FACT • OR • FAUX

Shutterstock

Science L.I.A.R.S.:

DOUGLAS ALLCHIN

ABSTRACT

Science students vlearn about deceptive tactics in the media in a game format.

Keywords: Misinformation; disinformation; *NGSS*; critical thinking; media, literacy; deception; persuasion; "Do Your Own Research"

Science in the wild—misinformation beyond the boundaries of the science classroom and curated media sources—threatens our culture, I think it is safe to say (e.g., Osborne, et al., 2022). Here, I present a fun classroom activity, in an engaging game format, that fits within the *NGSS* framework and can help us build a more media-savvy public. (See also in *TST*: Allchin, 2023; Herrick, Sinatra & Lombardi, 2023; Miller et al., 2021; Zucker, Noyce & McCullough, 2020.)

The Challenge

It is no wonder that folks succumb to scientific disinformation; they are not experts. Yet they often adopt a posture of "Do Your Own Research (DYOR)" (Figure 1), imagining that they are more adept thinkers than they are. Alas, conventional science education tends to foster a view that any student can be a scientist. Of course, they can *become* a scientist, given adequate gumption and training. But some are beguiled by the impression that simply by exercising "skepticism" or "critical thinking,"

or by evaluating an argument and the evidence for themselves—regardless of their level of expert knowledge—they can effectively assess scientific claims at a complex and technical level.

That might work if all the messages we encounter in the media were honest, but they are not. The internet and social media are filled with liars (Allchin, 2012; forthcoming). Liars seeking power or privilege. Profiteers and ideologues. Even when it comes to science. Climate change naysayers. Anti-vaxxers. Pandemic propagandists. Or critics of GMO food safety.

The purveryors of disinformation present bogus claims that appeal to our desires, pretending that vitamins will cure AIDS, or that leaded paints or home flame-retardants are safe. They present "evidence" that a non-expert can hardly recognize is cherry-picked, and which will lead all-too-conveniently to the perpetrator's preferred conclusion. They spout incomplete arguments—about the efficacy of N95 masks or about sea ice and global warming—that seem plausible, while hiding the alternative explanations that any true expert would recognize as correct. They publish biased studies on the healthiness of meat diets, or fats vs. sugars in causing obesity, or denying the long-term dangers of football concussions.

They create bogus journals, write bogus textbooks, and distribute reports from bogus professional organizations. They build bogus science museums (like the creation "science" museum in Petersburg, Kentucky).

So, no, we cannot trust science messages in the media to be honest. *That's why we need credible scientific experts to begin with*.

It may not be surprising that recent research now shows that people who adopt a DYOR strategy are, ironically, *more likely* to be fooled (not less!), and they are *more likely* to distrust science as a whole (Ballantine & Dunning, 2022; Carrion, 2017; Chinn & Hasell, 2023). That's not what science teachers want to promote, surely. Rather, we need to help students learn how to recognize and dodge deceit about science.

The Game

Trying to fool other people can be fun—when we all acknowledge that we are playing a game together, at least.

Here is a variant for the science classroom. The objective is to learn and to underscore some of the strategies that people use to lie or to gain our confidence. (These are the tactics, literally, of con artists; Allchin, 2012). But the format is a game.

This activity aligns with *NGSS* science and engineering practice (SEP) 8, Obtaining, evaluating, and communicating information. Students should be able to "assess the credibility, accuracy, and possible bias of each publication" (Vol. 2, p. 65). A recurrent *NGSS* theme is that students should draw on *reliable* media. This exercise helps build competence in ascertaining who might be reliable—and who is not. How do we judge credibility? (Isn't it remarkable that the *NGSS* has immediate relevancy to the current misinformation crisis, which emerged only after the standards were written?!)

The structure of the game is not entirely original. Many readers may know "Bluff the Listener" from the news quiz show, *Wait, Wait, Don't Tell Me* (Figure 2). One participant reports an amazing news story. Two others create bogus stories based on the same general theme. A contestant tries to guess who is telling the truth.

L I A R S

Looks

professional appearance and confident style

Identity

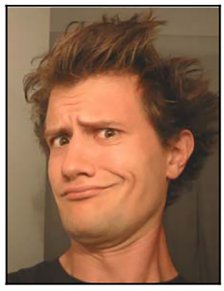
appeal to social bonds as a substitute for epistemic trust

Acting

false credentials or irrelevant expertise; disguise

Repetition

flooding the media with the same erroneous message



Skepticism

exaggerating and leveraging doubt for its own sake

Adapated from: Allchin, D. (2012). Science con-artists. *American Biology Teacher* 74(Nov.-Dec.), 661-666.

For a science class, of course, the news item should be related to science (Allchin, 2020; http://shipseducation.net/misinfo/bluff-the-class.pdf). Some sources might be "News of the Weird," the Ig Nobel Awards/(Annals of) Improbable Research/Journal of Irreproducible Results, or Ripley's "Believe It or Not!" But you might be surprised at how creative students can be at finding sources on their own!

Students work in groups of three. All three find an incredible science story and identify the general theme. All three help write the two "distractors" (that's what professional exam writers call the wrong answers). In class, one tells the real science story. The others get to try to persuade the class with the invented news reports. (Your job? *Keep track of the various techniques that the students deploy.* This will be raw material for later.)

Go straight to the voting (without discussion—yet). After votes are tallied, the "real" storyteller gets to reveal the original source of the genuine story (and any successful liar gets to take a bow!). Maybe award extra points if the group fools the teacher?

From Game to Take-Home Lessons

The game is fun. But the learning comes from reflecting on the performances afterwards. This transforms the game into a potent inquiry activity. Here, the students themselves do the heavy lifting on developing the target concepts. Your role is to pose the questions or problems: Which stories were believable, *and why*? What *techniques* helped persuade everyone?

The product of this discussion—ideally summarized on the board, of course—is an error repertoire. How might we go wrong in our beliefs about scientific claims in the media? One can easily imagine a sample list:

- *sounds* very professional or "scientific," with impressive vocabulary or jargon
- appeals to our sense of identity, or stirs our social emotions
- uses "expert" testimony, even if it is fake
- repeats the same falsehood until it feels familiar and true
- casts doubt on rival accounts
- uses data and numbers, even if they are fabricated
- appeals to our emotions

If the students seem unable to articulate the deceptive techniques themselves, you can nudge them, drawing on your earlier notes. The class has now generated a preliminary list of how to be fooled—with vivid examples from class. *The students* created this. They will *remember* it and, knowing how to apply the knowledge, *will likely use it*.

Students can be quite adept at lying. (Surprise?!) So, invite them to add to the list from their own experience. As a facilitator of discussion and leader of the inquiry, you can always offer suggestive questions or hints for further consideration. You can also note the principles that psychologists have already identified in advertising techniques or as biases in social learning (e.g., Allchin, forthcoming; Jackson & Jamieson, 2007; O'Connor & Weatherall, 2019)?

The final step is to give them all names, and perhaps to create a clever

mnemonic. If you like, you may want to "channel" the responses into an organized scheme that summarizes much of our current knowledge. See Figure 3, with the handy acronym, "L-I-A-R-S"? (Allchin, 2022, 2023).

Elaborate and Evaluate

This lesson is ripe for reinforcement. In the ensuing weeks and months, you can bring in various science reports from the news media, or videos from the internet, and ask students to apply their criteria in assessing the trustworthiness of the source. Or you may invite students to bring in claims that they encounter themselves. Perhaps create a bulletin board to post them on? Alternatively, you can assign such a diagnostic analysis as a form of evaluation. Reviewing all the examples at a later date, you might be able to discern patterns of the most frequent or powerful deceptive tactics, or add new ones to the list.

Misinformation—and deliberate *dis*information—is a serious threat. To our health, to our environment, and to scientifically-informed consumer choices and public decision-making. But *learning about it* need not be bogged down in dire images of gloom, or entanglement with unresolved controversial issues.

What a way to open the school year—in lieu of a stuffy discussion of the so-called "Scientific Method." Make science relevant to the here and now. SEP 8 is your guiding star.

REFERENCES

Allchin, D. 2012. "Science Con-Artists." *The American Biology Teacher 74* (9): 661–666.

Allchin, D. 2020. "The Credibility Games." *The American Biology Teacher 82* (8): 535–541.

Allchin, D. 2022. "Who Speaks for Science?" *Science & Education 31* (6): 1475–1492.

Allchin, D. 2023. "Marginalizing Misinformation—The Fast-and-Frugal Way." *The Science Teacher 90* (5): 16–19.

Allchin, D. forthcoming. "Science Denial, or Science Deceit?"

Ballantyne, N., and D. Dunning. 2022. "Skeptics Say, "Do Your Own Research." It's Not That Simple." New York Times. https://www.nytimes.com/2022/01/03/opinion/dyor-do-your-own-research.html

Carrion, M. 2017. ""You Need to Do Your Research": Vaccines, Contestable Science, and Maternal Epistemology." *Public Understanding of Science 27* (3): 310–324.

Chinn, S., and A. Hasell. 2023. "Support for "Doing Your Own Research" is Associated with COVID-19 Misperceptions and Scientific Mistrust." *Harvard Kennedy School Misinformation Review 4* (3): 1–15.

Herrick, I. R., G. M. Sinatra, and D. Lombardi. 2023. "Is That Plausible?: How to Evaluate Scientific Claims and Evidence in a Post-Truth World." *The Science Teacher 90* (3): 55–59.

Jackson, B., and K. H. Jamieson. 2007. *UnSpun: Finding facts in a world of disinformation*. New York: Random House.

Miller, J., L. Rost, C. Bryant, R. Embry, S. Iqbal, C. Lannoye-Hall, and M. Olson. 2021. "Media Literacy in the Age of COVID and Climate Change." *The Science Teacher 88* (6): 20–29.

Osborne, J., D. Pimentel, B. Alberts, D. Allchin, S. Barzilai, C. Bergstrom, J. Coffey, et al. 2022. *Science Education in an Age of Misinformation*. Stanford, CA: Stanford University. https://sciedandmisinfo.stanford.edu.

O'Connor, C., and J. O. Weatherall. 2019. *The Misinformation Age: How False Beliefs Spread*. New Haven, CT: Yale University Press.

Zucker, A., P. Noyce, and A. McCullough. 2020. "Just Say No!" *The Science Teacher 87* (5): 24–29.

Douglas Allchin (ORCID: 0000-0003-4038-5155) (*allchindouglas@gmail.com*) taught high school biology in Washington, DC many years ago. Now he is a historian and philosopher of science, author of *Teaching the Nature of Science* and *Sacred Bovines: The Ironies of Misplaced Assumptions in Biology*. See more at http://douglasallchin.net.