Biased Against Apathy:
Harnessing Curiosity and Knowledge Gaps in Source Analysis

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CHAPTER 50

Biased Against Apathy:

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ACRL Information Literacy Frame: Authority is Constructed and Contextual

Discipline: Sciences & Engineering

Subject: Health Sciences; Biology; Engineering; Social Work; Psychology; Public Health

Learning Theories: Expectation Confirmation/Disconfirmation Theory; Cognitive Load Theory; Loewenstein's Gap Theory of Curiosity

Special Populations: Graduate Students; Undergraduate Students; Professional Students

This lesson plan is our answer to two questions. The first is one common to all instructors, not just librarians: "How do you get students interested and excited in what you have to teach them?" Whether working with first-year students, upper-level undergraduates, graduate, or professional students, the risk of being confronted by apathy and "why do I need to know this?" is always present.

The second question emerged while socializing with a group of engineering, journalism, and linguistics students at a student/faculty mixer. The conversation drifted to space exploration and one engineering student announced that the faster-than-light drive had passed peer review.[1] He then opened his hand and mimed a "mic drop." He said it with absolute certainty, like being peer-reviewed made a claim unquestionably true. After talking with him for a bit, we realized that we had succeeded in detailing the difference between popular and scholarly sources, as well as instilling the preference for citing peer-reviewed scholarly materials. However, we had not conveyed the variable quality of research methods, the impact of positive publication bias, or the inherent problems presented by peer-review itself. It seemed that by selling the use of our library resources as more reliable than open web searches, we had accidentally given the impression that peer-reviewed sources did not require scrutiny and analysis. A peer-reviewed article published in a well-respected journal became scientific fact for this student. Thus, we stumbled on our second question: "What do you do when you realize you might have overemphasized a rule of thumb in your instruction?"

Developing the Lesson Plan

In order to answer the first question, "How do you get students interested and excited in what you have to teach them?," we employed the knowledge gap theory of curiosity and confirmation/disconfirmation theory. The lesson plan is designed to be modifiable and to allow for stretch activities. There are three essential components to the lesson plan: the warm-up activity, the small group activities, and the assessment. There are two essential main activities, so you can choose both or just one as it fits your time limits and class focus. There are also flex activities that you can pick and choose between depending on the length of your session, number of sessions available, and preparation of your student population.

The anticipatory set or warm-up activity for the lesson plan is a Cognitive Bias Poll. It is designed as a teaser trailer to pull students in by giving

them the chance to engage with testable credentials. Testable credentials are an activity that invites a student to experience a phenomenon rather than listening to a description of it. They are the academic version of "Don't take my word for it, try it for yourself." Each example provided invites the students to commit to a bias and discuss why they selected their answer. After the bias in answering is revealed, they are given another chance to discuss why they selected or changed their answer. The two main activities are a think-pair-share, asking students to think about how their assigned or selected bias might influence which articles are accepted for peer review, and a small-group, testable credential activity for confirmation bias. The assessment is a quick-write reflection. Reflective, short essays are a great way to assess for learning because they ask students to connect to their prior learning. Connecting to prior learning not only reinforces the lesson as they write but gives the instructor the chance to see potential gaps in student understanding.

The first of two flex activities involves a group discussion of the discovery of *Helicobacter pylori* as the cause of ulcers and how the scientific and medical communities scoffed at the rag-tag group of researchers who discovered and proved the link. The second is a peer-review simulation, where students are asked to think of an area where they are an expert, pair off, and argue about the minutiae that they find very important in that specific area of quirky knowledge. They are fun, light-hearted reinforcement activities that work great if your class is smaller and zipping through the other activities—if you are tired of doing the same activities over and over again or you want to break the lesson up over multiple sessions.

Learning Theories: Knowledge Gaps, Confirmation/Disconfirmation and Cognitive Load

Gap theory states that when we are aware that there is a gap in our knowledge, we are driven to fill that gap. Knowledge gaps are, in theory at least, why people binge watch television or cannot put down a novel.[2] They have to know what happens next. So, we wanted to know, could we employ a little curiosity to drive interest in our information literacy instruction? One method of creating curiosity gaps is by creating a disconnect between expectation and reality by employing confirmation/disconfirmation theory. On a very basic level, disconfirmation theory asks, "What does it feel like

to be wrong?" and answers, "Exactly like being right, until someone makes you aware of being wrong."[3] It is important when employing disconfirmation theory to help students interact with being wrong as a moment for growth, challenge, and learning, as opposed to a prescriptive failing to produce the correct response.[4] This is important to emphasize for our learners, as well as to emphasize for ourselves. The process of learning can be invisible to instructors and does not always occur in observable or synchronous spaces.[5] Students who appear to be struggling may have already mastered the idea, while those who have a high performance on direct tasks may not retain the skills five minutes past that session.[6] Long-term learning occurs when links are created between earlier knowledge and experiences with the purpose of longevity: "I need to remember this" and not "I need to remember this for the test/assessment/final."[7]

This lesson plan is also greatly influenced by the ideas of Cognitive Load Theory in a way that is distinct from its reliance on knowledge gaps and disconfirmation theory. Cognitive load is composed of three parts: the intrinsic complexity of the idea, the complexity involved with how you are teaching the idea, and extraneous complexity that distracts from your instructional goal. It relies on the idea that working memory can process three to seven things at a time, and this includes idly wondering about the air conditioner clicking, the flickering fluorescent light, or what the student plans to eat for lunch.[8] Cognitive Load Theory emphasizes the idea of desirable difficulty—the idea that you want to challenge your students enough to get them engaged without throwing roadblocks in their path or causing them to shut down and tune out because they have information overload.[9] Within Cognitive Load Theory, it is the job of the instructor to increase difficulty when students seem comfortable, and ease back on the throttle when they seem more taxed.[10] Since attention is a finite resource, Cognitive Load Theory encourages instructors to be greedy for student attention and to use attention-grabbing tactics that help to reinforce learning by drawing connections to existing knowledge.

ACRL Information Literacy Frame: Authority Is Constructed and Contextual

The basic idea behind the frame Authority is Constructed and Contextual is that the credibility of an author or institution changes based on group

dynamics and the stated information need.[11] The controversy surrounding Dr. Deepak Chopra is a useful and concrete example of these concepts. If you are unfamiliar with Dr. Chopra, he is a prolific author, self-help guru, and alternative medicine advocate. He is also a full professor with the University of San Diego School of Medicine. Depending on the markers that you use for authority, he could easily count as a credible source based on his credentials and associations. He is a controversial figure as a medical expert, however, because he makes many claims that have been debunked by the scientific community.

For an example of how authority is contextual, say that you wanted to know whether garlic could help lower your bad cholesterol. Your information need is for a comparison among garlic, not using anything, and using cholesterol-lowering medication. Your best bet would be a scientific trial or comparative effectiveness review. In the context of your question, it would have more authority than a self-help guru. A robust, double-blind, randomized, placebo-controlled trial would also have greater credibility than a self-help guru if you are the kind of person who finds scientific evidence compelling. If you were opposed to western medicine and thought pharmaceutical interventions were poison, then you might find Deepak Chopra a credible source. Additionally, if you were writing a paper discussing the claims made by Deepak Chopra, his writing would count as an authoritative source.

Authority is constructed by the standards for credibility within different communities, disciplines, and belief systems, and is contextual based on community standards and individual information needs.[12] It is important, within the frame, to understand that disciplines may have specific authorities or seminal works that are widely considered standard knowledge, but that there are scholars and experts within the discipline who may challenge the supremacy of those sources or authors.[13] It is also important for students to understand how the process of authority and credibility within scholarly communication can sometimes silence outside voices.[14] This is an especially important lesson for students in science, technology, engineering, math, and medicine.

Lesson Plan

Learner Analysis

This lesson plan has been used effectively with the following student populations:

- First time in college, ethnically diverse, and socio-economically disadvantaged students, typically requiring one or more remedial classes to attain college-ready classification
- College Success or First-Year Experience students from a broad range of majors and prior academic preparation (most fall within the traditional student designation)
- Honors college students, typically high-achieving first-year seminar students who have a high degree of self-motivation and willingness to engage
- Third- and fourth-year medical students and students enrolled in graduate medical education residency programs
- Professional development sessions for faculty members teaching at the secondary and post-secondary level using an online learning management system (LMS)

The typical student, regardless of background, will likely enter the library instruction session carrying a host of social programming designed to assist with rapid sorting and decision-making (also known as biases).

Limitations

- There may be the temptation to pack in too many ideas or activities for the time allotted. The flex activities are useful when instruction time is more than an hour or when the class moves through the activities faster than anticipated.
- The lesson plan covers areas outside of finding and citing articles, which sometimes creates resistance and uneasiness for a class with preconceived expectations for library instruction.

Opportunities

- Students are not expecting this topic from a library instruction session; disrupting expectations is a method for increasing engagement in learning activities.

Orienting Context and Prerequisites

- None

Instructional Context

Optimal Environment

- This lesson plan can be modified to work in any physical or online teaching environment. (It can be delivered effectively in a hybrid or distance learning course as well as in a seminar room with a flip-pad and marker.)

Minimalist Environment

- Method for the instructor to write or display options for first activity
- Method for students to publicly commit to an answer

Pre-Instruction Work

- Build a list of "testable credentials" that illustrate common biases in either a polling software, presentation slide deck, or other method depending on the available environment. Be creative. (Examples are provided in the activity.)
- Choose between two methods of preparing for the group activity:
    - ▷ Method one—more work upfront, but easier for first-year students or learners who might find assessing the quality of scientific research overly taxing for the time allotted.
        - ♦ Identify a contentious topic using a database that presents arguments for both sides of an issue.
        - ♦ Locate one research article on each side of the issue with at least one comment and rebuttal (or make them up from similar articles).
        - ♦ Prepare two separate short paragraphs describing each article. One sentence describing the methodology, one sentence detailing the results, followed by a one-sentence conclusion. Make one a high-quality methodology and the other a less-compelling one. (For example, one is a randomized controlled trial and the other is a self-report survey.)
        - ♦ Prepare a two-page, high-quality methodology and a low-quality methodology synopsis for each article, as if written by a science journalist, describing the research further.

- Create multiple packets, where each contains a high-level and a low-level methodology description for each topic.

▷ Method two—less creative, in that you are not making up summaries of evidence, but better suited to more advanced students and professionals.

- Identify a contentious topic that has reputable scholarly sources on both ends of the argument, and locate one high-quality article for each side and one lower-quality article for a total of four articles, two that support one side and two that support the other. (Points of View or similar databases can be used to glean ideas, or you can request a topic from the instructor to ensure salience of the activity to the course material.)
- Make the four articles available in a shared folder or print out enough copies for each person to have one of the four articles. (You may want to re-use to save trees.)
- Create an article appraisal handout that details the strengths and weaknesses of each article: good methods, high authority, blinding, large enough population, etc.
- Create an article credibility and validity checklist or worksheet if your institution does not already have a standardized version, or modify your standard handout as needed. For example, with higher-level students, we will often remove the guided section of our handout for analysis and citation information and simply provide a box for students to write their answers and citation. Targeting materials to student ability is a nonverbal method to indicate respect but can be tricky because, as experts, we assume a higher level of mastery for graduate students than they may have, which can lead to students feeling overwhelmed by the assignment. Use your discretion.

Learning Outcomes and Learning Activities

Learning Outcomes

1. Describe the potential impact of cognitive bias on which ideas are accepted for publication through the peer-review process of scholarly writing.
2. Explain how bias can affect choices when selecting materials for academic writing.
3. Relate implications of cognitive bias exercises to past experience, searching for answers online, or conducting research using library resources.

Learning Activities

Important note: Three activities are marked as essential because they are the core activities of the exercise—anticipatory set, assessment, activity; however, if time constraints dictate that you can only use one exercise, the source analysis activity is the quintessential nugget of this lesson plan.

1. Whole Group Activity: Cognitive Bias Poll *(LO2–3, 5–15 minutes, essential)*

   Scalable: Yes (minimum three biases, optimal five to seven)

This activity uses concept tests to create knowledge gaps that might entice apathetic students to engage with new material. As an anticipatory set, it is essential because it helps to create an atmosphere of inquiry and engagement. The idea behind concept tests, or content-based instruction, is that you are utilizing the testing principle to encourage deep processing. Deep processing promotes learning because it enables students to make connections based on emotional triggers and experience.[15] You see this principle used often in medical education, where students are assigned clickers to register their answers and track their progress longitudinally, but a clicker is not necessary to receive the gains from concept tests. Ask the instructor before the class about any necessary accommodations for holding up hands or fingers if that is the route selected; try to avoid able-ism where possible with premade cards or other options. You can also use online polling software like Socrative, Poll Everywhere, or Mentimeter.

Overview
Give students a chance to experience common biases, like availability bias, ease of recall bias, anchor bias, gambler's fallacy, authority bias, and apophenia by publicly selecting an answer. Experiencing the bias, rather than being told it exists, can provide a framework for students to recognize similar cognitive and social biases when they encounter them in the wild. Some examples are provided, but the purpose of this lesson plan is customization, so feel free to try out new or interesting ways for students to experience biases that can impact peer review.

Instructor Actions	Student Participation	
• Put a question in front of students (spoken or displayed). • Ask students to pick an answer. • Open a group discussion and invite students to explain their choices. • Reveal the bias being discussed and provide context for how that bias is helpful or how it appears commonly.	• Select an answer by holding up fingers, premade cards, or responding to an online polling software. • Explain the thought process behind their answer. • (Optional) Select a new answer based on peer discussion.	**Materials Needed** • Slides or marker/flipboard • (Optional) Polling software • Minimum of three (3) concept test questions that show bias. **Additional Notes** • Concept tests work best when sandwiched by discussion. • Five or fewer options are less likely to overwhelm students. • Include common misconceptions where possible so you can evoke the disconfirmation effect.

Bias	Example	Explanation/Discussion Points
Ease of Recall/ Availability Bias	Which is responsible for more U.S. deaths each year? A. Tornadoes B. Tuberculosis	• In 2013, 555 tuberculosis deaths were reported in the United States as opposed to the 55 killed by tornadoes that year.[16] • When we hear about something more often, our minds artificially inflate how often that thing occurs.
Gambler's Fallacy (*Bandwagon Effect*)	A coin is flipped seven times and lands heads up each time. If it is flipped again, which side is it more likely to land on? A. Heads B. Tails	• The Gambler's Fallacy is thinking that option B. Tails is more likely, even though the odds are still 50/50. • If a student sways enough other students to change their votes, it is a perfect opportunity to discuss the bandwagon effect (following the crowd).

Recency Bias/ Serial Position Effect	*(Present or read a list of words—keep exposure under 30 seconds)* Candle, jaded, yarn, befitted, fluffy, thoughtful, grass, hypnotic, sleet, vanish, bumpy 1. Which word came first in the list? A. bumpy B. candle 2. Which of these words came first? A. hypnotic B. thoughtful 3. Which word did not appear in the list at all? A. grass B. shiver	• According to the serial position effect, we remember items at the beginning and end of a list better than the middle. • Recency Bias states that we are more likely to remember what came last than what came first. • This is true of articles as well. It is not that people only read the abstract, introduction, and conclusion, but that they are situated in such a way as to be more memorable. In experimental disciplines like science and medicine, it is important to consider the methods section, which usually falls in the middle of the paper. • This applies to peer review in that article submissions at the beginning and end of a pile are more likely to be memorable and more likely to be selected than those in the middle of a stack.
Authority Bias	1. Albert Einstein famously said, "The definition of insanity is doing the same thing and expecting a different result." Is this a good definition of insanity? A. Yes B. No 2. What if I told you that this quote has been misattributed to Albert Einstein, Benjamin Franklin, Mark Twain, and Rita Mae Brown? Would you change your answer? A. Yes B. No	• We are more likely to find statements or ideas from people we think are smart or trustworthy compelling than ideas from relative unknowns or untrustworthy sources. • Students will surprise you on this one, sometimes selecting one or the other overwhelmingly on the first go, reinforced by discussion, and even more on the second. • If an answer goes in a way that you do not expect, just congratulate the class for their clear and decisive thinking and explain how authority can bolster ideas in society at large. • Perhaps ask them to come up with an example of a time they thought a quote had come from someone and believed it, then stopped believing it when they found out it came from someone else.
Modifications: For asynchronous online delivery: • Pose each question individually and provide an immediate explanation of the correct answer. • Do not let students go back to change their answers as publicly locking in an answer is an important component of this exercise. • Include a reflective question after each question or bias to check for understanding and provide students an opportunity to discuss their reaction and experience with disconfirmation.		

2. Whole Group Discussion: *H. pylori (LO1, 5–10 minutes, optional)* Scalable: Yes (can be left out, extended, or trimmed to fit allotted time)

This activity is a fairly standard group discussion that uses guided questions to get students thinking about scientific consensus and the peer-review process. It is useful when you are asked to present for longer than an hour or when you have a large number of repeat students and want to spice up the class. This activity is entirely optional but discusses a fascinating example of how authority in the form of consensus and the band-wagon effect can silence outside voices in scientific discourse.

Overview Provide an opportunity for discussion about the potential pitfalls of the peer-review process and how some voices can be silenced in the process of scholarly discourse. *H. pylori* is now commonly accepted as the cause of ulcers, but when the researchers who discovered the link first tried to publish their results, they were shunned by the scientific community at large.		
Instructor Actions	**Student Participation**	

• Refer to question list below. Ask the first question.
• Listen to the responses; wait for:
  * Other people should replicate your study.
  * People should examine your results and methods.
  * People should test your conclusions further.
If you do not have any of these responses after calling on a few students, thank them sincerely and move on to the next three questions.
	• Answer questions about the ideal process for scientific exploration and scholarly communication.
	• Explain the thought process behind their answer.
	• Answer teaser questions about how standards of proof may add to rigor or may unfairly disenfranchise some voices.
	• Discuss the circumstances around the discovery of *H. pylori* as a cause for ulcers. Specify if they agree that the publishers and medical community were right to distrust an outsider with a crazy idea, or if the researchers were right to use themselves as a guinea pig for their ideas.
		Materials Needed
		• Slides or marker/flipboard
		• (Optional) Polling software
		• Background information on *H. pylori* and ulcers:
		  * https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1283743/
		  * http://discovermagazine.com/2010/mar/07-dr-drank-broth-gave-ulcer-solved-medical-mystery
		
		Additional Notes
		• You can help create an environment that facilitates learning by:
		• Using open body language
		• Moving away from objects like podiums or lecterns that separate you from students

• Pose questions like five and six to determine if the students are familiar with the story of ulcers and Helicobacter pylori. • Invite students to explain their answers. • If someone mentions H. pylori or a bacteria as the cause for ulcers, ask if they know the story of the scientists who discovered the connection. If they do, have them tell the story; if not, relay it to them (use links in materials needed section to brush up on the specifics).		• Keeping your shoulders back and relaxed • Nodding as they touch on points, even if they are not what you are trying to tease out When they finish, thank them for contributing with sincerity and no equivocations. Avoid statements like "not quite what I was looking for, but …."

Example Questions	
Question 1	Suppose that you were a scientist, and you found a breakthrough that would fundamentally change how a field thought about a health condition or medical procedure. Given what you know about scholarly publication and the scientific process, what should happen next?
Question 2	What if you only had preliminary studies that provided really compelling evidence?
Question 3	Should you be published anyway, even if your study did not have enough participants?
Question 4	Would you ever be tempted to experiment on yourself to prove that you were right?
Question 5	Has anyone heard that stress causes ulcers?
Question 6	Do you think that is true? Why or why not?

Modifications

For asynchronous online delivery:

- Pose as a two-part discussion topic that encourages students to first theorize what the process of scholarly communication around breakthrough scientific discovery should look like.
  - * Depending on your learning management system, threaded discussions often allow for logic so that a second discussion topic is triggered once the first is answered.
- The second question should provide a brief description of what occurred and a link to an audience appropriate explanation—leaning toward popular science for undergraduates—and ask students to compare and contrast their ideal scenario with what occurred in the real world.

3. Small Group Activity: Peer review simulation *(LO1, 15–20 minutes, optional)*
   Scalable: No (flex activity)
   Target Outcomes: I

This small group discussion serves the same purpose as the *H. pylori* activity above, but only one of the two activities should be used since they serve a similar function. It is entirely optional.

Overview Provide an opportunity for discussion about the potential pitfalls of the peer-review process and how different perspectives and group understanding of an idea can silence some voices or lead to acceptance of ideas that agree with the biases and preconceived notions of peer-reviewers. The important take-away is that peer-review is an important indication of quality research but that it is not perfect and does not remove the need for ideas and articles to be examined critically on an individual basis.		
Instructor Actions	**Student Participation**	
• Poll the group using your preferred method. • Refer to sample question list below. Ask the first question. • Look for commonality in responses or an overarching area in which most students claim expertise, then draw from that for the next section Poll the group using either a call-out group discussion method or polling software to ask in what area they know an embarrassing amount of information (see example questions below). • Break students into groups based on the similarity in their expertise. * Include tangentially related concepts; for example, if several people pick musicians, place them together even if it is Beethoven and Tupak.	• Think about their own expertise, and identify an area where they know enough about a subject to argue minutiae with others. • Identify a time when they disagreed with someone based on their understanding of an area or phenomena. • Engage in an example of peer-review with group members of similar expertise. Explore what it feels like to be asked to weigh in on an idea related to their passion. • Think about how they react when someone disagrees with them and what their likely course of action will be. • Discuss how they would respond if asked to weigh in as a supposedly impartial observer in an argument between someone who disagreed with their position and someone who agreed with their position.	**Materials Needed** • Slides or marker/ flipboard • (Optional) Polling software: Socrative, Mentimeter, Poll Everywhere **Additional Notes** • Use more technical examples when working with upper-level undergraduates or graduate students. • If humor and joviality aren't your usual teaching methods, play to your strengths and use more formal or scientific examples.

• Point out that while peer-review gives a level of credibility that is higher than a newspaper or trade magazine where ideas are not challenged, it is not the last word in the accuracy of that article or idea. • Reinforce that assessing sources for yourself is crucial.	• Imagine what it would be like to have to say yes or no to someone's paper who disagreed with them. • Discuss how peer-review is when people of varying levels of expertise read and evaluate the claims of others.	

Example Questions	
Question 1	We are all experts in something—Beyoncé lyrics, football trivia, latte art, Pokémon identification, neuroanatomy minutiae. What is your area of expertise?
Question 2	Have you ever argued with someone else about the specifics of a finer detail, like whether or not the dress was blue/black or white/gold? Can you give an example?
Question 3	Now, in your group I want you to come up something contentious to say—something you've argued about or that you might argue about with someone else who felt passionately about your subject.
Question 4	If someone made a claim that was wildly different from your understanding in this area, what would you do? Would you double-check to see if you were right, stand by your stated understanding, or have some other kind of reaction?
Question 5	Now, I want you to think, how would that difference between your perspective and that other person's understanding influence your response if someone asked you to weigh in on a similar question?
Question 6	Now imagine that you could red-light or green-light a really well-written, sound paper written by someone who disagrees with your position. What would you do?

Modifications

For asynchronous online delivery:

- Present the guidelines for peer-review provided to Elsevier reviewers:
  * https://www.elsevier.com/reviewers/how-to-conduct-a-review.
- Attach an unformatted paper retrieved through "green" open-access related to the research topic or course content of the class, and ask students to post in the threaded discussion their version of the peer-review checklist, summarizing the article, discussing whether or not they think it's new or exciting and whether or not they think it should be published.
- For fun and profit, select a terrible article that should not have been published and see what students say regarding its suitability for publication.

4. Think-Pair-Share: Peer Review *(LO1–3, 10–15 minutes, essential)*
   Assessment Type: Formative
   Scalable: No

This activity is a think-pair-share that asks students to think about how their assigned or selected bias might influence which articles are accepted for peer review.

<table>
<tr><td colspan="3">Overview
Allow students to think about how common biases, like availability bias, ease of recall bias, anchor bias, gambler's fallacy, authority bias, and apophenia might impact peer review. As a think-pair-share, students will be asked to ponder the question on their own, discuss their answer with a partner, and then share the highlights of their discussion with the class as a whole. Not every pair needs to talk, but give enough room for those who want to talk to do so.</td></tr>
<tr><td>Instructor Actions</td><td colspan="2">Student Participation</td></tr>
<tr><td rowspan="2">• Assign or have students select a partner.
• Ask them to imagine they have been asked to serve as a peer reviewer for an important journal.
• Explain that each pair will think individually about how one of the biases covered in the first activity might impact their selection of papers for publication.
• Provide an example (Gambler's Fallacy is a good one to use because it is straightforward).
• Assign biases to the groups.
• Allow the class a moment to orient themselves, and five to eight minutes for small group discussion.</td><td rowspan="2">Typical case scenario:
• The class is quiet as students organize their thoughts, and noise slowly builds, you will need to be observant, and when discussion wanders away from the topic, pull everyone back for the class-wide sharing.
Worst case scenario:
• Students blink at you and each other and the silence stretches on past an internal count of ten seconds. Walk around to individual groups and give them hints or suggestions for how to think about each bias in the context of peer-review.</td><td>Materials Needed
• Slides or marker/flipboard
• (Optional) Polling software
• Minimum of three (3) concept test questions that show bias.</td></tr>
<tr><td>Additional Notes
• If you are using a presentation slide deck to accompany this session, it is especially helpful to have the names of the biases displayed.</td></tr>
</table>

Bias	Explanation/Discussion Points
Ease of Recall/ Availability Bias	Things we hear about often are considered more common than they actually are. This can impact peer-review by making really groundbreaking ideas that touch on common ideas seem less groundbreaking or, conversely, really groundbreaking ideas that fall outside of the commonly trod discussions seem irrelevant or not grounded enough in the seminal discourse of the field.
Gambler's Fallacy	If a reviewer subscribes to the Gambler's Fallacy and has a large number of articles that they are reviewing for different journals, they may feel a greater pressure to reject a deserving article after having accepted two or three prior articles, even though each article should be judged on its own merits, irrespective of other articles reviewed
Recency Bias/ Serial Position Effect	We are more likely to remember things that happen at the beginning or end of things, so reviewers might miss glaring discrepancies in methodology because they only remember the abstract, introduction, and conclusion. • This applies to peer review also in that article submissions at the beginning and end of a pile are more likely to be memorable and more likely to be selected than those in the middle of a stack.
Apophenia	Seeing patterns where there are none. This can cause otherwise gibberish data to be accepted for publication because the authors make a compelling case for what their results show, and the expert peer-reviewer may not be statistics- or methods-savvy enough to recognize poor design or data-fishing when they see it.
Authority Bias	We are more likely to believe that something is true or high quality because it is attributed to someone famous or well-known. This can affect peer-review in that sometimes bad work is published because it bears a well-known author whose writing style or topic is well known to the peer-reviewers.
Modifications For asynchronous online delivery: • As a threaded discussion or quick response paper, have students go on a search to find examples of given biases that prevented or allowed publication of an article. * For example, an examination of three top-tier journals in medicine—The Lancet, Annals of Internal Medicine, and the British Medical Journal—found that each of the fourteen most highly cited papers was rejected by at least one of the three before being published elsewhere.[17] This could be linked to the Gambler's Fallacy, Authority Bias, or Availability Bias. • There is no correct answer; it is merely an opportunity for formative assessment and to check that students are drawing connections.	

5. Small Group Activity: Selection Bias *(LO1–3, 20 minutes, essential)*
   Assessment Type: Authentic
   Scalable: Yes

This activity is the quintessential nugget of the lesson plan. If you are running short on time or have only twenty or so minutes for your section, this is the most important activity. Depending on the level of student and the option that you selected in preparing, it will give students a chance to experience confirmation bias for themselves as a testable credential. It also provides an opportunity for hands-on guidance in source analysis and assessment.

Overview
A high cognitive load activity which asks students to examine four articles and determine the relative strength of evidence and credibility of the source. The purpose of this activity is to give students an opportunity to commit a confirmation bias by selecting articles that agree with them as having higher credibility than those that disagree. Of course, if your class bucks the status quo, you can still use the opportunity to discuss examples from popular culture of how this works, especially for polarizing and politicized ideas like man-made climate change or a woman's right to choose (abortion).

Instructor Actions	**Student Participation**	
• Tell the class that one wall represents one stance on a controversial issue and the other wall represents the other. • Instruct them to pick a wall that matches either their personally held beliefs or the more interesting of the two claims. • Select an option below. • Assign each article a number or letter. • Have students rank the articles from most credible to least credible. • Encourage the class to discuss why they found certain articles more credible: * Tone, methods, rigor, or other measurements. • Reveal a slide or paper with ideal ranking of articles, and why. • Discuss how we are more likely to believe research that agrees with our positions than research that opposes it (confirmation bias).	Typical case scenario: • Some students will get right to work, while others will look around like they're confused. Wander the class to provide additional guidance for those who are struggling. Worst-case scenario: • Everyone looks around and seems completely lost for more than the count of ten seconds. Volunteer to go through one article with each group so they can see what the process is like. This should get them reset and ready to finish. • Pick a side in a debate and rate the relative credibility of papers. • Discuss why the papers were rated the way they were. • Publicly commit to an order of credibility or research strength. • Discuss how their rating differs from the ideal rating and how that might impact their choices for selecting sources for future papers and presentations.	**Materials Needed** • Slides or marker/ flipboard • (Optional) Polling software • Pre-arranged packets with article summaries and analysis or • Articles, summaries, and appraisal worksheets **Additional Notes** • Only step in to interfere if no one is willing to take the position on one side or the other. • If your class follows a typical distribution, they will identify the two articles that agree with their position as having stronger evidence than the two articles that disagree, with the weaker of the two articles that agree placed above the stronger of the two articles that disagree.

Pick One	**Explanation/Discussion Points**		
Option 1:	Pass out pre-arranged packets. Instruct students to read through and rank the articles from best evidence to worst evidence.		
Option 2:	Walk the students through the process of rating the articles according to the checklist, outlining how a numerical or relative rating scale works. The checklist should be self-explanatory, but do so anyway to avoid misunderstanding or increased cognitive load from trying to parse the handout. • Have at least two people rate each article, but inform them they can swap papers as they finish.		
Example	**Pro Side (+)** *Assisted Suicide is a Right*	**Con Side (-)** *Euthanasia Should Be Outlawed*	**Ideal Rating**
Article I (+)	1.) Strong Evidence	3.) Weak Evidence	Strong Evidence
Article II (-)	3.) Weak Evidence	1.) Strong Evidence	Strong Evidence
Article III (+)	2.) Strong Evidence	4.) Weak Evidence	Weak Evidence
Article IV (-)	4.) Weak Evidence	2.) Strong Evidence	Weak Evidence
Modifications For asynchronous online delivery: • Similar set-up. Have students rate and discuss the articles in groups, then formally submit a list of rankings for each article. * Follow the assignment up with an assigned reading of the original research.			

6. Individual Activity: Reflection Quick-Write *(LO1–3, 5–10 minutes, essential)*
   Assessment Type: Summative
   Scalable: Yes

This summative assessment is intended to be a moment for reflection and decompression after the cognitively challenging main activity. Meta-cognitive activities provide an opportunity for students to check in with themselves and benchmark their learning against an outside standard.

Overview This activity is a quick-write reflection response that relates the discussion of bias in source selection to the experience students had in the class and in their lives outside of class in looking for information in real-world or course-specific situations.		
Instructor Actions	**Student Participation**	
• Ask students to write as generally or specifically as they feel comfortable about their experience in class.	• Demonstrate and identify links between their own experience and elements of the lesson.	**Materials Needed** • (Optional) Response handout • (Optional) Polling software

Instructor Actions	Student Participation	
• Will their experience with the examples of bias change their behavior in the future? • Has it changed their perspective on peer-reviewed articles?	• Ideally, they will explain how bias impacts not only the process of peer-review but also their own research decisions.	**Additional Notes** • A quick-write reflection gives students a chance to draw connections between their prior knowledge and the lesson. • They can also demonstrate their learning of the subject matter outside of the specific context of the lesson itself.
Modifications • For asynchronous online delivery: • Same questions as a journal response or information quick write paper.		

Assessment

Goals for Assessment

- Demonstrate an understanding of how bias influences how we select materials for publication and for academic writing.
- Draw correlations between exercises and personal experience to demonstrate awareness of confirmation bias.

Assessment Tools

- Formative Assessment
  - ▷ Think-Pair-Share: Peer Review *(10–15 minutes, essential)*
- Authentic Assessment
  - ▷ Small Group Activity: Selection Bias *(20–30 minutes, essential)*
- Summative Assessment
  - ▷ Individual Activity: Reflective Quick-Write *(5–10 minutes, assessment)*

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16. National Weather Service, "2013 Preliminary Killer Tornadoes," 2014, http://www.spc.noaa.gov/climo/torn/STATIJ13.txt.
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