

Science as a Knowledge Source

Lesson 2: Fact-Finding Task

Focus: *How do real-world scientific controversies reveal tensions between justification, objectivity, and perspective?*

Objectives	<ul style="list-style-type: none">● Analyze real-world case studies where scientific knowledge was challenged, revised, or misused.● Understand how different perspectives and contexts influence what is accepted as “scientific truth.”● Use TOK concepts (e.g., justification, objectivity, perspective) to examine the reliability of scientific knowledge.● Substantiate or challenge claims from Lesson 1 using contextual examples and TOK reasoning.
Homework Preparation Task	<p>Case Study Task</p> <ul style="list-style-type: none">● Divide students into small groups and assign each group a real world scientific case study. Students will add their findings to the Kialo discussion from Lesson 1.● Each group will:<ul style="list-style-type: none">○ Reflect on how the case connects to the concepts discussed in Lesson 1.○ Explore the case using provided resources and their own research.○ Prepare a short presentation (5–7 minutes) responding to the question: “How does the chosen scientific case challenge or reinforce the idea that science is the most reliable method of creating knowledge?”● Students should include details of:<ul style="list-style-type: none">○ What happened in the case.○ How different perspectives (scientists, government, public, media) justified or criticized the work.○ Which TOK concept is most relevant: justification, objectivity, or perspective.○ Whether the case supports or challenges a claim from Lesson 1. <p>Case Study Options</p> <ol style="list-style-type: none">1. <u>Replication Crisis</u><ul style="list-style-type: none">● Focus: Widespread failure to replicate studies in psychology and biomedicine.● Key Question: If findings cannot be repeated, are they reliable?● Suggested Sources:<ul style="list-style-type: none">Replication Crisis - an overview ScienceDirect TopicsWhy Most Published Research Findings Are False - PMCTED - Is there a reproductability crisis in science?2. <u>Planet Vulcan and the Limits of Newtonian Physics</u><ul style="list-style-type: none">● Focus: 19th-century astronomers invented a planet to protect Newton’s laws when Mercury’s orbit didn’t match.● Key Question: Why were scientists reluctant to revise their models, even with contradictory evidence?● Suggested Sources:<ul style="list-style-type: none">The mystery of the planet Vulcan - MensaYoutube - The planet closer to the sun than mercury3. <u>HIV/AIDS Denialism and Public Harm</u><ul style="list-style-type: none">● Focus: Political leaders in South Africa rejected mainstream science, leading to delayed treatment rollout and thousands of deaths.● Key Question: What happens when alternative perspectives are given equal footing despite lacking evidence?● Suggested Sources:<ul style="list-style-type: none">Death by denial - Harvard Gazette



[HIV/AIDS denialism in South Africa - Wikipedia](#)
[Joe Rogan Spreads AIDS Denialism To Spotify's Massive Audience](#)

4. **The Human Genome Project**

- Focus: A global effort to map human DNA that raised debates about ownership, funding, and genetic ethics.
- Key Question: Who decides what counts as valuable research, and who benefits?
- Suggested Sources:
[The Human Genome Project](#)
[The Human Genome Project Was a Failure](#)

Activities

1. **Introduction (5 mins)**

- Recap Lesson 1: Review key claims from the Kialo discussion.
 - Prompt: What claims did you find most convincing or flawed? Did any arguments rely too much on assumptions without real verification?
- Present the central question for this lesson: *How do real-world scientific controversies reveal tensions between justification, objectivity, and perspective?*
 - Emphasize applying objectivity, perspective, and interpretation to evaluate how scientific methods and knowledge are judged and categorised by institutions, the public, etc.

2. **Bridge to Lesson 2**

- Explain that in this lesson, students will explore real-world scientific controversies where: Scientific claims were challenged, ignored, or revised; Perspectives from media, public, government, and the scientific community influenced the legitimacy of those claims; These cases highlight that scientific knowledge is not always neutral, universally accepted, or free from social influence.
- Clarify the shift: This is no longer about theory alone — we're now testing claims from Lesson 1 using historical and contemporary examples. Students will investigate how evidence, bias, power, and public trust affect the status of scientific knowledge.
- Reinforce the goal: Move from general discussion to evidence-based evaluation. These case studies should help students understand how scientific knowledge is constructed, challenged, or reshaped within specific institutional and social frameworks.

3. **Presentations (30 mins)**

- Students present their case studies to the class.
- Students should take note of any useful points from other groups' presentations to use in the Kialo discussion.

4. **Recording Findings in a Kialo Discussion (20 mins)**

- Students return to the Kialo discussion from Lesson 1 and:
 - Add at least one new claim or counterclaim based on their case study.
 - Reply to at least one peer's argument, using insights from another group's case.
 - Label their post with the relevant TOK concept (e.g., justification – peer review failure, perspective – political interference, objectivity – funding bias).
- **Focus areas for Kialo updates**
 - Scientific Gatekeeping: Who decides which scientific knowledge is accepted, funded, or published and who gets excluded?
 - Institutional Authority: How do governments, corporations, or journals affect the perceived legitimacy of a scientific claim?
 - Trust and Public Reception: How does misinformation, media framing, or social bias shape what the public considers "science"?
 - Knowledge Inequality: Are all scientific voices, especially from the Global South, Indigenous communities, or whistleblowers, treated equally within the scientific system?



Reflection Questions	<p>Discuss the following reflection questions in open discussion or exit ticket format:</p> <ul style="list-style-type: none"> • How did your case study affect your understanding of who gets to define and legitimize scientific knowledge? • What made certain examples feel more like political or institutional interference — versus scientific self-correction or progress? • In your case, who had the most control over the scientific narrative: researchers, governments, corporations, or the public? • Can efforts to make science more inclusive ever be truly equal when access to funding, publication, and institutional support remains uneven? • What role should credibility, transparency, and ethics play in deciding whether scientific claims are accepted or contested? • Should all scientific research that affects public wellbeing (e.g., health, environment, genetics) require broader social consultation, or are there exceptions?
Resources	<ul style="list-style-type: none"> • Lesson Slides • Kialo discussions from previous lesson
TOK Concepts	<p>Justification: What reasons were given to support or reject the scientific claim? Were these reasons based on evidence, authority, peer review, or institutional status?</p> <p>Objectivity: To what extent were the methods, interpretations, or outcomes of the scientific case influenced by bias, funding, ideology, or social values?</p> <p>Perspective: Whose viewpoint shaped the public, political, or institutional response to the scientific controversy?</p>
Critical Thinking Concepts	<ul style="list-style-type: none"> • Confronting Biases & Assumptions: <ul style="list-style-type: none"> ○ Challenging Institutional Bias: Questioning the belief that only scientific knowledge endorsed by elite institutions, journals, or governments is legitimate. ○ Recognizing Objectivity Bias: Analyzing how the assumption that science is always neutral or value-free can obscure the influence of funding, ideology, or politics on scientific research. • Exploring Contexts: <ul style="list-style-type: none"> ○ Stakeholder Analysis: Identifying who benefits or loses when a scientific claim is accepted, contested, or silenced, e.g., corporations, policymakers, marginalized communities, or public health systems. ○ Cultural and Social Influence: Considering how geography, class, race, political ideology, or historical context affect how scientific knowledge is produced, interpreted, and trusted. • Responsiveness and Flexibility of Thought: <ul style="list-style-type: none"> ○ Adapting Arguments: Being willing to reconsider whether a scientific claim is reliable after examining the context, funding, and public response surrounding it. ○ Comparing Conflicting Interpretations: Weighing differing reactions (scientific, governmental, public, or media-based) to develop a more nuanced understanding of how scientific credibility is constructed or challenged. • Extrapolation & Reapplication of Principles: <ul style="list-style-type: none"> ○ Applying Ethical Reasoning: Students assess whether the scientific claim or research in question was promoted, ignored, or suppressed fairly using ethical principles like public responsibility, transparency, and equity. ○ Connecting to Modern Issues: Students relate their case to current debates around misinformation, scientific denialism, corporate-funded research, or inclusion of Indigenous/alternative epistemologies in science. ○ Building Arts Literacy: Students examine how access to education, data, and publication shapes which scientific voices are elevated or silenced, and reflect on what counts as “reliable” knowledge in society today.

