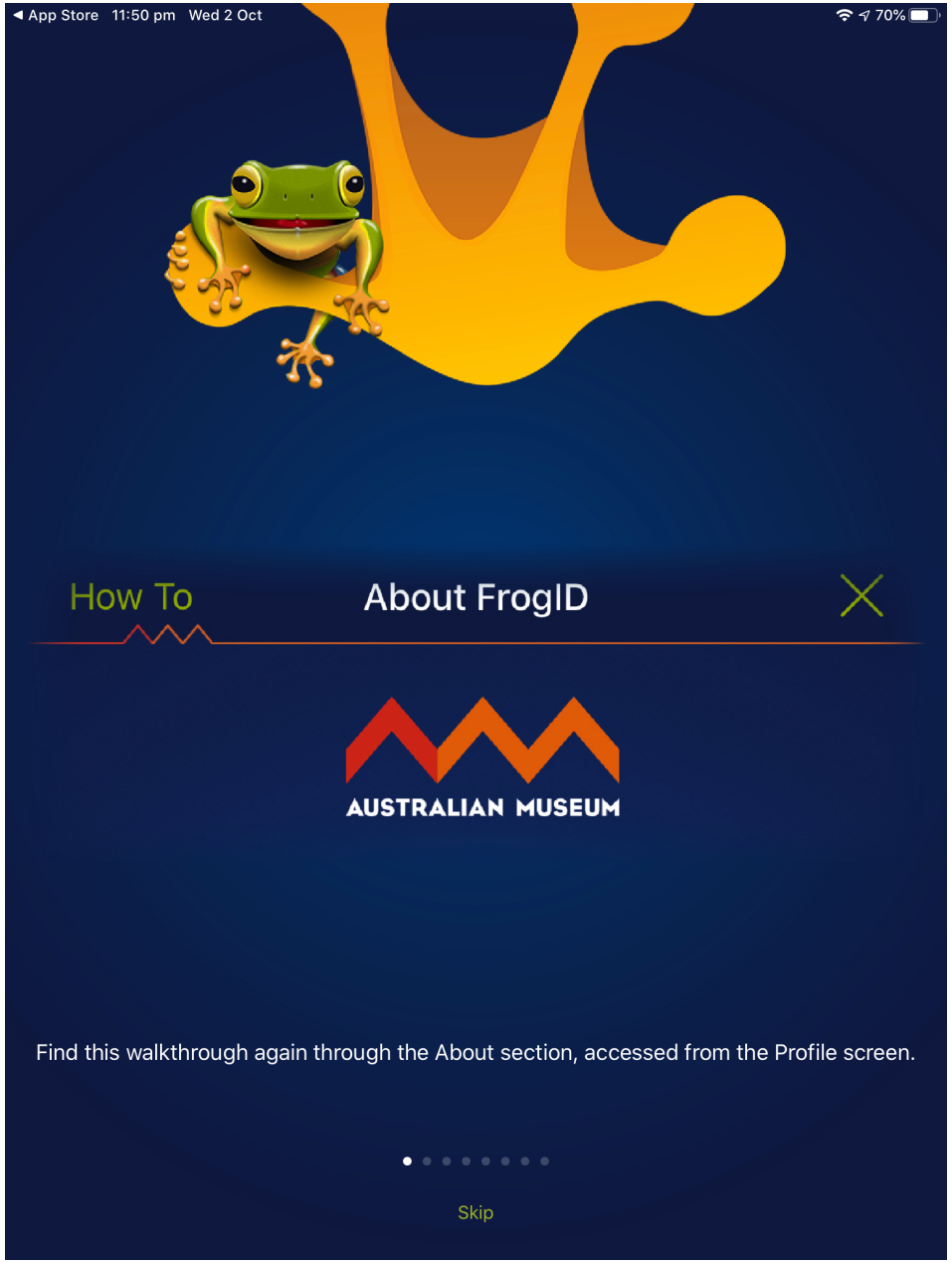
Citizen Science





Great for applied fieldwork at home OR at school

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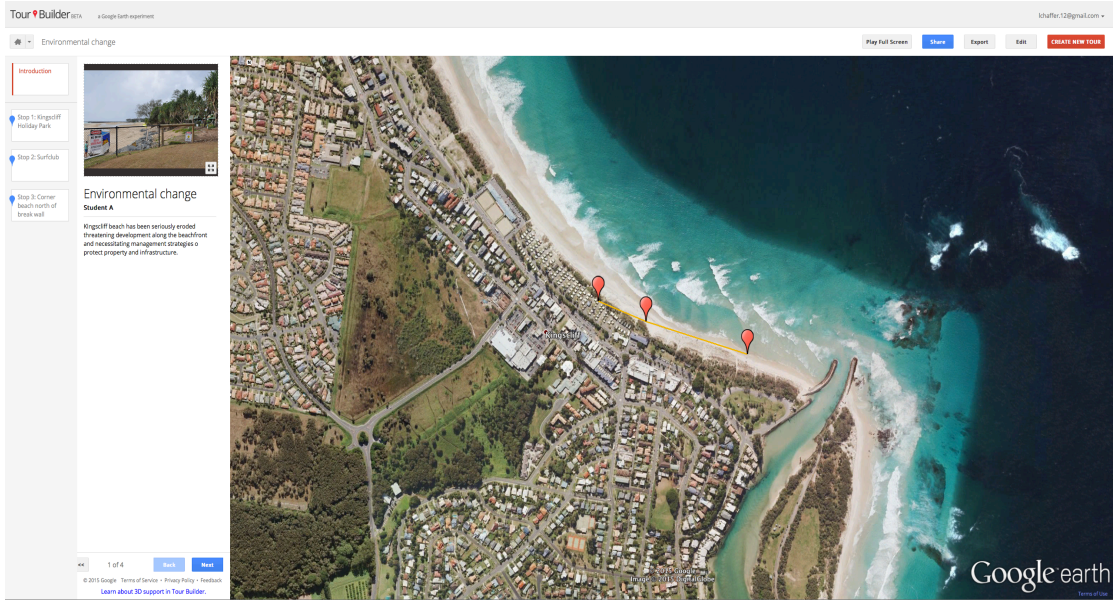
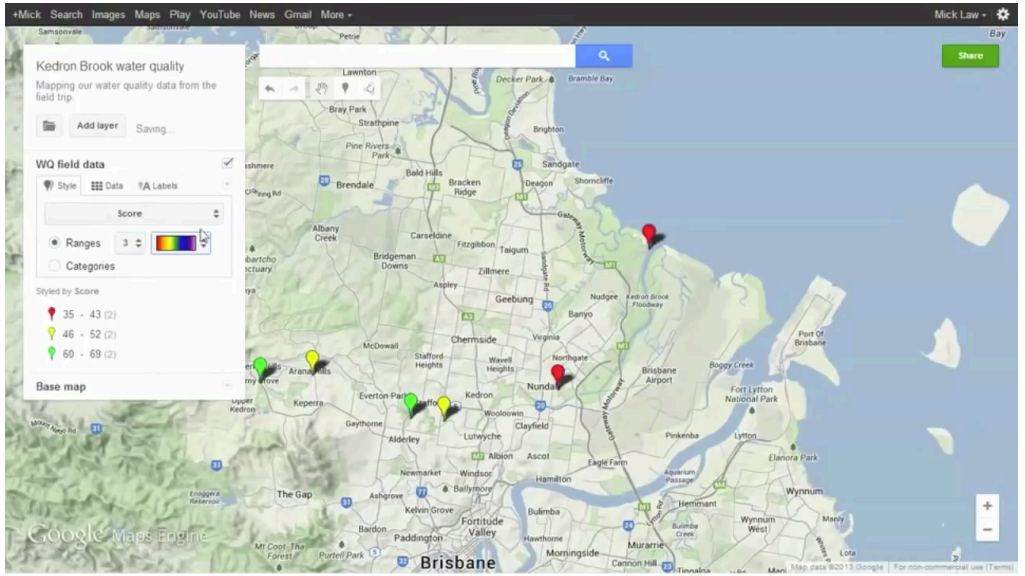
Communicating fieldwork data / findings



Google tour builder (Old)

Map created by L Chaffer using Google Tour Builder
http://www.google.com.au/earth/outreach/tutorials/tourbuilder.html



Google My Maps

Google Earth Projects (newer)
Google Tour Creator (newer)

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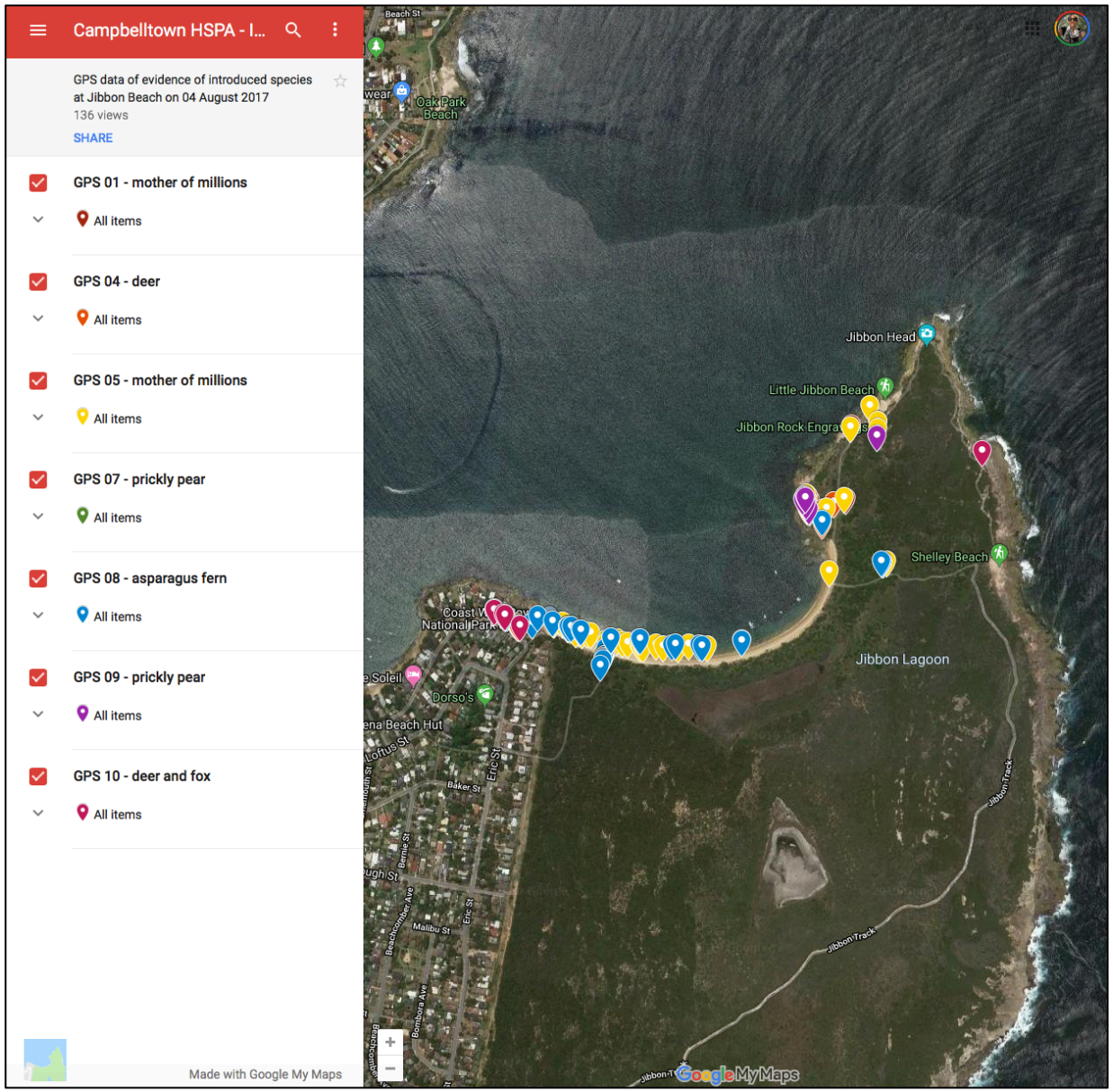

Google My Maps

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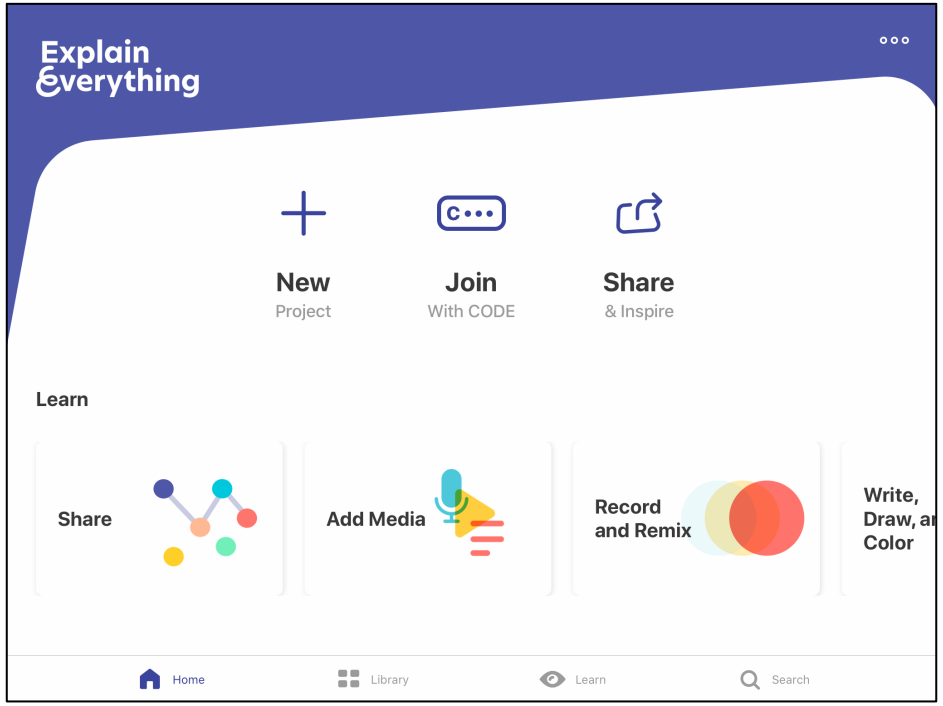
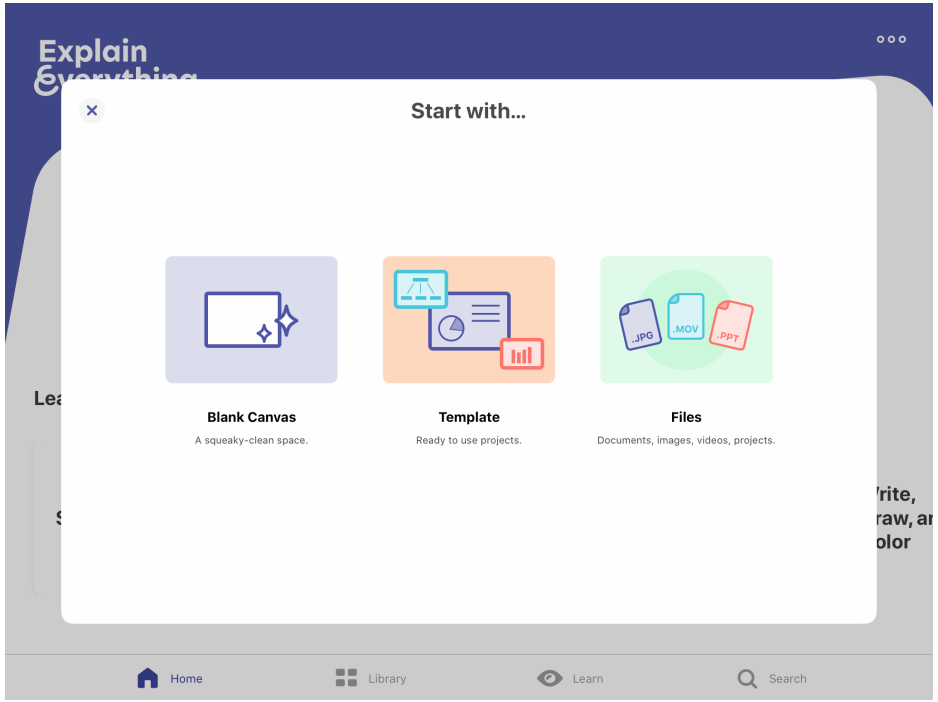
Communicating fieldwork data / findings

Explain everything





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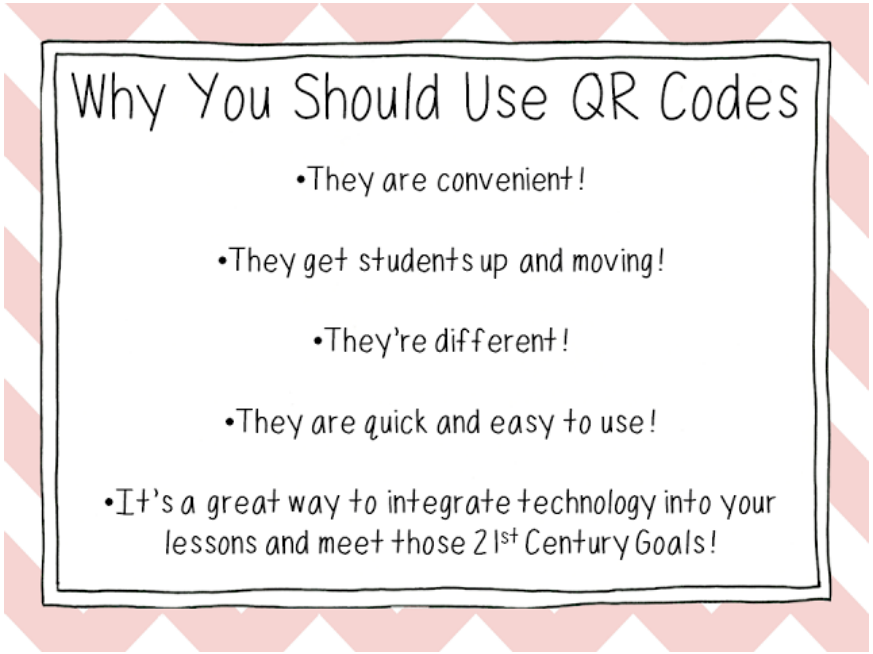
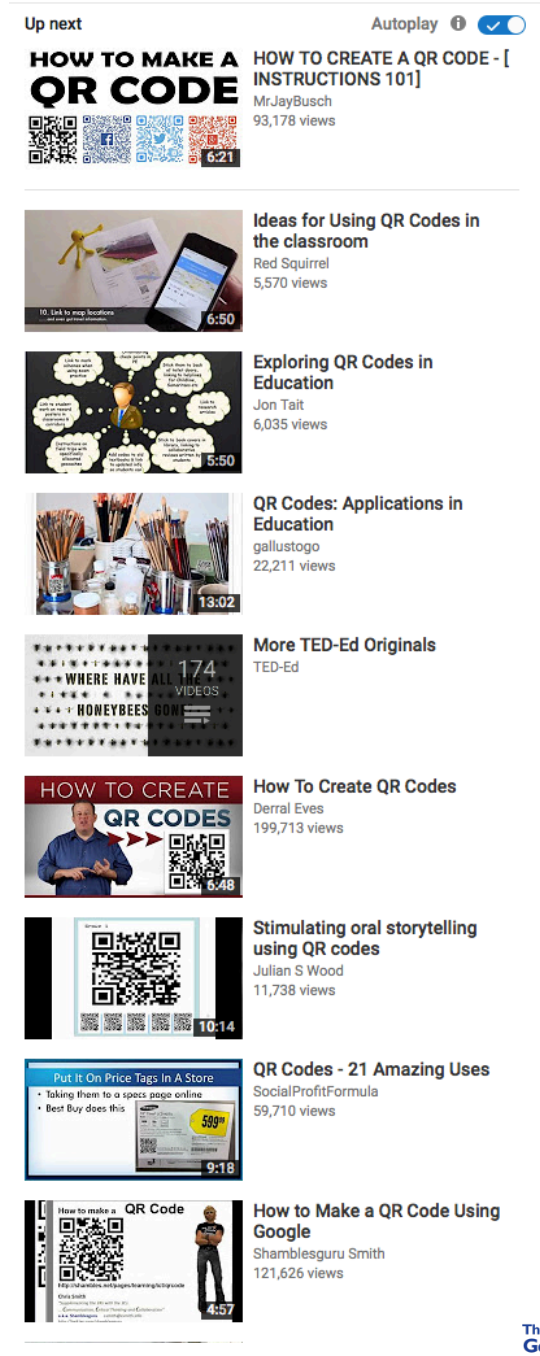
QR CODES



Create 'Walls that talk'
Students create presentations that are accessed by others using a Q code

Set up 'Learning stations' that show how different instruments are used for learning before the fieldwork activity



TED TALK
https://www.youtube.com/watch?v=NRgWRXFXLQs
https://www.youtube.com/watch?v=PL27_BGduDE

BLOG :exploring QR codes in education
https://ictacrossthecurriculum.wordpress.com/2011/10/09/qr-codes-in-education/

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A process for geographical inquiry

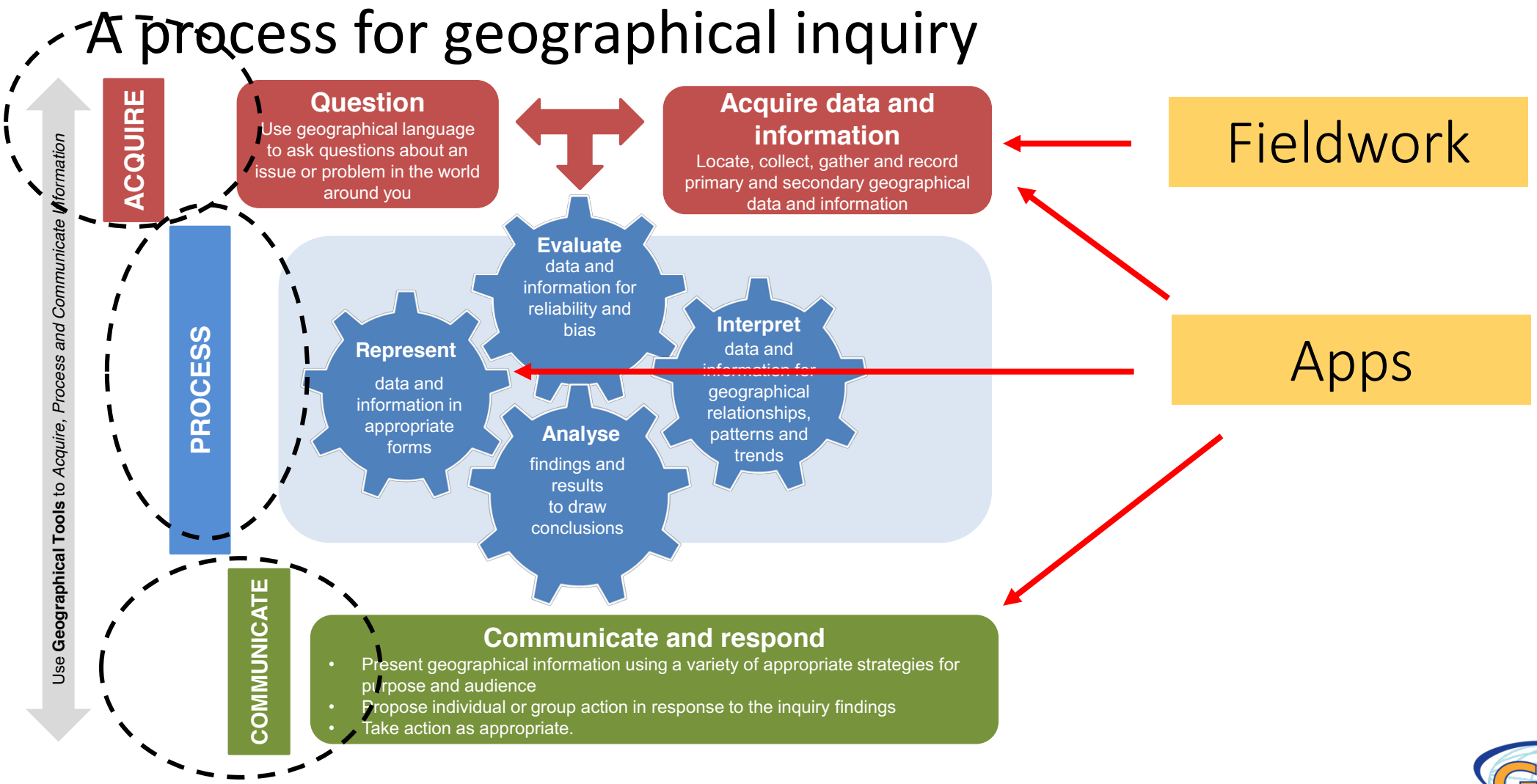

Image : www.hsiensw.com

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