NZASE resource

Teaching how to search critically

Students are often required to search online. We assume they know how to do it, and they say they're good at it, but research shows otherwise (Breakstone et al., 2021). This discrepancy is dangerous with the amount of disinformation students are exposed to in their lengthy time on digital devices (ibid). Science students need to be equipped with skills to find reliable information.

Diagnostic assessment

We can find out what skills students already have with a simple diagnostic task. For this it is often a good idea to give one closed question (only one possible answer) and one open question (multiple possibilities). For example, what is the name of the famous Wellington inner city cat with its own Facebook page? And what is the best way of killing possums? Give the students a short time, say 10 minutes. Then ask them to give a brief answer to each question. And the key – ask them explain each step of what they did.

Such an activity can be enlightening. Typically we find students enter the whole question into Google, look at the first few sites listed, take the first answer they find and rarely do anything to check the reliability of the information. How can we teach students to think about how they search and be critical of information they find?

Search terms

A *search term* is the word or set of words typed in when searching on sites like Google.com. The words used, and how they are phrased, is one of the things that determine what results are listed. Experienced researchers:

- **Use fewer words**. To search, often students type a question, e.g. "how are polar bears adapted to living in an extreme environment?" But Google is not designed to answer long questions. Instead, it looks for pages that include every single word that we type in, in any order. It's unlikely that a page with all those words will be useful. Instead, students should think about keywords, or the most essential words about a topic, e.g. polar bear adaptation extreme.
- **Highlight exact phrases**. Sometimes students need to search for an exact phrase. Searching for colony collapse disorder will find many websites that have nothing to do with bees. To exclude those, use quotation marks: "colony collapse disorder." [Note to teachers - this is also an easy way to check for plagiarism in student work.]
- **Remember synonyms**. Different sources can use different phrases to mean the same thing, so using OR can make sure the search catches it all. This tells Google to search for either term: e.g., "climate change" OR "global warming".
- **Exclude the unwanted**. Sometimes searches can yield unexpected or unwanted results. For example searching about spears will find pages about Britney, or searching about the scientist Tesla will also return sites about Tesla the car. To exclude these unwanted results use NOT (or a minus symbol in Google): e.g., spear NOT Britney. [Librarians call OR, NOT, AND Boolean operators.]
- **Think about root words**. It is best to use words in the singular rather than plurals, and the root word rather than variations. For example 'adaptations' is quite restrictive, but the search term 'adapt' will also find adaptation, adaptations and adapted.

Using an advanced Google Search often helps with these skills.

The Search Engine Result Page

The search engine result page (SERP) will be sorted by relevance, but what Google sees as relevant depends on its search algorithms and does not always match with our needs. So students should not assume that the sites listed first are the best.

Search results can show many different types of pages – including ads for businesses, images, news items, videos and books. So the first thing to do with the results page is to look at what sorts of results it shows:

- The domain name in the website's URL says something about the source: educational (.edu, .ac, .k12, or .sch), commercial (.com, .co, .name, .biz, or .info) or governmental (.gov or .govt). Sites that include .org or .net can be businesses, non-profit, or special interest and they are not necessarily impartial. In New Zealand, scientific organisation domains include .cri, .pmcsa, .royalsociety and .pce.
- The date indicates how recent the information is.
- Watch out for 'ad' beside the URL – pages trying to sell something may make claims that are overblown or false, as clicks generate income.
- The snippet below the URL shows the search terms as they appear on the site. [Use control-F or command-F to find the search terms on a webpage or in a pdf.]

A skilled researcher will then quickly skim through a few sites in the SERP, looking for information relevant to their search. If the first few sites have little that is helpful, then it is worth thinking about refining the search – rewrite the search term again using AND, OR, NOT. Experts may amend search terms two or three times, looking for more recent sites, to find what they want. Once the SERP has lots of useful sites, going to its second page can give a wider range of sources.

Evaluating sources and content

Once students have found relevant information, they need to assess its credibility. Online sites and stories include a lot of disinformation – false information deliberately created to cause harm – as well as misinformation – false information, such as conspiracy theories, circulated with good intentions. Assessing credibility is an important skill for students – asking "how do I know I can trust this site?" needs to become standard practice.

Item on a search engine result page.

The Rauru Whakarare framework, drawn from Mātauranga Māori, provides a useful way to evaluate information sources using five concepts:

- **Whakapapa** – What is the pedigree of the source, its purpose, audience and relevance to Aotearoa/New Zealand?
- **Orokohanga** – When was the information created, is it current?
- **Mana** – What is the credibility or standing of the author or organisation, and the accuracy of their information?
- **Maramatanga** - What does this information add to our understanding, and is it relevant?
- **Aronga** – What is the perspective of the author; do they consider the validity of other perspectives, even if they do not agree?

An earlier checklist asks similar questions about Authority, Accuracy, Objectivity, Currency, and Coverage (the CRAAP detector). While these aspects can be important and a good place to start, they are based on an article from the internet's early days (Kapoun, 1998).

Particularly look at language - the use of emotive language is often part of an attempt to manipulate your point of view. Instead of relying on fact, disinformation is often designed to make readers feel happy, angry, sympathetic or excited so they click on or share a link without thinking. If a heading or article produces a strong, knee-jerk reaction, stop and think – where is the evidence to back up the claims?

Looking critically at content

Contemporary disinformation organisations aim to appear trustworthy by using polished

There are many search engines (b is for Microsoft's Bing), but more than 90 percent of searchers use Google. Try using others and see how their results differ.

web design and optimising their sites to suit search engines such as Google. Simplistic guidelines that check only for an author, a reference list, and a lack of typos may not identify such sites and can create a false sense of security.

Those whose job it is to check facts go beyond observable features like the CRAAP detector – they practice what is called lateral reading; that is, judging credibility by finding out what others say about the site.

Once they have found and quickly scanned a website that appears to have relevant information, fact-checkers (right click to) open up a new browser tab, searching for the name of the original site. Wikipedia can be useful here. Sites with misinformation are quickly found this way. Only once credibility is verified do experts look at the content. In research that compared this expert credibility check with those of students or lecturers, fact checkers arrived at more accurate conclusions in a fraction of the time (Wineberg, 2017).

When students have learnt how to check credibility, it is fun to test their skills with sites like California's Velcro Crop; Dihydrogen Monoxide; the Pacific Northwest tree octopus, or Victorian robots. These sites can also be useful diagnostically.

Digital resources

Sites that teach basic search skills

- November Learning, Education Resources for Web Literacy.
- EdX, Power searching with Google (free but will try to direct you to paid options
- Common Sense Education, Digital citizenship curriculum
- Google, Search education lesson plans.
- Google's lateral thinking questions.
- NZ History, Finding and evaluating information.

Fact checking sites

- Snopes (USA); SciCheck (USA); FullFact (UK).

A Kiwi digital literacy animation

- Siouxsie Wiles and Toby Morris on disinformation and misinformation.

Teaching lateral reading

- Stanford resources used in Wineberg & Breakstone's research.
- Harvard resources in the appendices to Breakstone's 2017 paper.
- Ara Institute of Canterbury, Information skills Matauranga Maori, for resources supporting Māori research, including whakapapa, mōteatea and whakataukī.

Sites about evaluation and critique

- Media Smarts, Canada.
- Netsafe's fake news trainer.

Games and challenges to check skills

- Google's Interland Reality River game.
- DQ World (USA, Korea, for 8-12-year-olds).

References

Breakstone, J et al., 2021, Lateral reading: College students learn to critically evaluate internet sources in an online course. *The Harvard Kennedy School Misinformation Review*.

Kapoun, J. (1998). Teaching undergraduates Web evaluation: A guide for library instruction. *College & Research Libraries News, 59*, 522-533.

Wineburg, S., & McGrew, S. (2017). Lateral reading: Reading less and learning more when evaluating digital information.

The Rauru Whakarare framework.

Thanks to Alison Campbell and Deb Thompson for their comments on this article, and Mere Manning, Ngāti Kahungunu ki te Wairoa, for a Māori perspective.

Ngā Kupu

Ao matihiko – Digital world
Ariā kakai – Conspiracy theory
Arotake mōhiotanga – Evaluate knowledge
Kōrero horihori – False or disinformation
Mātau matihiko – Digital literacy
Pūrapu – Search engine
Rauemi matihiko – Digital resource
Whakakoia meka – Fact check.

Te Aka Maori Dictionary & Paekupu