



**Supporting the new Stage 6 Syllabuses  
for Science, Maths and History**

# **MANTLE 2019**

**BACK TO THE  
HEART OF IT  
MAY 10TH, 2019  
NEX NEWCASTLE**

**Bill Cohen, Asquith Girls HS  
william.cohen6@det.nsw.edu.au  
@BillCohenAU**

An apology and a request...

# Taking the temperature - who are our resident experts?

Anyone present with teaching qualifications for...

- Stage 6 Maths?
- Stage 6 Sciences?
- Stage 6 History?

Anyone present who...

- *has taught* one of these subjects within the last five years?
- *is currently teaching* one of the above subjects, ie with a new syllabus?

# What we'll be discussing today

Information Literacy Models (a little)

Research based tasks mandated in new Stage 6 syllabuses for

- 6 Science courses
  - Biology, Chemistry, Earth and Environmental Science, Physics, Investigating Science, Science Extension
- 2 Maths courses
  - Mathematics Standard, Mathematics Advanced
- 3 History courses
  - Ancient History, Modern History, History Extension

...and the help and support we can provide as TLs for each of these.

# What we'll be discussing today

## Information Literacy Models (a little)

Research based tasks mandated in new Stage 6 syllabuses for

- 6 Science courses
  - Biology, Chemistry, Earth and Environmental Science, Physics, Investigating Science, Science Extension
- 2 Maths courses
  - Mathematics Standard, Mathematics Advanced
- 3 History courses
  - Ancient History, Modern History, History Extension

...and the help and support we can provide as TLs for each of these.



Source: NSW, Department of Education and Training. (2007). *Information skills in the school.*

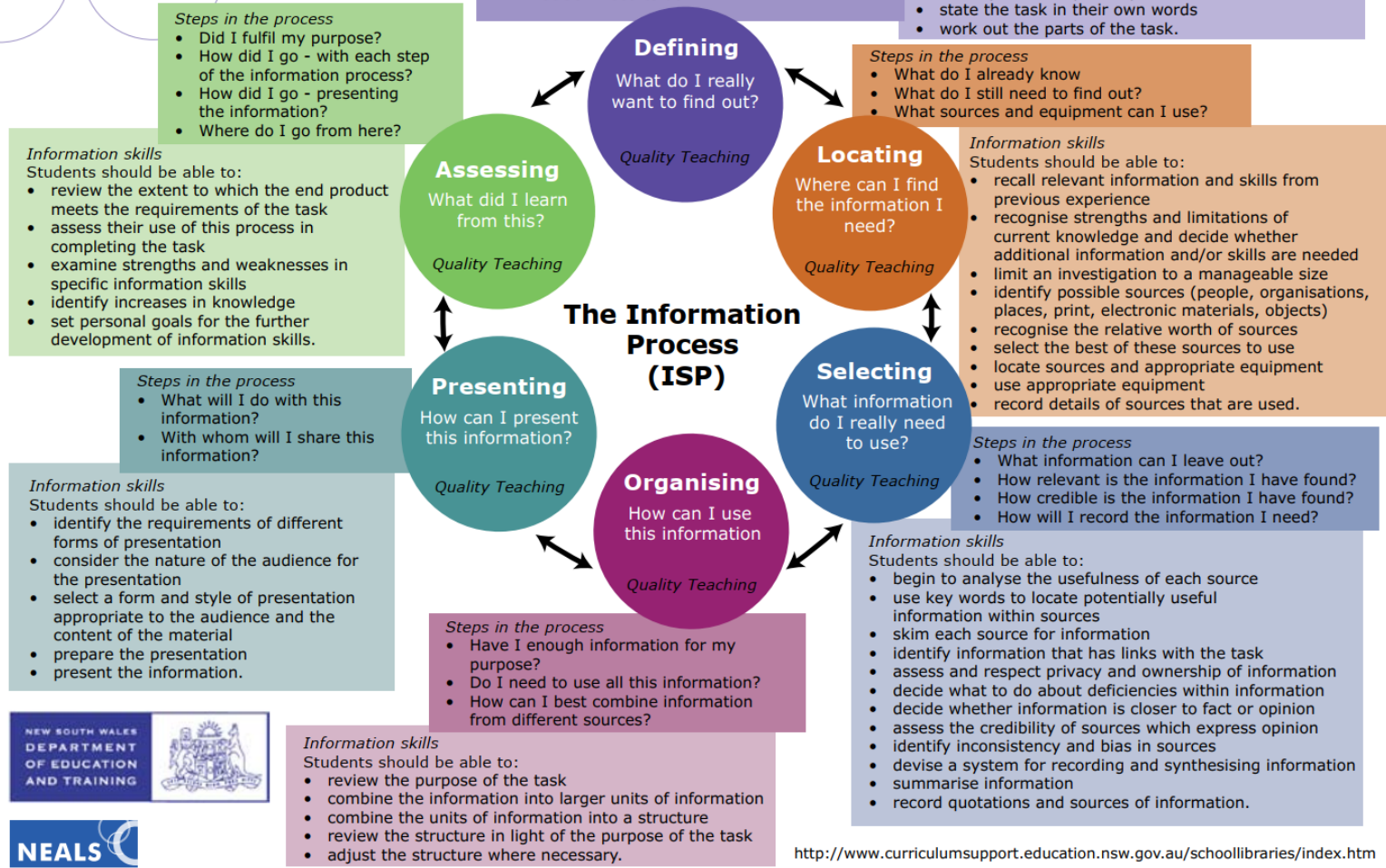
Are you using this model to guide research...

- In Stages 4 and 5?
- In Stage 6?

An issue of *complexity*  
and *presentation...*

# Information skills in the school: engaging learners in constructing knowledge

© State of New South Wales through the NSW Department of Education and Training, 2007





A question of *fluency*  
and *automaticity*...



# The **BIG 6** Information Problem Solving Process



**1**

### **Task Definition**

- 1.1 Define the task
- 2.1 Identify the information needed



**2**

### **Information Seeking Strategies**

- 2.1 Brainstorm possible sources
- 2.2 Select best sources



**3**

### **Location & Access**

- 3.1 Locate source
- 3.2 Access information within source

**4**

### **Use of Information**

- 4.1 Engage in the source (read, view, listen, etc.)
- 4.2 Take out needed information

**5**

### **Synthesis**

- 5.1 Organize information from all sources
- 5.2 Present results

**6**

### **Evaluation**

- 6.1 Judge the result
- 6.2 Judge the process

# What we'll be discussing today

Information Literacy Models (a little)

Research based tasks mandated in new Stage 6 syllabuses for

- 6 Science courses
  - Biology, Chemistry, Earth and Environmental Science, Physics, Investigating Science, Science Extension
- 2 Maths courses
  - Mathematics Standard, Mathematics Advanced
- 3 History courses
  - Ancient History, Modern History, History Extension

...and the help and support we can provide as TLs for each of these.

# Stage 6 in-school assessments for new syllabuses

	Preliminary (Year 11)	HSC (Year 12)
How many tasks	3 (one is end-of-year exam)	4 (one is Trial HSC)
Weighting (min/max)	20% / 40%	10% / 40%
Formal written examinations*	One (except Maths)	One - max weighting 30%

## \*What is the difference between an *examination* and a *test*?

A **formal written examination** is defined as a task such as a half yearly, yearly or trial HSC examination. It is undertaken individually, under supervised examination conditions and **includes one or more unseen questions or items**. A formal written examination is used to gather evidence about student achievement of a range of syllabus outcomes, at a point in time. A formal written examination typically draws from most or all content areas, topics or modules.

Class and cohort tests that include a small number of content areas, topics or modules will continue to be relevant and appropriate methods of formal assessment. These types of tasks would not be considered as formal written examinations.

<https://educationstandards.nsw.edu.au/wps/portal/nesa/about/news/news-stories/news-stories-detail/nesa-answers-common-questions-about-new-stage-6-school-based-assessment-requirements>

# What we'll be discussing today

Information Literacy Models (a little)

Research based tasks mandated in new Stage 6 syllabuses for

- **6 Science courses**
  - Biology, Chemistry, Earth and Environmental Science, Physics, Investigating Science\*, Science Extension\* **\*These courses are new**
- **2 Maths courses**
  - Mathematics Standard, Mathematics Advanced
- **3 History courses**
  - Ancient History, Modern History, History Extension

...and the help and support we can provide as TLs for each of these.

# Think / Pair / Share

What research have you supported in **Stage 6 Science**...

- In previous years?
- Since the introduction of the new syllabuses last year?

# Science in Stage 6 - Overview (not including Science Ext.)

Biology*	Chemistry	Earth & Env. Science*	Physics	Investigating Science
4 modules each in Preliminary and HSC	4 modules each in Preliminary and HSC	4 modules each in Preliminary and HSC	4 modules each in Preliminary and HSC	4 modules each in Preliminary and HSC
Minimum of 35 hours each year for “practical investigations”	Minimum of 35 hours each year for “practical investigations”	Minimum of 35 hours each year for “practical investigations”	Minimum of 35 hours each year for “practical investigations”	Minimum of 35 hours each year for “practical investigations”
<p>“15 hours of course time for depth studies in both Year 11 and Year 12”</p> <p><i>*Mandated fieldwork in Year 11</i></p>	<p>“15 hours of course time for depth studies in both Year 11 and Year 12”</p>	<p>“15 hours of course time for depth studies in both Year 11 and Year 12”</p> <p><i>*Mandated fieldwork in Year 11 and 12</i></p>	<p>“15 hours of course time for depth studies in both Year 11 and Year 12”</p>	<p>“<u>30</u> hours of course time for depth studies in both Year 11 and Year 12”</p>

# Depth Studies in Science

## What are Depth Studies?

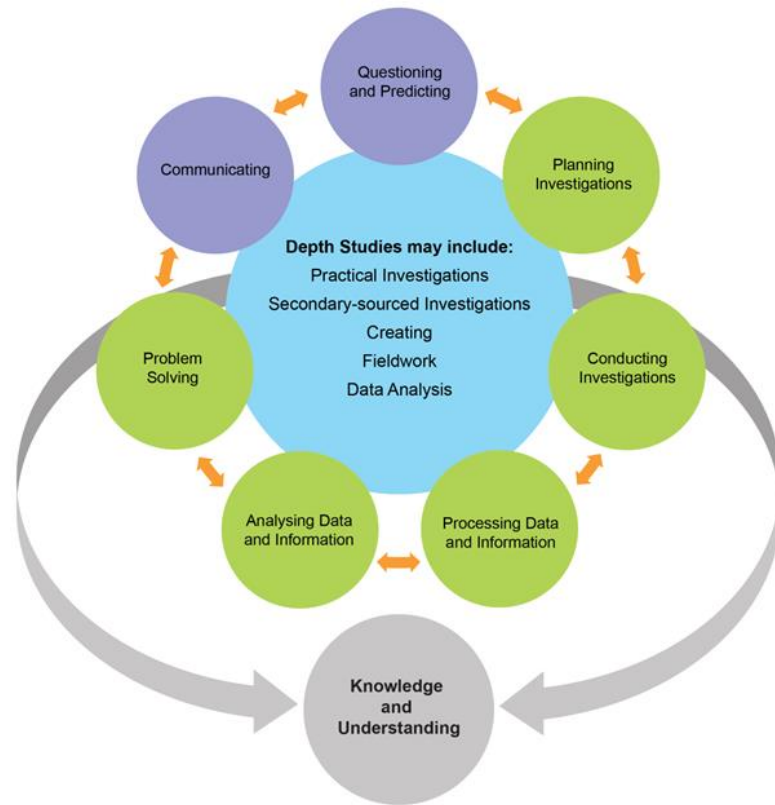
A depth study is any type of investigation/activity that a student completes individually or collaboratively that allows the further development of one or more concepts found within or inspired by the syllabus. *It may be one investigation/activity or a series of investigations/activities.*

A depth study may be, but is not limited to:

- a practical investigation or series of practical investigations and/or a secondary-sourced investigation or series of secondary-sourced investigations
- presentations, research assignments or fieldwork reports
- the extension of concepts found within the course, either qualitatively and/or quantitatively.

The time for the depth studies may be allocated to a single study or spread over the year, and incorporate several studies depending on individual school and/or class requirements.

- *NESA (2017) Stage 6 Syllabuses for all 2-unit Science courses*



### Assessment of Depth Studies must:

- address Questioning and Predicting, and Communicating skills outcomes
- address a minimum of two additional Working Scientifically skills outcomes
- include assessment of at least one Knowledge and Understanding outcome.



# Sample Scope and Sequences – Single depth study

Academic Year (not to scale)				
Module 1 27 hrs	Module 2 26 hrs	Module 3 26 hrs	Module 4 26 hrs	Depth Study 15 hrs (Includes assessment)

Academic Year (not to scale)				
Module 1 25 hrs	Module 2 20 hrs	Depth Study 15 hrs (Includes assessment)	Module 3 30 hrs	Module 4 30 hrs

Source – NESAs (2017), **Stage 6 Science: A Guide to Depth Studies**

# Sample Scope and Sequences – Multiple depth studies

## Academic Year (not to scale)

Module 1 25 hrs	Depth Study 1 5 hrs	Module 2 25 hrs	Depth Study 2 5 hrs	Module 3 25 hrs	Depth Study 3 5 hrs (Includes assessment)	Module 4 30 hrs
--------------------	------------------------	--------------------	------------------------	--------------------	---	--------------------

## Academic Year (not to scale)

Module 1 27 hrs	Module 2 26 hrs	Module 3 26 hrs	Module 4 26 hrs
Depth Study 15 hrs (Includes assessment)			

# Science in Stage 6 - Investigating Science

- Not a replacement for Senior Science (course no longer exists)
- Strong focus on student-directed investigations
- A ‘stand-alone’ course - students **do not** need to be studying a ‘traditional’ Science subject (Bio/Chem/EES/Physics) to take this subject

# Biology Year 11 Course Content

---

## Year 11 Course Structure and Requirements

		<b>Modules</b>	<b>Indicative hours</b>	<b>Depth studies</b>
<b>Year 11 course</b>  <b>(120 hours)</b>	<b>Working Scientifically Skills</b>	<b>Module 1</b> Cells as the Basis of Life	60	*15 hours in Modules 1–4
		<b>Module 2</b> Organisation of Living Things		
		<b>Module 3</b> Biological Diversity	60	
		<b>Module 4</b> Ecosystem Dynamics		

\*15 hours must be allocated to depth studies within the 120 indicative course hours.

# Comparison - Biology VS Investigating Science

## *Biology Year 11 Module 1: Cells as the Basis for Life*

### *Content Focus*

*Students examine the **structure and function of organisms** at both the **cellular and tissue levels** in order to describe how they **facilitate the efficient provision and removal of materials to and from all cells in organisms**. They are introduced to and **investigate biochemical processes** through the application of the Working Scientifically skills processes. Students are introduced to **the study of microbiology and the tools that scientists use in this field**. These tools will be used throughout the course to assist in making predictions and solving problems of a multidisciplinary nature.*

### *Working Scientifically*

*In this module, students focus on conducting investigations to collect, process and analyse data and identify trends, patterns and relationships related to cell structure and function. Students should be provided with opportunities to engage with all Working Scientifically skills throughout the course.*

# Investigating Science Year 11 Course Content

---

## Year 11 Course Structure and Requirements

		<b>Modules</b>	<b>Indicative hours</b>	<b>Depth studies</b>
<b>Year 11 course (120 hours)</b>	<b>Working Scientifically Skills</b>	<b>Module 1</b> Cause and Effect – Observing	60	*30 hours in Modules 1–4
		<b>Module 2</b> Cause and Effect – Inferences and Generalisations		
		<b>Module 3</b> Scientific Models	60	
		<b>Module 4</b> Theories and Laws		

\*30 hours must be allocated to depth studies within the 120 indicative course hours.

# Comparison - Biology VS Investigating Science

## *Investigating Science Year 11 Module 1: Cause and Effect - Observing*

### *Content Focus*

*Students explore the importance of observation and the collection of quantitative and qualitative data in scientific investigations. They conduct their own practical investigation, either individually or collaboratively, which is used to demonstrate the importance of making detailed and accurate observations, determining the types of variables and formulating testable scientific hypotheses.*

### *Working Scientifically*

*In this module, students focus on developing hypotheses that arise from their observations and evaluate these in order to gather, select and process appropriate qualitative and quantitative data. Students should be provided with opportunities to engage with all Working Scientifically skills throughout the course.*

## Science in Stage 6 - Science Extension

*The Science Extension Stage 6 Syllabus focuses on the nature, development and processes of science.*

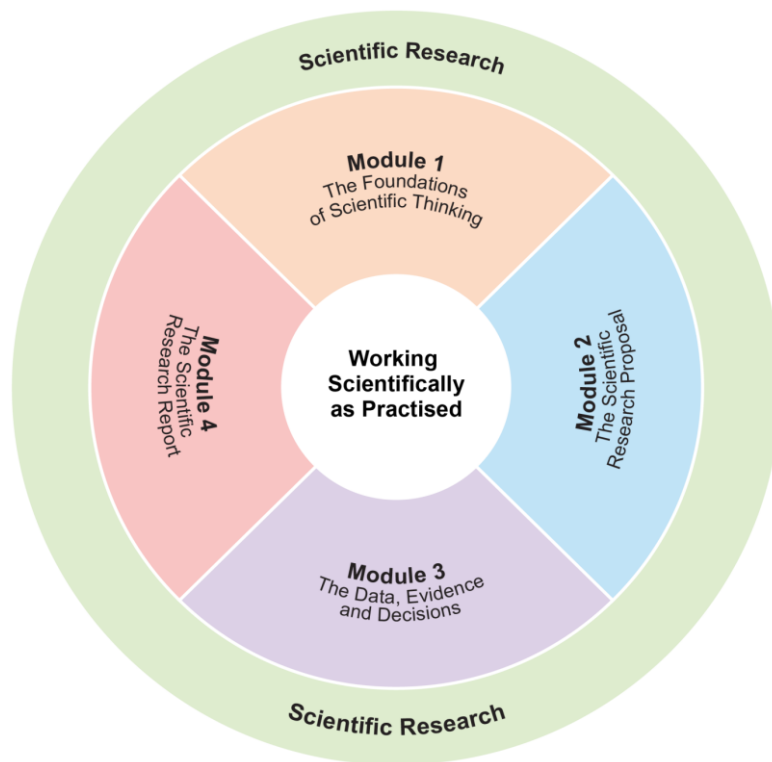
*The course requires students to engage with complex concepts and theories and to critically evaluate new ideas, discoveries and contemporary scientific research.*

*Students are challenged to examine a scientific research question influenced by their study of one or more of the scientific disciplines.*

*In doing this, students extend their knowledge of the discipline(s), conduct further analysis and authentic scientific investigations, and uniquely for this course, produce a detailed scientific research report that reflects the standards generally required for publication in a scientific journal.*



# Content comparison - Science Extension VS 2-unit Chemistry



# Science Extension - Course Structure and Requirements

## Year 12 Course Structure and Requirements

- 1-unit, HSC-only course. **MUST** be taken alongside at least one 2-unit HSC Science course.
- Content is taught alongside the development of an independent Scientific Research Project

<b>Year 12 Course</b> <b>1 Unit</b> <b>(60 hours)</b>	Students develop a response to a scientific research question that requires the analysis of data from one, or a combination of, the disciplines of Science		
	Modules	Indicative Hours	Scientific Research Project
	<b>Module 1</b> The Foundations of Scientific Thinking	10	Establish an area for scientific research  ↓
	<b>Module 2</b> The Scientific Research Proposal	10	Formulate the hypothesis for research  ↓
	<b>Module 3</b> The Data, Evidence and Decisions	20	Find or generate the data Apply methodologies to analyse the data  ↓
	<b>Module 4</b> The Scientific Research Report	20	Develop the Scientific Research Report and respond to the hypothesis  ↓
<b>Mandatory Scientific Research Report and Portfolio</b>			

# Module 2 - The Scientific Research Proposal

*Students:*

- *conduct a detailed literature review to support the validity, significance and appropriateness of the scientific research question”*
- *employ accepted referencing protocols, for example*
  - *APA*
  - *Harvard*
  - *MLA*

# The Scientific Research Report - the 'Major Work'

*Format (from the syllabus):*

A scientific research report or paper (approximately 2500-3000 words) has a formal structure. Regardless of the scientific discipline the report is prepared in a way that can be clearly interpreted by academics or other scientists.

- Internally marked then uploaded to Schools Online
- Worth a mandatory 40% of internal assessment mark

*This includes...*

# The Scientific Research Report - the 'Major Work'

## Literature Review

This section (approximately 750-1000 words) is designed to inform the reader of the relevance of the scientific research and includes background information enabling the reader to understand the key areas involved. It is usual to start the review with a broad scope and become more specific. **Sources used are to be current** and, where possible, original articles referenced rather than reviews of the articles.

NB: A literature review (for a different topic) can be used as an additional assessment prior to the submission of the Scientific Research Report.

# The care and feeding of panicked Science students

- Help them to find their sources via
  - Advanced Google searches and/or Boolean searches
  - Legitimate sources with less academic language, government reports, white papers etc - these will have a reference list that can be utilised
  - Websites with expert authors such as [The Conversation](#)
  - ~~Threaten them until they~~ *heartily encourage them to* get State Library memberships

....and support effective and consistent referencing and source collation via low and/or high-tech means, suitable to your cohort

# The care and feeding of panicked Science students

Help them assess the validity of sources for their Research Project, consider the CRAP model:

<b>C</b> urrency	How recent is this information?
<b>R</b> elevance	Is this information <b>related to the topic</b> ?
<b>A</b> uthority/ <b>A</b> ccuracy	Who <b>wrote</b> and/or <b>published</b> the information?
<b>P</b> urpose	What is the <b>intention</b> of the information?

**staff**

# The care and feeding of panicked Science ~~students~~

- Speak to HT / Subject Coordinators about how their Year 11 Depth Studies went in 2018 – ask about specific problems or common student mistakes.
- Ask if you can speak with the Science teachers during a faculty meeting about their experiences with student research quality – look for what they view to be an ‘80/20’ obstacle.
- Offer to ‘have a look over’ the Depth Study outline during the creation phase – younger teachers are your target here!
- Ask to get copies of the final Depth Studies assessments before they are given to students so you can have relevant websites referenced on your LMS.



# What we'll be discussing today

Information Literacy Models (a little)

Research based tasks mandated in new Stage 6 syllabuses for

- 6 Science courses
  - Biology, Chemistry, Earth and Environmental Science, Physics, Investigating Science, Science Extension
- 2 Maths courses
  - Mathematics Standard, Mathematics Advanced
- 3 History courses
  - Ancient History, Modern History, History Extension

...and the help and support we can provide as TLs for each of these.

# Think / Pair / Share

What research tasks have you supported in **Years 7-12 Mathematics...**

- In previous years?
- Since the introduction of the new syllabuses last year?

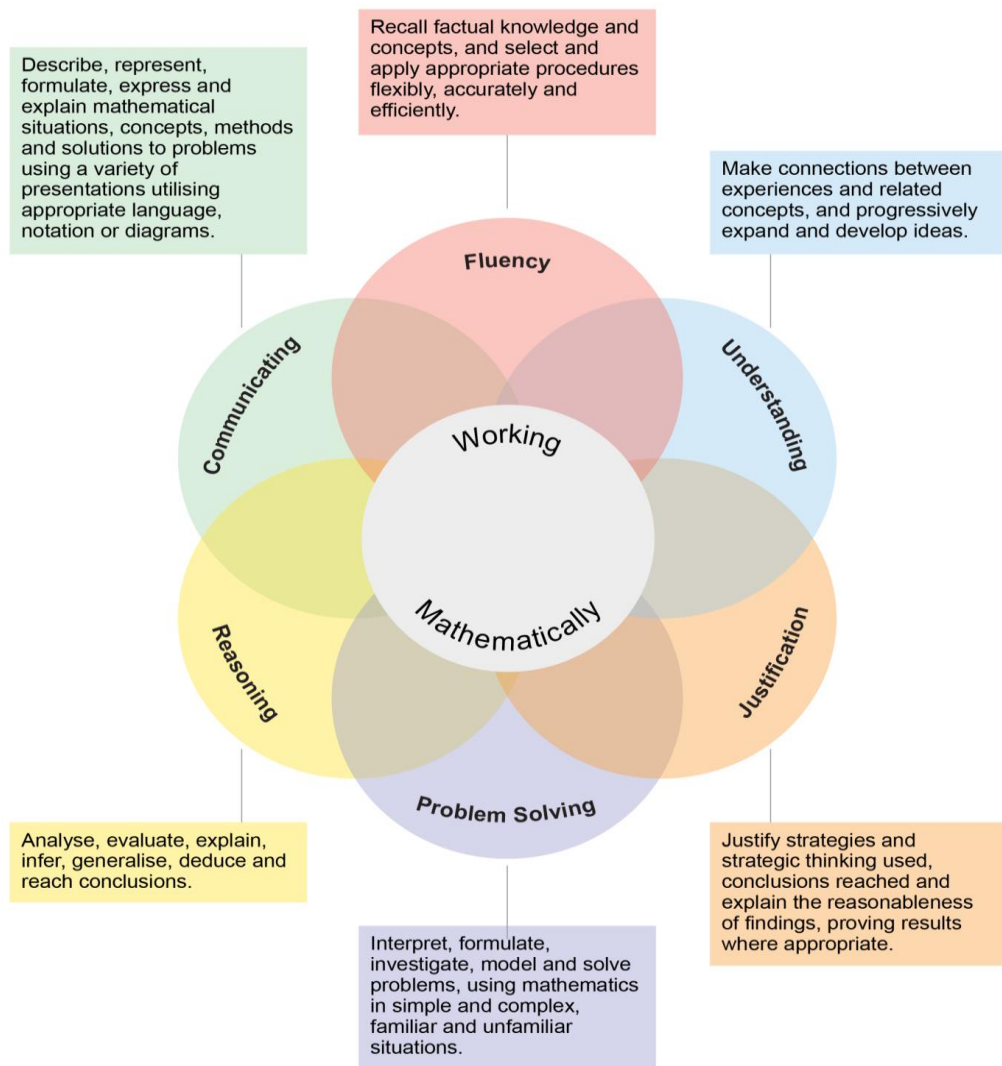
# Stage 6 Maths - Staggered implementation

<b>Mathematics Standard 2018/2019</b>	<b>Mathematics Advanced 2018/2019</b>
Year 11 2018 <b>NEW</b> Syllabus (2017)	Year 11 2018 <b>OLD</b> Syllabus (2008)
Year 12 2019 <b>NEW</b> Syllabus (2017)	Year 12 2019 <b>OLD</b> Syllabus (2008)
	<b>Mathematics Advanced 2019/2020</b>
	Year 11 2019 <b>NEW</b> Syllabus (2018)
	Year 12 2020 <b>NEW</b> Syllabus (2018)

# Working Mathematically

Working Mathematically is integral to the learning process in mathematics. It provides students with the opportunity to engage in genuine mathematical activity and develop the skills to become flexible, critical and creative users of mathematics. In this syllabus, Working Mathematically builds on the skills developed in Stage 5, and encompasses six interrelated aspects which form the focus of the syllabus.

- NESA (2017), *Mathematics Standard Stage 6 Syllabus*



# Stage 6 Maths - New assessment requirements

Standard and Advanced Mathematics	Year 11	Year 12
How many tasks	Maximum of 3	Maximum of 4
Task weighting (min/max)	20% / 40%	10% / 40%
“Assignment or investigation-style task”	1 with 20%-30% weighting	1 with 15%-30% weighting

## **Must address specific outcomes - Mathematics Advanced:**

MA 11-8: uses appropriate technology to investigate, organise, model and interpret information in a range of contexts

MA 11-9: provides reasoning to support conclusions which are appropriate to the context

MA 12-9: chooses and uses technology effectively in a range of contexts, models and applies critical thinking to recognise appropriate times for such use

MA 12-10: constructs arguments to prove and justify results and provides reasoning to support conclusions which are appropriate to the context

## Some potential approaches to investigation-style task types:

- an investigative project or assignment involving presentation of work in class
- an independently chosen project or investigation
- scaffolded learning tasks culminating in an open-ended or modelling-style problem
- a guided investigation or research task involving collection of data and analysis.

# Sample Stage 6 Mathematics ‘Investigation-style task’: *Statistical Analysis: Investigating National Data\**

Draws on the following websites:

Graduate Careers Australia (GCA)  
([www.graduatecareers.com.au](http://www.graduatecareers.com.au)).

The Australian Government Bureau of Meteorology  
(<http://www.bom.gov.au/climate/data/>).

The Australian Bureau of Statistics (ABS) using the following link:  
[Table showing Monthly Australian Labour data from 2007-2014](#) (!)

*\*Source: NESA (2017), Mathematics Standard Year 11 Sample Assessment Task Statistical Analysis*

# Supporting students for Mathematics research assessments and ‘investigative-style tasks’

Find examples of **gathering**, **interpreting** and **presenting** LARGE data sets, for example:

- [Information is Beautiful](#) (the best infographics from around the world)
- [ConCensus](#) (2011 Australian Census data)
- [The Pudding](#) (data-driven ‘visual essays’)

...and then encourage students to interrogate the way in which **all three** of these things are accomplished, and the intended audience.



# Supporting students for Mathematics research assessments and ‘investigative-style tasks’

- Become familiar with statistical data-gathering tools like Google Forms and Survey Monkey, become **really** familiar with how to analyse and subdivide the data collected.
- For financial mathematics, provide examples of websites and services that track and display price fluctuations such as [Price Hipster](#) and [CamelCamelCamelAU](#)
- Encourage students to deploy the CRAP test when looking for websites and models to support their research – Maths is not a static field!

How can we support Maths  
Faculty staff with  
investigative tasks?

# What we'll be discussing today

Information Literacy Models (a little)

Research based tasks mandated in new Stage 6 syllabuses for

- 6 Science courses
  - Biology, Chemistry, Earth and Environmental Science, Physics, Investigating Science, Science Extension
- 2 Maths courses
  - Mathematics Standard, Mathematics Advanced
- 3 History courses
  - Ancient History, Modern History, History Extension

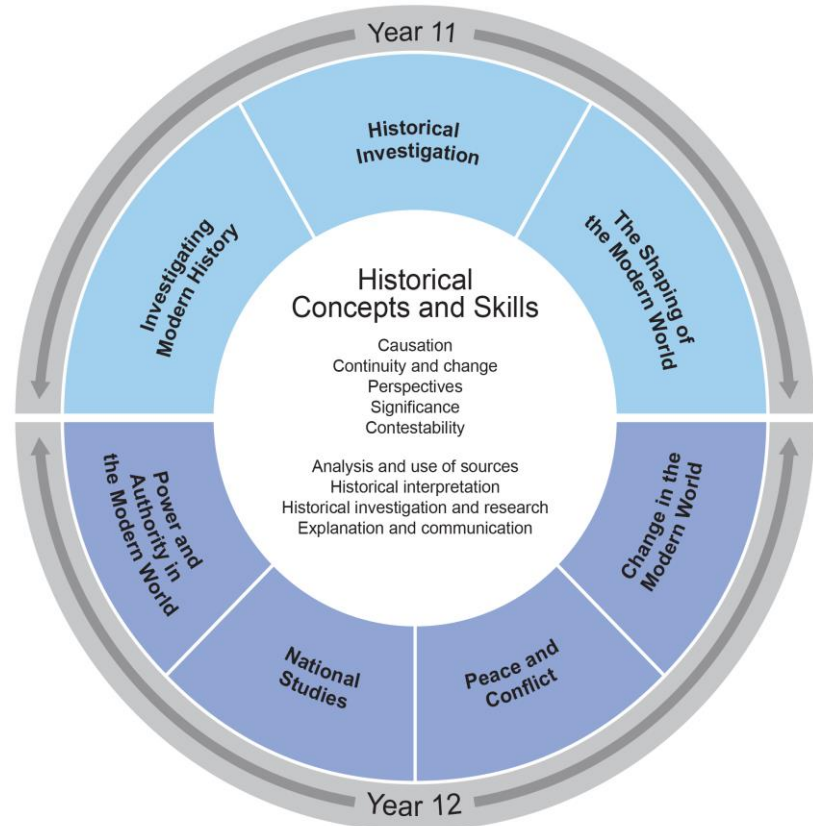
...and the help and support we can provide as TLs for each of these.

# Modern / Ancient History: Research tasks

## Year 11: Historical Investigations

- Indicative hours have dropped (slightly) from 24 to 20
- Weighting must be between 20% and 30%
- Very similar to previous syllabus

*See handout*



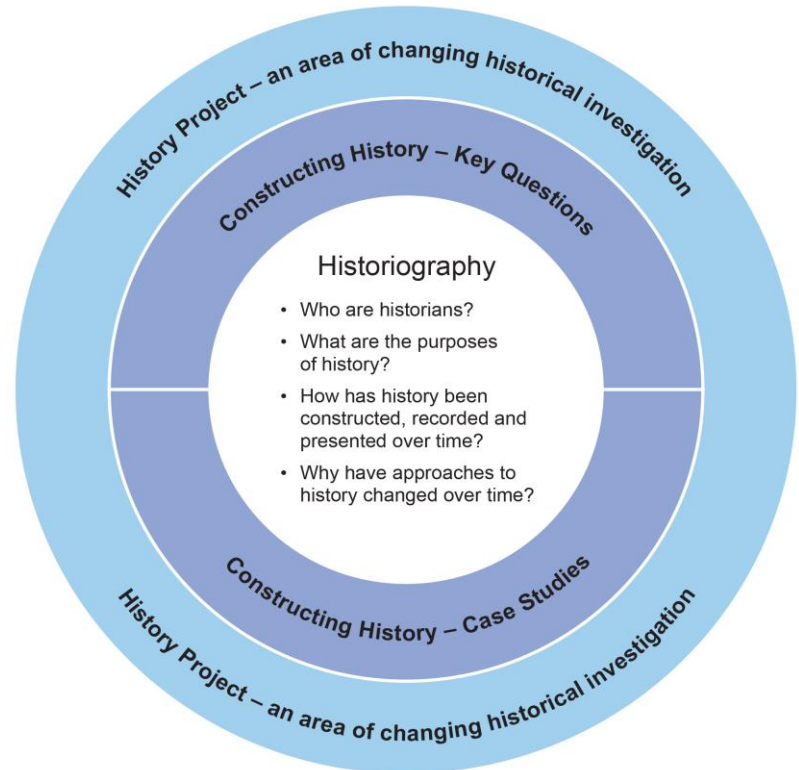
# Modern / Ancient History: Research tasks

## Year 12: Historical Analysis

The Historical Analysis provides students with the opportunity to focus on an historical question, issue or controversy of interest, and to develop a reasoned argument, supported by evidence. It may occur in or across any of the Year 12 topics selected for study. The Historical Analysis may be presented in written, oral or multimodal form, and must:

- be completed individually
- be a maximum of 1200 words, 6 minutes duration or equivalent in multimodal form
- address relevant syllabus outcomes
- relate to a Year 12 topic or topics studied in the Modern History Stage 6 Syllabus.

# Modern / Ancient History VS History Extension



# History Extension: Internal Assessment

*The Year 12 formal school-based assessment program is to reflect the following requirements:*

- three assessment tasks*
- only one task may be a formal written examination with a weighting of 30%*
- one task must be the History Project - Historical Process (proposal, process log, annotated sources) with a weighting of 30%*
- one task must be the History Project - Essay with a weighting of 40%.*