



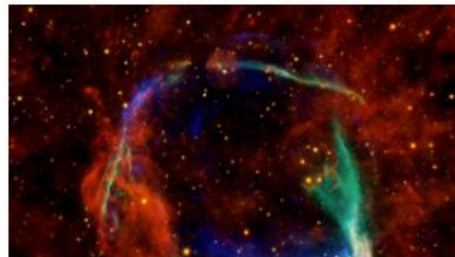
## Science Reporting Quality

Science is often reported in the media. Clickbait headlines such as these sell more newspapers than sober reporting of the facts.



**INSECTS** 3 days ago

**Giant spider hauls away man's pet goldfish for dinner**



**Near star could soon  
explode**

**SUPER NOVA** Astronomers have become obsessed with a nearby star after it dimmed to its faintest level, potentially pointing to an imminent explosion.

Headlines shout about cures for diseases after preliminary results in mice show tiny successes. We are warned about the health risks of everything from food to mobile phones on the basis of studies that were of tiny sample sizes or had no statistically significant results. So how can we evaluate the quality of science journalism and separate fact from clickbait? This project will explore ways to identify high quality journalism. You'll study a range of different articles and videos and find ways of communicating their quality (or lack thereof) to your friends and family. Once you've done all of that, you'll evaluate publications, websites, or particular journalists for the overall quality of their science.

## Year levels

Years 9 and 10

## Curriculum Areas (VCAA 2016)

CURRICULUM AREA	STRAND	SUB-STRAND
Science	Science Understanding	Science as a human endeavour
	Science Inquiry Skills	Questioning and predicting Planning and conducting Recording and Processing Analysing and evaluating Communicating
Mathematics	Number and Algebra	Linear and non-linear relationships
	Statistics and Probability	Data representation & interpretation
Digital Technologies	Data and Information	
Design and Technologies	Technologies and Society	
Economics and Business	The business environment Consumer and financial literacy Reasoning and interpretation	
History	Historical Concepts and Skills	Cause and effect Historical significance
	Historical Knowledge	The making of the modern world The modern world and Australia
English	Reading and Viewing Writing Speaking and Listening	Texts in context/ Text structure and organisation Creating texts Interacting with others
Capabilities	Critical and Creative Thinking Ethical Capability:	

## Equipment needed

- Computer, Internet access

## Success Criteria

In this unit the student will improve their data literacy and data analysis skills by :

### Knowing:

- What data is and how it is collected
- That data can help tell a story about the world around us and help us solve problems

### Doing:

- Learning to evaluate and identify the quality of science journalism
- Developing graphing and information visualisation skills
- Developing science enquiry, critical thinking, and communication skills
- Applying basic mathematical skills to make sense of data
- Learn the graphing skills that enable these comparisons
- Sharing the data story with others in different ways

### Understanding:

- How to check your data for possible errors
- How data and language can be bias and incorrect reporting or analysis can influence public opinion

## Resources

<https://www.smc.org.au/for-media/tips-on-reporting-science>

<https://www.theguardian.com/science/blog/2012/mar/07/scientists-help-improve-science-journalism>

## Step 1

- As a class, brainstorm the characteristics of a high quality science experiment. Not class experiments where you know the expected outcome, but experiments designed to test a hypothesis. What does a high quality experiment look like? Does it aim to prove the hypothesis, or disprove it? Create a list of things to look for when evaluating a science experiment.

## Step 2

- Having identified the characteristics of a high quality science experiment, how would you write it up in order to highlight those characteristics? What would you look for in the write up to show that the experiment has been rigorous and unbiased?

## Step 3

Science journalism is one step removed from the write up of the experiment - it's a write up of a write up. What does this mean for quality journalism? What features of the scientific write up need to be reflected in a popular science article about the work?

Think about the purpose of science journalism. It aims to help people to understand the research - what did they do, and why does it matter?, understand the implications of the research - what does it mean for us? What might it mean in the future?, understand the limitations of the research - what does it *not* tell us? (for example, work done in mice or other animals will not necessarily show the same results in humans - check out @justsaysinmice for examples).

- Create a list of features to look for in a popular science article to show that it correctly reflects the work reported by the scientists, and the state of the science. This is your High Quality list.

## Step 4

As well as looking for positive features, sometimes negative features of a piece show up the quality of science reporting. What kind of features suggest that a particular piece of reporting is sensationalised, or otherwise poorly reported? Some things to consider are how does a particular way of reporting something change how we feel about it?

Read this article on relative versus absolute risk, paying close attention to the examples the author gives. How do the different ways of expressing risk make you feel?

<https://www.healthnewsreview.org/toolkit/tips-for-understanding-studies/absolute-vs-relative-risk/>

- Create a list of features that indicate low quality science journalism. Start with clickbait headlines that promise near-magical cures/solutions, and work from there. This will be your Low Quality list.

## Step 5

- Create a table, or other organised way to display your information and make a checklist using both High Quality and Low Quality to determine the quality of any particular article or video. As a class, work out where you will draw the line. Which, and how many, characteristics from the High Quality list must an article have to be considered High Quality? Which, and how many, characteristics from the Low Quality list must an article *not* have, to be considered Low Quality?

## Step 6

- In pairs, find 4 popular science pieces - articles or videos. Articles in newspapers or magazines, or on news websites are perfect, or youtube explainers about recent science results. For each piece record the writer/creator, the publisher (which magazine or newspaper, which youtube channel, etc), and the medium (video or text).
- When you've read/watched each piece, rate it for quality, just on your first impressions.
- Now go use your checklist/table to rate each piece according to your criteria.

## Step 7

- Compare your first impressions with the results when you used your criteria. How good a match were they?
- As a class, discuss your findings. Did your first impressions match your criteria? Were any of the pieces you evaluated wrongly classified by your criteria? For example, do you feel like high quality pieces, when evaluated using your criteria, were labelled low, or low quality pieces labelled high? What, if anything, went wrong?
- Refine your criteria, if necessary, to make them more effective.

## Step 8

Visualisation is a form of communication. To visualise data, you need to consider the fundamental principles of communication: What am I trying to say, and who am I trying to say it to? For visualisations, “What am I trying to say?” comes down to which aspect(s) of the data you want to highlight. For example, do you want to focus on total numbers (how many ranked high, how many ranked low, how many in between)? Or do you want to look at a particular criteria and how the pieces scored on it? Do you want to compare video with text and show the relative rates of high & low quality? What is the question you most want this data to answer?

- As a class, combine your findings in a spreadsheet, and then in groups of 3 or 4 find ways to visualise the answer to your question.
- Your first challenge will be to figure out what you want to communicate.
- Your second will be to find the clearest, most compelling way to visualise your results. You can draw the image by hand or in a drawing app, or graph it using Python visualisation libraries or online graph creation packages. It doesn't matter what technology you use here (and yes, pen and paper are technologies!), what matters is your message and how effectively you communicate it.

## Curriculum Links (VCAA 2016)

Curriculum Area: Strand: • Sub-strands	Level 9	Level 10	Level 10A
<b>Science:</b> Science Understanding: • Science as a human endeavour	<ul style="list-style-type: none"> <li>Scientific understanding, including models and theories, are contestable and are refined over time through a process of review by the scientific community.</li> <li>The values and needs of contemporary society can influence the focus of scientific research.</li> </ul>		
<b>Science:</b> Science Inquiry Skills: • Questioning and predicting	<ul style="list-style-type: none"> <li>Formulate questions or hypotheses that can be investigated scientifically, including identification of independent, dependent and controlled variables.</li> </ul>		
<b>Science:</b> Science Inquiry Skills: • Planning and conducting	<ul style="list-style-type: none"> <li>Independently plan, select and use appropriate investigation types, including fieldwork and laboratory experimentation to collect reliable data, assess risk and address ethical issues associated with these investigation types.</li> </ul>		
<b>Science:</b> Science Inquiry Skills: • Recording and processing	<ul style="list-style-type: none"> <li>Construct and use a range of representations, including graphs, keys, models and formulas, to record and summarise data from students' own investigations and secondary sources, to represent qualitative and quantitative patterns or relationships, and distinguish between discrete and continuous data.</li> </ul>		
<b>Science:</b> Science Inquiry Skills: • Analysing and evaluating	<ul style="list-style-type: none"> <li>Analyse patterns and trends in data, including describing relationships between variables, identifying inconsistencies in data and sources of uncertainty, and drawing conclusions that are consistent with evidence.</li> <li>Use knowledge of scientific concepts to evaluate investigation conclusions, including assessing the approaches used to solve problems, critically analysing the validity of information obtained from primary and secondary sources, suggesting possible alternative explanations and describing specific ways to improve the quality of data.</li> </ul>		
<b>Science:</b> Science Inquiry Skills: • Communicating	<ul style="list-style-type: none"> <li>Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations.</li> </ul>		
<b>Mathematics:</b> Number and Algebra • Linear and non-linear relationships	<ul style="list-style-type: none"> <li>Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations</li> </ul>		
<b>Mathematics:</b>	<ul style="list-style-type: none"> <li>Identify everyday</li> </ul>	<ul style="list-style-type: none"> <li>Investigate and</li> </ul>	<ul style="list-style-type: none"> <li>Calculate and</li> </ul>

<p>Statistics and Probability:</p> <ul style="list-style-type: none"> <li>• Data representation and interpretation</li> </ul>	<p>questions and issues involving at least one numerical and at least one categorical variable, and collect data directly from secondary sources.</p> <ul style="list-style-type: none"> <li>• Compare data display using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread</li> </ul>	<p>describe bivariate numerical data, including where the independent variable is time.</p> <ul style="list-style-type: none"> <li>• Evaluate statistical reports in the media and other places by linking claims to displays, statistics and representative data.</li> </ul>	<p>interpret the mean and Standard deviation of data</p> <ul style="list-style-type: none"> <li>• and use these to compare data sets. Investigate the effect of</li> <li>• individual data values including outliers, on the standard deviation</li> <li>• Use digital technology to investigate bivariate numerical data sets.</li> <li>• Where appropriate use a straight line to describe the relationship allowing for variation, make predictions based on this straight line and discuss limitations</li> </ul>
<p><b>Digital Technologies:</b> Data and Information</p>	<ul style="list-style-type: none"> <li>• Analyse simple compression of data and how content data are separated from presentation</li> <li>• Analyse and visualise data to create information and address complex problems, and model processes, entities and their relationships using structured data</li> </ul>		
<p><b>Design and Technologies:</b> Technologies and society</p>	<ul style="list-style-type: none"> <li>• Critically analyse factors, including social, ethical and sustainability considerations, that impact on designed solutions for global preferred futures and the complex design and production processes involved.</li> <li>• Explain how designed solutions evolve with consideration of preferred futures and the impact of emerging technologies on design decisions.</li> </ul>		
<p><b>Economics and Business:</b> The business environment</p>	<ul style="list-style-type: none"> <li>• Explain the nature of innovation and discuss how businesses seek to create and maintain a competitive advantage in the market, including the global market.</li> </ul>		
<p><b>Economics and Business:</b> Consumer and financial literacy</p>	<ul style="list-style-type: none"> <li>• Explain why and describe how people manage financial risks and rewards in the current Australian and global financial landscape.</li> </ul>		
<p><b>Economics and Business:</b> Reasoning and interpretation</p>	<ul style="list-style-type: none"> <li>• Generate a range of viable options, taking into account multiple perspectives, use simple cost-benefit analysis to recommend and justify a course of action, and predict the intended and unintended consequences of economic and business decisions</li> </ul>		
<p><b>History:</b></p>	<ul style="list-style-type: none"> <li>• Analyse the long term causes, short term triggers</li> </ul>		

<p>Historical Concepts and Skills Cause and effect</p>	<p>and the intended and unintended effects of significant events and developments.</p>		
<p><b>History:</b> Historical Knowledge The making of the modern world</p>	<ul style="list-style-type: none"> <li>• Significant effects of the Industrial Revolution, including global changes in landscapes, movements of people, development and influence of ideas, political and social reforms, and transport and communication.</li> <li>• Significant events and influencing ideas in the development of the society, including different perspectives of the events at the time and different historical interpretations and debates.</li> </ul>		
<p><b>History:</b> Historical Knowledge The Modern World and Australia</p>	<ul style="list-style-type: none"> <li>• Students investigate one major global influence that has shaped Australian society, including the development of the global influence during the twentieth century.</li> <li>• Causes and developments of the major global influences on Australia</li> <li>• Changing social, cultural, historical, economic, environmental, political and technological conditions on a major global influence in Australia.</li> </ul>		
<p><b>English:</b> <u>Reading and Viewing:</u> Texts in context/ Text structure and organisation</p> <p><u>Writing:</u> Creating texts/ Expressing and developing ideas</p> <p><u>Speaking and Listening:</u> Interacting with others</p>	<ul style="list-style-type: none"> <li>• Analyse how the construction and interpretation of texts, including media texts, can be influenced by cultural perspectives and other texts.</li> <li>• Create imaginative, informative and persuasive texts that present a point of view and advance or illustrate arguments, including texts that integrate visual, print and/or audio features</li> <li>• Listen to spoken texts constructed for different purposes and analyse how language features in these texts position listeners to respond in particular ways, and consider the interaction skills used to present and discuss ideas, or to influence and engage audiences through persuasive language, varied voice tone, pitch and pace.</li> </ul>	<ul style="list-style-type: none"> <li>• Compare the purposes, text structures and language features of traditional and contemporary texts in different media</li> <li>• Refine vocabulary choices to discriminate between shades of meaning, with deliberate attention to the effect on audiences.</li> <li>• Identify and explore the purposes and effects of different text structures and language features of spoken texts, and use this knowledge to create purposeful texts that inform, persuade and engage audiences, using organisation patterns, voice and language conventions to present a coherent point of view on a subject.</li> </ul>	
<p><b>Capabilities:</b> Critical and Creative</p>	<ul style="list-style-type: none"> <li>• Questions &amp; Possibilities: Investigate the characteristics of effective questions in different</li> </ul>		

Thinking:	<p>contexts to examine information and test possibilities.</p> <ul style="list-style-type: none"> <li>Reasoning: Examine how to identify and analyse suppressed premises and assumptions.</li> <li>Meta-Cognition: Investigate the kind of criteria that can be used to rationally evaluate the quality of ideas and proposals, including the qualities of viability and workability.</li> </ul>	
<b>Capabilities:</b> Ethical Capability	<ul style="list-style-type: none"> <li>Understanding Concepts: Distinguish between ethical and non-ethical dimensions of complex issues, including the distinction between ethical and legal issues.</li> <li>Decision Making and Actions: Discuss issues raised by thinking about consequences and duties, in approaches to decision-making and action, and arguments for and against these approaches.</li> </ul>	