

# Science as a Knowledge Source

## Lesson 3: Listening Task

Focus: *Can science be trusted without question?*

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| <b>Objectives</b> | <ul style="list-style-type: none"><li>● Explore how bias, institutional power, and public interpretation influence the credibility of scientific claims.</li><li>● Deepen understanding of justification, perspective, and objectivity in the natural sciences.</li><li>● Evaluate real-world consequences when science is distorted, misrepresented, or hidden from public view.</li></ul>  |
| <b>Activities</b> | <ol style="list-style-type: none"><li><b>1. Introduction (5 mins)</b><ul style="list-style-type: none"><li>● Present the guiding question: <i>"Is science still the most reliable way to produce knowledge when it can be manipulated and misrepresented?"</i></li><li>● Brief recap of key concepts:<ul style="list-style-type: none"><li>○ Justification: What makes scientific reasoning convincing?</li><li>○ Perspective: How do industry, media, and the public view scientific findings?</li><li>○ Objectivity: Is it possible to eliminate bias in scientific work?</li></ul></li><li>● Ask students:<ul style="list-style-type: none"><li>○ What do you think makes a scientific claim trustworthy?</li><li>○ Who do you trust more: scientists, journalists, or institutions like governments or pharma companies?</li><li>○ Can science ever be neutral?</li></ul></li></ul></li><li><b>2. Listening Task</b><ul style="list-style-type: none"><li>● Students watch the video: <a href="#">Ben Goldacre: Battling Bad Science</a></li><li>● Students should actively map Goldacre's key arguments, counterarguments, and ethical claims.</li><li>● <b>Key Points to Listen For:</b><ul style="list-style-type: none"><li>○ What examples does Goldacre give of science being misrepresented?</li><li>○ How do media and authority figures distort evidence?</li><li>○ How do flawed methodologies (e.g., lack of control groups, placebo misuse) weaken scientific justification?</li><li>○ What role does publication bias play in shaping our understanding of drug efficacy?</li><li>○ Who benefits from this manipulation of evidence?</li><li>○ How does Goldacre suggest science can regain credibility?</li></ul></li><li>● <b>Note-Taking Framework:</b></li><li>● Main Arguments:<ul style="list-style-type: none"><li>○ Why authority is not enough in science.</li><li>○ Why poorly designed studies mislead public understanding.</li><li>○ Why missing data (e.g. withheld trial results) is the greatest threat to scientific objectivity.</li></ul></li><li>● Supporting Examples:<ul style="list-style-type: none"><li>○ Coffee and cancer contradictions in the media.</li><li>○ Fake credentials and bogus claims in nutrition science.</li><li>○ Reboxetine and Tamiflu as case studies in pharmaceutical industry misconduct.</li></ul></li><li>● Counterarguments:<ul style="list-style-type: none"><li>● Is science the problem, or the way it's communicated and funded?</li><li>● Can the peer-review process fix these issues?</li><li>● Do individual scientists have enough power to change flawed systems?</li></ul></li></ul></li><li><b>3. Kialo Discussion (30 mins)</b></li></ol> |



- In small groups, students create a new Kialo discussion around the guiding question.
- Alternatively, if students require more structure, clone and share [this ready-made discussion](#), based on the thesis below, and use the suggested claims as prompts for students.
- Students should use their analysis to ensure they select the strongest arguments from the listening task.
- They should add these to the Kialo discussion as arguments, counterarguments, examples, and evaluations.
- Encourage students to refer to the concepts of justification, perspective, and objectivity in their arguments.

Example Claims:

**NAME: Is science still the most reliable way to produce knowledge when it can be manipulated and misrepresented?**

**THESIS: Science is still the most reliable way to produce knowledge.**

**PROS:**

- Scientific methods are designed to be self-correcting through peer review and replication.
  - Supporting example: Goldacre explains how the academic process involves critical appraisal, where postdocs expect “bloodbath” Q&A sessions after presenting data. This culture of intellectual challenge ensures only rigorously defended knowledge survives.
- Flaws in communication or funding do not undermine the scientific method itself.
  - Supporting example: Even though studies can be misrepresented in the media (e.g., red wine preventing breast cancer), Goldacre shows that the underlying study itself was sound lab research, just misinterpreted. The flaw is in translation, not the scientific work.
- Science remains the best tool we have for reducing bias and producing evidence-based conclusions.
  - Supporting example: The placebo effect, randomization, and control groups are discussed as essential scientific tools to isolate variables and test treatments objectively (e.g., sugar pills vs injections for ulcers and pain). These techniques are unique to science and help minimize personal or systemic bias.

**CONS:**

- Industry-funded studies are four times more likely to produce positive results, compromising objectivity.
  - Supporting example: Goldacre cites meta-analysis findings showing that trials funded by pharmaceutical companies are four times more likely to report positive outcomes than independently funded trials, even though their methodology is often more rigorous. This reveals the power of selective reporting or framing.
- Withholding trial data proves that critical evidence is often hidden from the public.
  - Supporting example: Reboxetine: 76% of trials were hidden, distorting the appearance of effectiveness. Goldacre himself prescribed it, unaware of the missing data. Tamiflu: Governments spent billions stockpiling it for flu complications without ever getting access to full trial data. Even Cochrane researchers were denied.
- The public often cannot distinguish between good and bad science due to media distortion.
  - Supporting example: Goldacre shows how the Daily Mail claims contradictory health outcomes (e.g., coffee both causes and prevents cancer). These stories misrepresent small-scale or lab-based studies as definitive, confusing public understanding of scientific reliability.

**Reflection**

Discuss the following reflection questions in open discussion or exit ticket format:

- What surprised you most about how science is distorted in real life?
- Does this change your trust in science as a knowledge system?



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|                                   | <ul style="list-style-type: none"> <li>• What role should institutions (like governments, pharma companies, media) play in maintaining scientific integrity?</li> <li>• Can we expect objectivity when the same people funding research benefit from its results?</li> <li>• How should educators prepare students to navigate conflicting or misleading science?</li> <li>• Is it more dangerous to overtrust science or to distrust it completely?</li> </ul>  |
| <b>Resources</b>                  | <p>Lesson Slides<br/>         Kialo Discussion: <a href="#">Is science still the most reliable way to produce knowledge when it can be manipulated and misrepresented?</a><br/>         Debate video:  Ben Goldacre: Battling Bad Science</p>   |
| <b>TOK Concepts</b>               | <p><b>Justification:</b> What reasons were given for accepting flawed evidence as valid?<br/> <b>Perspective:</b> How do industry vs. public vs. scientific perspectives conflict in interpreting data?<br/> <b>Objectivity:</b> What limits objectivity in real-world scientific practice?</p>  |
| <b>Critical Thinking Concepts</b> | <ul style="list-style-type: none"> <li>• <b>Confronting Biases &amp; Assumptions:</b> <ul style="list-style-type: none"> <li>○ Challenging Authority Bias: Questioning the assumption that claims made by doctors, scientists, or experts are automatically justified, and examining how their status can discourage scrutiny or dissent.</li> <li>○ Recognizing Institutional Bias: Analyzing how corporations, governments, and media organizations may shape, skew, or selectively present scientific research to protect interests, manage public perception, or maintain authority.</li> </ul> </li> <li>• <b>Exploring Contexts:</b> <ul style="list-style-type: none"> <li>○ Stakeholder Analysis: Identifying who benefits or loses when scientific data is manipulated, selectively disclosed, or withheld, such as pharmaceutical companies, regulators, patients, or the wider public, and how those stakes influence what gets accepted as reliable knowledge.</li> <li>○ Cultural and Social Impact: Considering how misinformation or partial truths affect public health, social trust, and everyday behavior, and how different communities experience these impacts unequally.</li> </ul> </li> <li>• <b>Responsiveness and Flexibility of Thought:</b> <ul style="list-style-type: none"> <li>○ Adapting Judgments: Being willing to reconsider prior beliefs about scientific neutrality, especially when confronted with evidence of bias, omission, or manipulation.</li> <li>○ Evaluating Multiple Perspectives: Weighing how your trust in the scientific claim shifts depending on who is interpreting, funding, or communicating the data, including scientists, companies, regulators, media, or activists, and using these contrasts to form a more nuanced judgment.</li> </ul> </li> <li>• <b>Extrapolation &amp; Reapplication of Principles:</b> <ul style="list-style-type: none"> <li>○ Applying Ethical Reasoning: Assessing whether it is ethically defensible to withhold or delay trial data for reasons such as profit, control, or reputation management, using principles like transparency, harm reduction, and fairness.</li> <li>○ Connecting to Modern Issues: Extending the same critical framework to contemporary debates, for example vaccine skepticism, climate science denial, or controversies over drug approval, to examine how scientific information is promoted, contested, or distrusted today.</li> </ul> </li> </ul> |

