Looks Can Be Deceiving: Learning to Stop and Read Laterally

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Abstract. Fact-or-Faux addresses issues of misinformation and science media literacy. This article shares two examples of students attempting to evaluate a science disinformation website and unpacks effective evaluation approaches like lateral reading and SIFT.

In 2023, 96% of teenagers reported being online every single day (Anderson et al., 2023). This is probably not surprising to most educators. We know that our students are constantly "plugged in" to their phones and electronic devices. Less obvious, perhaps, is how often our students turn to the internet to access science-related information. Eighty-four percent of teens get at least some of their health information online (Center on Media and Human Development, 2015) and over 50% use online content to learn about climate change (Prothero, 2023). Why might this concern science teachers?

On the internet, the onus is on the reader to discern fact from faux. Misinformation and disinformation are shared at unprecedented speeds online. Disinformation can be particularly tricky to detect because those who spread it often do so with tactics to obscure their deceit (Fact-or-Faux, Jan., 2024). And even though students report feeling confident about evaluating information on the internet, studies suggest that they can struggle with these evaluations (Barzilai & Zohar, 2012; Breakstone et al., 2021; Salmerón et al., 2018).

As science teachers, where do we begin? First, let's learn from our students?! Enter Cassandra and Dhruv (pseudonyms). I observed both as part of a study exploring how to integrate media literacy into science classrooms (Pimentel, 2023). Both were ninth graders taking general biology. Each evaluated an article about renewable energy on a climate denial organization's website. Although they approached the task quite differently, there is a lot that we can learn from both. Let's take a look.

Cassandra's Approach

> Cassandra: Well already off the bat, I saw the *[Institute's Name]* *[moves arrow cursor over the webpage logo - see Figure 1]* and even though I don't know much about it, my first thought was, 'this does look credible' because of the images *[moves cursor over image of solar panels]*, the title *[moves cursor over the web article's title]*, the person who wrote it, [and] the February date *[moves cursor over author byline and published date]*. There [are] options here with news and opinions *[moves cursor over hyperlinked text]*.

> Then it says 'Institute' *[moving cursor back over the webpage logo]* and you'd assume an institute would be an important place… And then there's a menu *[clicking on the menu button in the top right corner, opening a navigation menu in the right side of screen]*. The menu here is really well laid out, so you can find out more information about the person *[moves mouse over 'About Us' text],* the topics, opinions, news, publications, and you can look at videos or events *[moves cursor down the navigation list as she reads each option, then clicks on the exit button to close the navigation menu]*.

> … I assume this is a pretty credible source *[scrolling down through the text of the article]* because it already includes information listed here with numbers and values *[moves cursor over cost values mentioned in the text]* and it's already entering with 'Problems with Scale' *[moves cursor over a heading that reads 'Problems of Scale']*... Because of that, he's using another writing tactic to show you what's really going on [and]... explain deeper into the topic to get more writing out of it. And it's a pretty short article… overall, I'd assume that this is credible.
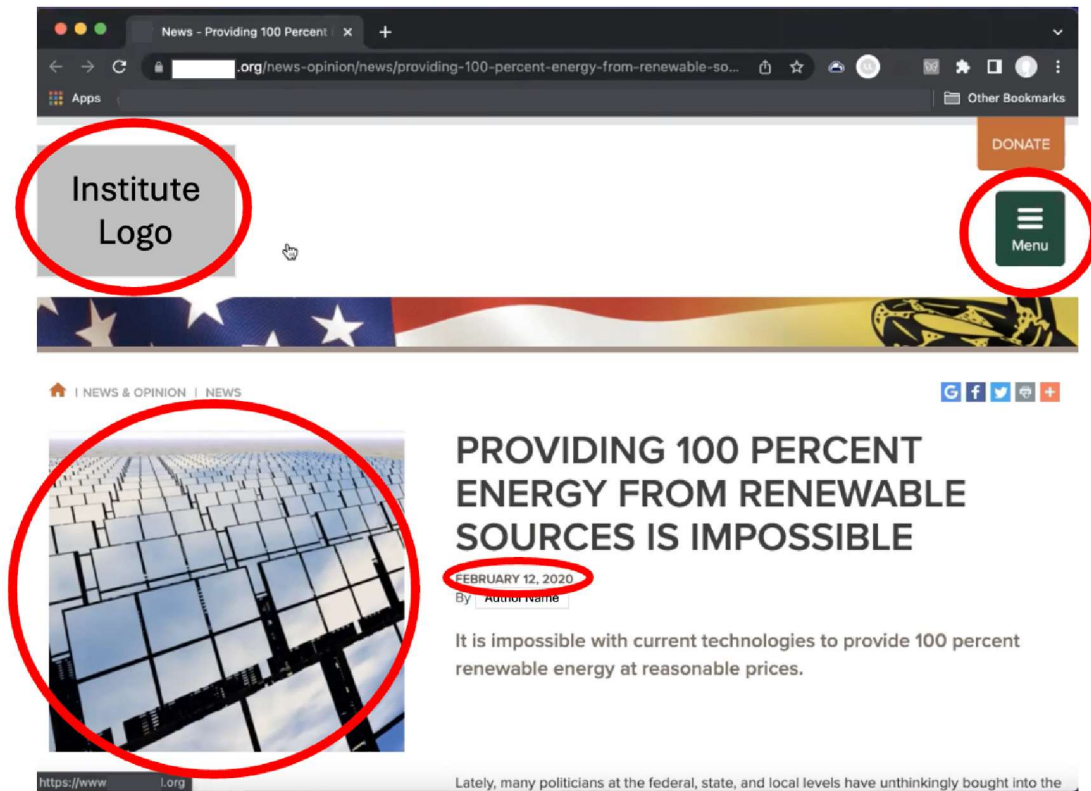
Figure 1. *Cassandra uses stylistic features of the website (circled) to evaluate its credibility*

Unpacking Cassandra's Approach

In this vignette, Cassandra uses a *stylistic* (or *appearance*) approach to evaluate the website, essentially attempting to answer the question, "Does this webpage *look* credible?" Throughout the scene, we see Cassandra refer to the quality of the website's images and logos, the 'professional' layout of the menu, the inclusion of numbers and statistics, and the 'sound' of the institute's name. She also points to the relatively current publication date, something she might have learned from the CRAAP (Currency, Relevance, Authority, Accuracy, and Purpose) checklist. Cassandra refers to these features as reliable indicators of the website's credibility. Unfortunately, she was deceived because the website was *designed to look* credible.

Research indicates that this appearance-based approach is relatively common among students, who tend to focus on "content relevance and usefulness, ease of use, amount of information, and appearance of the information," when evaluating source credibility (Abed & Barzilai, 2022, p. 560). I observed this trend with other students in my study. All the students relying primarily on stylistic features concluded that the website was credible.

What could Cassandra have done differently? Other students clicked on the 'About Us' page to learn more. This did not help much: the 'About Us' page appears equally professional and includes a list of people with fancy degrees and titles. Some used the website's domain name as an indicator. Aren't ".org" URL addresses supposed to be more legitimate? Not so fast. Anyone can create a website using the ".org" label. These approaches also rely on style, or appearance. If not these strategies, what is the student to do? Let's examine how Dhruv tackles the task.

Dhruv's Approach

Dhruv: I can see the big logo here, the *[Institute's Name]* *[moving mouse cursor over logo]*, so I want to look into them. Oh, and they revealed the author, actually... I want to click on his name *[moves cursor to author's name and clicks on it, loading the author's biography page]*. Here we are *[reading from the webpage]...* He has a PhD in the Philosophy of Science and Mathematical Logic. Okay… from the University of Pittsburgh and… He's been on the Faculty at Carnegie Mellon University... I think he has a pretty solid background. So the author doesn't seem too bad *[returns to main article and begins reading]*.

> … Okay, I kind of want to do a search on the… Institute, because there are some sites that can give their input on whether a site is trustworthy or not. Okay, so I'm going to type in *[opens a new tab and types into the URL search bar]* 'is the… Institute credible". Now, this might not give me the best results, but it can still help... Okay, so I'm looking at the websites here *[scrolling through the search results and reading some of the snippets]*. The most recognizable one is Wikipedia. In school, I was taught not to trust Wikipedia too much because anyone can edit it, but I still think it's a relatively trustworthy site, regardless *[clicks on link for Wikipedia entry on the institute]*. *[reading the webpage]* 'The… Institute is… [a] think tank known for its rejection of the scientific consensus'. Oh, rejection of the scientific consensus. Not sure what that is, but it doesn't sound too good.
>
> *[continues reading]* … 'the rejection of the scientific consensus on climate change and the negative impact of smoking.' So, if I'm reading this sentence right, this institute is known for its rejection on climate change... I'm going to open up the scientific consensus here *[clicks on Wikipedia link to 'scientific consensus page]* just to check it. *[reads the page]...* Yeah, this is kind of discrediting for me, in my head, this Institute *[returning to institute page on Wikipedia and reads page]* 'It… has been a leading promoter of climate change denial.' Okay, at this point, this doesn't look like a very credible source to me anymore. And if I'm looking back here I was a little unsure of this before but the Philosophy of Science isn't the same as having a science degree, I don't think. I'm not sure about Mathematical

Logic either or if they have an actual degree in mathematics. So yeah, I don't think [this is a credible source].

Unpacking Dhruv's Approach

Unlike the stylistic approach used by Cassandra and many of her classmates, Dhruv uses an *investigative* approach to evaluate the credibility of the webpage. The implicit question he is trying to answer is, "Does this webpage come from *a credible person or organization?*" Like Cassandra, Dhruv notices the website's logo, however he briefly *stops.* That is, he acknowledges that he doesn't know much about the organization and that he should "look into them." Upon seeing the author byline, he *stops* reading the article to *investigate* the author's background. However, Dhruv initially only uses information *provided by the website that he's trying to evaluate.* Using only that information, Dhruv might have been deceived.

The crucial moment comes when Dhruv makes the decision to *leave* the website. He opens a new tab to search for information about the organization in question, a strategy known as *lateral reading (see Figure 2)*. Notably, Dhruv decides to click on a result sending him to Wikipedia, a 2019 website that teachers had previously told him to avoid. Using information on Wikipedia about the scientific consensus and the organization in question, he concludes that the website's sponsoring organization is not credible.
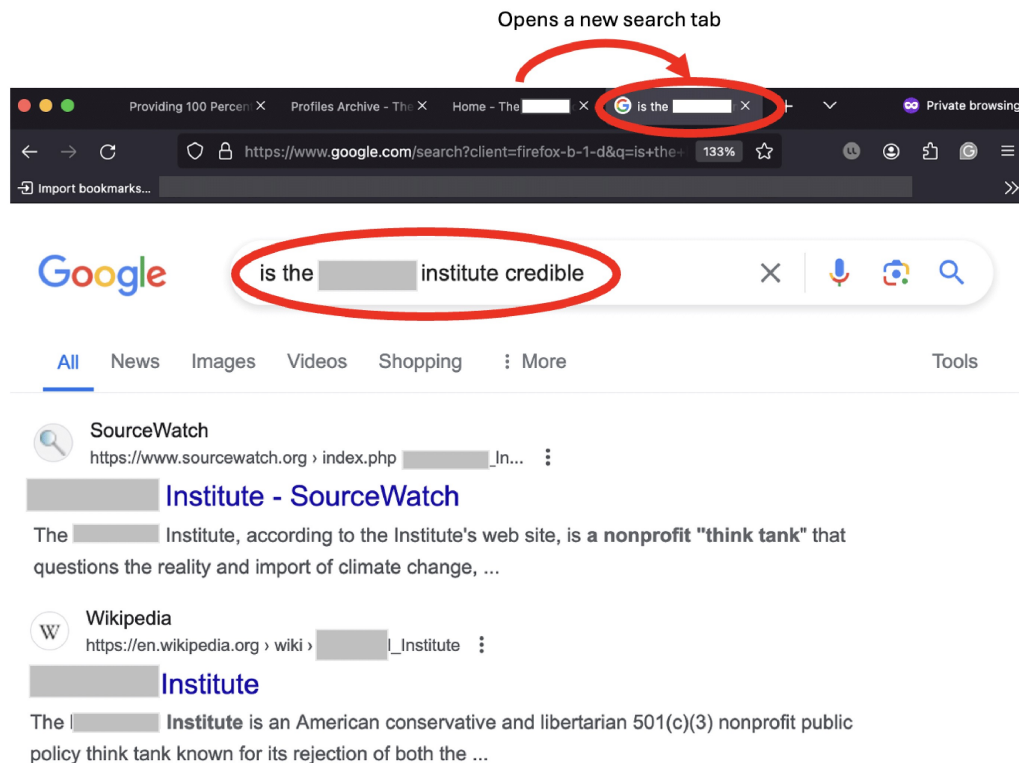

Figure 2. *Dhruv uses lateral reading by opening a new tab (circled) to investigate the institute*

Dhruv's approach resembles that of professional fact-checkers, who often utilize outside sources and references on pages like Wikipedia to check the credibility and accuracy of claim (Wineburg & McGrew, Dhruv was able to correctly recognize the source as dubious, primarily using just two strategies: (1) stopping and (2) reading laterally. Once he left the original website, he was able to dismiss the source as unreliable in about two minutes (he might have done it even faster if he did not have to share all his thinking out loud). By contrast, Cassandra dwelled on the target site for the same amount of time, and never detected any deceit. Dhruv's approach exemplifies the first steps in the *SIFT method* -- Stop, Investigate the source, Find better coverage, and Trace information to original context -- a protocol that has proven effective among high school students (Caulfield & Wineburg, 2023).

Implications for Teaching

What are some key takeaways from these vignettes for teachers focusing on NGSS's SEP 8: obtaining, evaluating, and communicating information:

1) *Create opportunities for students to practice "stop" and lateral reading*. Students can become savvier with SEP 8 when their teachers offer occasions for them to figure out, name, and apply online investigation strategies. To do so, a first step is incorporating information that varies in quality and credibility into lessons (e.g., social media posts, videos, websites, etc.). This will help students learn that unlike many of the other resources shared in science class, information on the internet is not always accurate or credible.

2) *Model and discuss effective evaluation strategies and dispositions.* Show students that looks can be deceiving and why appearances alone are inadequate. During investigations, ask students questions like, "What can we learn about this source's background or goals? Does this source have a motivation to deceive or not and why?" These questions can foster the disposition to stop and investigate. Help students learn what to look for by incorporating lessons on funding in science, the possibility of "conflicts of interest" (COI) in scientific research, and how to use known, reliable sources when assessing a new or unknown source of information.

3) *Create opportunities for students to learn how the scientific enterprise produces reliable knowledge*. As Dhruv's example demonstrates, learning about the nature of scientific consensus was key for his evaluation (see Fact-or-Faux, May, 2024). Students will also need opportunities to learn about peer review, vetting by a critical scientific community of fellow experts, and the role of scientific institutions (Fact-or-Faux, July, 2024).

In my study, I found that after just a few lessons with the strategies mentioned above, students were more likely to use them and thus to be deceived less often (Pimentel, 2023). When teachers explicitly incorporate science media literacy strategies into their classes, students can improve their investigative skills and learn to avoid deception.

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