



7 FACT SHEET ASSESSING THE VALIDITY OF SCIENTIFIC INFORMATION

OBJECTIVES OF THE CURRICULUM

DISCIPLINES AND LEVELS CONCERNED

English (Secondary – Cycle 2)

Reading and assessing various texts

- Making a critical judgment: taking a critical distance from the text by relying on cultural and media references that confirm the credibility or acceptability of a source or information.

ERC (Secondary – Cycle 1)

Theme: Autonomy

- Conditions that favour autonomy (e.g. critical judgment, common sense, moral responsibility, ability to choose, authenticity, etc.)

TARGETED DIMENSIONS OF THE DIGITAL COMPETENCY

- Exploit the potential of digital technology for learning;
- Develop critical thinking regarding digital information;
- Produce content with digital technology;
- Innovate and show creativity with digital technology;
- Communicate by using digital technology.

SUGGESTED DIGITAL TOOLS

- Create a conceptual map: Popplet;
- Develop a meme: Canva;
- Record a podcast: Anchor.

EDUCATIONAL INTENTION OF THE GUIDE

By the end of these activities, the students will be able to assess the credibility of scientific information.

OBJECTIVES OF THE ACTIVITIES

- In a conceptual map, distinguish between reliable and dubious information, taken from a scientific article.
- Through the creation of "memes", make a critical judgment concerning the reliability of different information.
- In a podcast, discuss the different ways we can behave regarding what we see or hear on the Web.

INTRODUCTION

We've heard a lot about fake political news in the past few years. But statistics show that people share just as much (or even more) fake news on the Web and social media regarding health and nutrition. There's generally some science behind this false information. Or at least that's what the people circulating it claim!

Can you fact check information based on science if it isn't scientific itself? Yes! There are basic checks you can do and easy questions you can ask. You can apply them to a YouTuber's statements, a journalist's report or even a claim by a scientist.

BASIC FACT CHECKING

You're reading a report or watching a video and the author talks about a "discovery". It can be a new drug or a new treatment. Or it can be a food you already know that's supposed to have a positive or negative impact on your health. After reading the article or watching the video, ask yourself two questions:

Is a scientist cited?

Too often, authors or YouTubers vaguely indicate that "researchers affirm" or

"studies say". If there aren't any names or hyperlinks to fact check them, be suspicious. It's better to wait before sharing this information.

If scientists are cited, have they published something?

Students must understand that current scientific knowledge is the result of a long validation process. This depends on many studies, not on scientists debating with each other only based on their opinions.

A scientist's comments during an interview with a journalist can certainly include opinions. But statements about an alleged discovery will only be credible if the scientist has already published one or more studies on the subject. That's because once the results are published, other experts can read them, analyze them and check if they are solid — or if he made mistakes.

Why is it considered so important for other experts to analyze the first scientist's results? Because scientific progress has always been made by trial and error. So it's

perfectly normal, on certain subjects, for one study to say white while another says black. That means more studies are needed to find out who's right. It also means you must be patient before sharing the results on social media!

Examples taken from recent reporting

- [...] there have been changes in atmospheric currents, according to an article by Antara Banerjee and her colleagues of the University of Colorado in the latest edition of Nature...
- [...] This hypothesis, suggested by the authors in their research published last week in *Antiquity* [...]
- In an article published in February in *Bioscience*, a group of biologists from seven countries review [...]

When scientists make a statement based on their expertise, it's clearly relevant — in a debate on public health, for example. But it's still an opinion, as long as what they say can't be grounded in facts (see the Fact Sheet Information and opinion).

Be suspicious of celebrities!

A great many statements on health are made by celebrities —TV, movie or social media stars. Too often, they will base their recommendations for a treatment or a miracle food on their personal experience. It's important to remember: their opinion has no scientific value. Not even if it comes from your favourite movie star!

OTHER FACT CHECKING

In addition to these questions, you can go farther and check the following points:

Did the YouTuber question other researchers?

Journalists often will reflexively include an interview with a second researcher in their articles. This researcher didn't participate in the study, but knows the subject well enough to comment on it. He or she can provide reservations or clarifications that enlighten us on the limits of the study.

Does this involve an experiment on mice or on humans?

Any new drug or treatment must go through years of studies before it is approved. Some might try to convince us their drug is effective by describing it as "promising". But if the study behind this is still testing mice, be suspicious!

What is the sample?

A study of 50 people and a study of 50,000 people don't have the same value.

Do they talk about a "revolutionary", "extraordinary", "miraculous" discovery?

Be suspicious! Scientists never use this type of vocabulary. But a university or a company will sometimes use it to boost their advertising. Unfortunately, many authors, YouTubers or Instagrammers also use it. We have even seen cases where the author is selling the product or receiving advertising revenue.

What is the risk?

If an article or a video explains that a product is "dangerous" but never gives numbers, be suspicious. Ask yourself what quantity of this product is dangerous. Or if they say the risk increases 20%, that's 20% of what? A disease that affects one person in a million isn't the same as a disease that affects 1 in 10.

Two tips to check the quality of the studies cited

1. Do you see the word "meta-analysis" among the studies mentioned? If you do, that's a good sign. It means a synthesis of the scientific literature on a subject. In other words, several studies were analyzed to lead to these conclusions, not only one.
2. If it's a drug study, do you see the term "double-blind"? This type of study is more solid. It means the drug was tested on two groups, one of which received a fake pill (a placebo) without knowing it. If both groups feel equally well at the end of the study, this tells us the real pill isn't very effective.

If the subject is complex, target popular science sites

A discovery may be part of a much larger context you never heard about before. Or there may be a controversy involving debates unknown to you. If you rely on a quick Google search, you're likely to run into websites that only present one side of the controversy. Or you'll find a celebrity who's very popular, but not necessarily credible. To avoid this problem, you must learn to identify websites that specialize in popular science (see the Fact Sheet *How can you identify a reliable website?*).

Here are a few:

In Québec:

- Agence Science-Pressé;
- Québec Science;
- The TV show Découverte;
- For youth: Les Débrouillards.

Elsewhere:

- New Scientist;
- National Geographic;
- National Geographic Kids;
- Scientific American;
- Smithsonian Magazine.

EXERCISES

EXERCISE 1

Read this excerpt from an article and identify the reliable and unreliable (or dubious) information

Here's what Dr. April Fisher proposes to beat the coronavirus: the most important vitamin, vitamin D, followed by vitamins C and E, which are very useful against winter viral infections. They strengthen the immune system. And they improve your resistance to respiratory infections, like those caused by the coronavirus.

She also recommends taking another very promising food supplement, which you can find on her website: Naturetine, an effective antiviral. Major Canadian researchers are convinced that Naturetine is the most promising substance against the new coronavirus.

Suggestion: This exercise can take the form of conceptual maps, using the Popplet digital tool, for example. The student creates a diagram containing reliable information and enters the nature of the fact checking (as seen above). Then the student produces a second conceptual map, this time for dubious information, and again adds the necessary fact checking items.

EXERCISE 2

You read 4 articles that each contain 3 pieces of information. Which of these articles would you share on social media and why?

- a) A miracle treatment against the flu. Dr. Fisher is cited. She has published a study of 500 mice.
- b) A promising treatment against the flu. Dr. Fisher is cited. She has published a study of 50 people.
- c) George Clooney and Scarlett Johansson have tried this treatment. They were cured of their flu. They recommend it.
- d) A meta-analysis of this flu treatment. The results are promising. Dr. Fisher recommends it.

Suggestion: This activity will be performed by creating "memes". The student will have to choose a statement and convert it into a meme, using the Canva platform. You must ensure that all the articles will be addressed. After the memes are created, group them and present them in the Interactive Digital Table (IDT). Have the students respond on the credibility of these memes. Hold a group discussion on eventually sharing them on social media.

**It must be noted here that the memes created by the students must be educational, and not parodies.*

Additional exercise: The teacher can take a journalistic article from a recent local or national media publication. Avoid articles by opinion columnists. Ask the students to identify the most important information. Have them validate the quality of the scientific information contained in the article and the points that should be fact checked. Ask them to explain their choices.

EXERCISES

EXERCISE 3

Observe your behaviour when you click on an article or a video talking about science or health.

- Do you have a favourite subject (astronomy, environment, nutrition, etc.)? Do you click on anything your favourite social media outlet offers you, as soon as this subject is mentioned?
- Do you have well-established opinions on controversial subject (natural health, Big Pharma, government conspiracy, alarmism by a group of scientists, etc.)? Do you rely on what the social media algorithms send you?
- Do you faithfully read certain media or individuals (whom you follow through their newsletter, an RSS feed, Google alerts, etc.)?

Additional question: Do you feel these choices confine you to an information bubble? (If necessary, refer to the Fact Sheet *Confirmation bias*)? Whether your answer is yes or no, explain the arguments on which it is based. Propose solutions to vary your information sources. Explain why you considered a specific media outlet or individual is reliable. (If necessary, refer to the Fact Sheet *How can you recognize a reliable website?*).

Suggestion: This activity could also be transformed into a classroom debate. Instead of the validity of a specific website, it could address the choices we all make, sometimes unconsciously. This can also be an opportunity to record a podcast. The students, in teams of two, discuss their behaviour in response to what they see on the Web about science or health. Use the Anchor tool to record, edit and post the podcast.

Two additional exercises

The *Rumour Detector* proposes these two exercises (In french):

- [One of these news items is false. How can you identify it?](http://www.bit.ly/3gJxlGy) (www.bit.ly/3gJxlGy)
- [April 1: the Rumour Detector test](http://www.bit.ly/3eGtlKy) (www.bit.ly/3eGtlKy)

ANSWER KEY

1.

“She proposes”, “she recommends”: Opinions;

“Major Canadian researchers”: Too vague, no study cited.

“For sale on my website”: Does the author have commercial interests in the sale of this product?

Note that all the information on vitamins contained in this article may be true. But that doesn't prove they are treatments against a new virus.

2.

“D” would be the most interesting article, at first glance, given the meta-analysis. But “B” nonetheless is better than “A” (study only on mice) and “C” (celebrities' opinion).

3.

Rumour Detector exercises

The answers are here (In french):

[Exercise 1](http://www.bit.ly/3dA9PiM) (www.bit.ly/3dA9PiM)

[Exercise 2](http://www.bit.ly/2ADm67m) (www.bit.ly/2ADm67m)

TO GO FURTHER

[How to make a clinical trial say whatever you want](http://www.bit.ly/2UM9nqk) (www.bit.ly/2UM9nqk) – The Pharmafist

[A Skeptic's Guide to Health News and Diet Fads](http://www.bit.ly/304H6ib) (www.bit.ly/304H6ib) - On the Media

[Breaking News Consumer's Handbook: Infectious Disease Edition](http://www.bit.ly/2MsfjS) (www.bit.ly/2MsfjS) - On The Media

[5 things to keep in mind when fact-checking claims about science](http://www.bit.ly/3dxPMBH) (www.bit.ly/3dxPMBH) - Poynter

[Conseils santé douteux - 6 indices à repérer](http://www.bit.ly/2AGJctL) (www.bit.ly/2AGJctL) - Le Détecteur de rumeurs (Dubious health tips – 6 clues to identify them)