PHILOSOPHY AND SCIENCE
Two high school philosophy workshops designed by Michelle Sowey

These two workshops may be introduced within a double-period, or on two separate lessons. The suggested total running time is 1 hour and 50 minutes (i.e. 55 minutes per workshop).

Workshop 1: Using perceptual illusions to explore fallibility in observation

Teaching resources needed:
- whiteboard markers
- a toy Zoetrope, if available (not essential)

Introduction and stimulus: Perceptual illusions slideshow
(10 mins)

**SLIDE: Cover slide**
Today we’re going to be taking a look at some aspects of Philosophy of Science. Our focus is on the question of whether we can trust science to give us an accurate understanding of the world.

**SLIDE: Look Here**
I want to begin by showing you eight perceptual illusions – illusions in which our sense-perception tricks us and misleads our thinking. And after we’ve experienced the illusions, we’re going to have a discussion about why they might matter in a Philosophy of Science class.
**SLIDE: Shepard rising tone**
This is actually an auditory illusion, which means that it tricks us into misinterpreting what we’re hearing.

[PLAY AUDIO]
Who can tell me what you heard?

**SLIDE: The Dress**
Now here’s one that you’ll probably recognize.
Who remembers seeing this?
The question is, what colours do you see in this dress?
(Hands up – discuss)

White and gold, or blue and black? Differences in perception showed that different people’s visual systems were making different assumptions about the lighting conditions that the dress was in. Mindy Kaling tweeted on February 25, 2015, "I think I'm getting so mad about the dress because it's an assault on what I believe is objective truth."

Okay, here’s another illusion:

**SLIDE: Scintillating Grid**
What do you see?
(Discussion)

**SLIDE: The Rubber Hand illusion video**
I've got an example of a tactile illusion here.
I'm going to play a short video to show you how it's possible to manipulate your vision, your sense of touch, and your proprioception. (Proprioception is the perception of the where your body parts are in relation to each other.)
And by manipulating vision, touch and proprioception, we can actually create the phenomenon of a ‘phantom limb’ – or in this case, a ‘phantom hand’ that seems to be able to feel stuff, even though it’s not a real limb.

[PLAY VIDEO] excerpted from https://www.youtube.com/watch?v=sxwn1w7MJvk

One of the researchers in this field is a neuroscientist named VS Ramachandran. Ramachandran reported that for one of his research subjects, “The fingers were illusory, but the pain was real – indeed, so intense that I dared not repeat the experiment.”(Phantoms in the Brain, p. 43.)

So we’ve taken a look at a few perceptual illusions that humans have made, and now I want to show you how perceptual illusions can also exist in nature:

**SLIDE: Underwater waterfall**
This is the so-called ‘Underwater waterfall’ in Mauritius.
What we’re seeing is just an illusion of water falling. What’s actually happening is that ocean currents are pushing sand (from the beaches of Mauritius) off the edge of an ocean shelf, underwater. And the sand is plunging down more than 4 km into an abyss.

**SLIDE: Moon illusion**

The Moon illusion is an optical illusion that causes the moon to appear larger near the horizon than it does higher up in the sky. There’s still a lot of debate about what actually causes this illusion.

**SLIDE: Two-headed zebra**

Here’s a two-headed zebra. But of course it’s just an illusion that we fall for because it’s difficult to distinguish the markings of the two different zebras in the picture.

**SLIDE: Photograph that looks like a painting.**

And here’s one final illusion. It’s a photo, but it sure looks like a painting!

*(Photographer Frans Lanting, camel thorn trees in Namibia)*

**SLIDE: Summary of all illusions shown**

So, what we’ve experienced in all these illusions is a gap between perception and reality.

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**Collaborative philosophical enquiry**

*(40 mins)*

*Teacher to scribe student responses on the board*

**Suggested questions:**

Can we trust our senses? (pair talk)

If we can’t trust our senses, how can we trust scientific observation and experiment? (pair talk)

How can we know whether our observations are reliable?

Is it the case that we don’t perceive reality as it really is, but instead we perceive a reality that is constructed by our own minds?

*e.g. There are no inherently red or blue photons (light particles) to be found in the physical world, but we do perceive a world of colour around us.*

If our perceptual reality differs from objective reality, how can we know whether objective reality exists, or what it is really like?
When what your senses tell you conflicts with what your reasoning tells you, should you trust your senses or your reasoning? (example: Zoetrope)

Can we perceive reality as it really is?

What is the direct object of our sensory experiences?

Is there an objective "truth" or reality which we are simply unable to access?

Closing synthesis/reflectons
(5 mins)

Workshop 2: Investigating hypothesis-testing in science and pseudoscience

Teaching resources needed:
- illustrated scenarios (with accompanying questions) dealing variously with scientific and pseudo-scientific investigations
- table of characteristic differences between science and pseudoscience
- printable cards (printed and cut) corresponding with items in the table above

Note: the above resources are available to download from
- ‘cheat sheet’ with teacher’s (contestable) answers to the questions on the illustrated scenarios, together with teacher’s predictions of which characteristics of science/pseudoscience are likely to arise from class discussion of each scenario. You are invited to write your own ‘cheat sheet’.
- blu-tack or pins to mount printable cards
- whiteboard markers

Introduction and exercise: Science or Pseudoscience?
(4 mins)
(Note: this exercise was originally designed for a small class of 14 students, but could be adapted for a larger class).

In this activity, we’re ultimately going to be thinking about ways of distinguishing science from pseudoscience. ‘Pseudoscience’ refers to a collection of beliefs or practices that are mistakenly thought to being based on scientific method.

Break class into six small groups.
I’m going to distribute a different scenario to each small group. The characters in your scenario might be engaging scientific thinking, or they might be engaging in pseudoscientific thinking. We’ll be discussing that later.

For now, your task is to read the scenario and try to answer the questions that follow. In most cases you’re being asked to identify a hypothesis made by a character in your scenario, and suggest how that hypothesis might be tested.

We’ll take about 10 minutes to work on this, and then we’ll all come back together, and I’ll ask a spokesperson from each small group to present an overview of your scenario, and offer your answers to the questions.

*Distribute six scenarios: one to each small group.*

**Small group work**

(10 mins)

*Reconvene class.*

*Small groups take turns to present their responses, followed by whole-class collaborative enquiry. As students raise points that indicate characteristic differences between science and pseudoscience, the teacher may pin up the relevant printable cards.*

**Scenario 1 presentation and discussion.**

(6 mins)

**Scenario 2 presentation and discussion.**

(6 mins)

**Scenario 3 presentation and discussion.**

(6 mins)

**Scenario 4 presentation and discussion.**

(6 mins)

**Scenario 5 presentation and discussion.**

(6 mins)

**Scenario 6 presentation and discussion.**

(6 mins)

**Closing synthesis/reflections**

(5 mins)

*Ask students for reflections about how the activity we’ve just done sheds light on the distinction between science and pseudoscience.*