

**Title:** Scientific Literacy for all

**Subject area/discipline:** Interdisciplinary

**Grade level:** 7-12

**Suggested time:**

Synchronously (on-line or face-to-face): 150 minutes

Asynchronously: 150 minutes

**Overarching critical inquiry question:** What are the most essential attributes for ground-breaking scientists who impact the future in positive ways?

**Overarching critical inquiry task:** Tell a compelling story of the discovery of insulin in a way that can inspire powerful future actions to a selected audience using the most

**Lesson critical inquiry question:**

What makes scientific literacy of vital importance to living a healthy life? (Decode)

**Lesson critical inquiry task:**

Using scientific literacy, develop an infographic that highlights the best ways to help someone with diabetes lead the healthiest life achievable.

**Central ideas/learning goals:**

- understand what it means to be scientifically literate
- understand the importance of being scientifically literate to advocate for a healthy life for self and others
- apply scientific literacy to help themselves and others lead a healthy life
- connect scientific literacy to the study of comorbidity factors as they relate to diabetes

**Related concepts**

- scientific literacy
- healthy living (flourishing)

## Key competencies

- think critically in the process of scientific literacy
- think prospectively to choose future-oriented actions to help others lead the healthiest life possible
- apply a flourishing mindset\* (being compassionate with respect to people with diabetes; understand ways in which they suffer and help to alleviate this suffering)
- communicate scientific findings clearly, succinctly and appropriately for a specific purpose and audience.

\*Teacher Note: A Flourishing Mindset represents the thinking habits that support sustained well-being. To possess a Flourishing Mindset, certain thinking behaviours are necessary. These thinking behaviours result from an intentional and conscious desire to maximize the well-being of self and others and are designed to guide decisions on how to act to optimize the likelihood of meeting well-being goals (FlourishCo, 2020)

## Lesson overview

In this lesson students explore what it means to be scientifically literate and develop their own capacity to be scientifically literate in the context of helping people with diabetes lead the healthiest lives possible. They gather, select, assess and use scientific information to make sound decisions about how to best help people with diabetes. Building on their previous learning regarding physical health, students broaden their understanding of living healthy lives, allowing them to expand how to best manage diabetes beyond traditional approaches. Students share their learning in the form of an infographic with a particular audience of interest to them in an effort to make a compassionate difference in the lives of others.

## Materials and preparation required

- Appendix 5-1: Information Cards
- Appendix 5-2: Thinking Organizer
- Appendix 5-3: Guide to: *Are you being scientifically literate?*

## Opportunities for Differentiation

- Students in lower grades may be encouraged to work together in groups to share responsibility for all 8 information cards. Students in higher grades may be encouraged to work more independently.
- Students may be encouraged to select the information cards they believe they are most accessible to them or are of personal interest.
- Student can base the ideas for their infographic on some of the information provided in this lesson, on all the information provided, or extend and refine their ideas based on additional research.

## Launch the learning:

1. Provide students with the following definition for scientific literacy:

*Scientific literacy is the ability to read and understand, observe and make sense, select relevant and reliable information, communicate using appropriate language, listen and process and make sound decisions that are informed by science.*

2. Ask students to reflect on: “How helpful do you think it is to be scientifically literate to live a healthy lifestyle?” (not helpful; a little helpful; somewhat helpful; very helpful)
3. Invite them to indicate their initial thinking on a continuum such as the one below:



Encourage students to justify their choice considering their personal experiences and the experiences of others they know.

4. Ask students what living a healthy life may involve. As students share their thoughts invite them to consider a broader definition of a **healthy** life which includes many indicators beyond just physical health (for example, emotional, psychological, cognitive, mental and social health)

### Set the task

5. Inform students that they will be considering how being scientifically literate can be used to help develop an infographic that highlights the best ways to help someone with diabetes lead the healthiest lifestyle achievable. This infographic will need to communicate important and accurate information and suggest helpful actions to promote a healthier future.

### Construct understanding of criteria for being scientifically literate

6. Provide students with several pieces of information that suggest ways to improve the health of people who suffer from diabetes (see Appendix 5-1 for 8 information cards). Note that some information will be more scientifically sound than other information and that the information has been intentionally selected to surface the attributes of scientific literacy.

7. Ask students to consider the information on each card, summarize the topic the information addresses, and use the information to suggest ways to help people with diabetes lead the healthiest life possible. Using the thinking organizer in Appendix 5-2, encourage students to also describe how they used scientific literacy to suggest ways to help (do a think aloud to share the example provided in the template with students so that they have a clear understanding of how to complete the template)
8. Present students with the following descriptors for **scientific literacy. A person is scientifically literate when they...**

- are open-minded (willing to open my mind to other ideas if it is supported by quality evidence), full-minded (I make up my mind only after I've considered enough evidence) and fair-minded (I don't reject any evidence until I've thought about its quality regardless of source)
- consider how reliable sources of information are
- select and use information that is both directly and indirectly relevant
- consider the quality of the information; it's strengths and limitations – what is known and what is yet to be known
- identify options and select thoughtfully from those options
- transfer scientific knowledge into specific everyday contexts
- observe and generalize specific phenomena
- accurately read, understand and communicate scientific terms and concepts
- make sound decisions informed by science
- understand past trends and think prospectively to guide current and future actions

Ask students to indicate which aspects of scientific literacy they used as they considered the helpfulness of each piece of information in determining what actions can be taken to help those with diabetes live a healthy life. Provide students time to revisit the information on of each of the cards using all of the descriptors to help them build their capacity to be scientifically literate (see Appendix 5-3: How to be scientifically literate)

9. Have a class discussion inviting students to share how their ideas (about ways to help people with diabetes lead the healthiest lifestyle achievable) changed after they applied the descriptors (criteria) for being scientifically literate.

### **Encourage Iterative Thinking**

10. Invite students to revisit the definition for scientific literacy:

*Scientific literacy is the ability to read and understand, observe and make sense, select relevant and reliable information, communicate using appropriate language, listen and process and make sound decisions that are informed by science.*

Encourage them to revise it so that it captures all they have learned about being scientifically literate.

11. Ask students to revisit their initial thinking on: “How helpful do you think it is to be scientifically literate to live a healthy lifestyle?”
12. Invite them to compare their initial assessment (made in the Learning Launch) to their current position using the same continuum:

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not at all helpful	a little helpful	somewhat helpful	very helpful
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Encourage students to justify why their assessments have changed using their learning.

### **Consolidate learning**

13. Share the following statements with students:
  - A) *It is becoming increasingly difficult to discern between what is fake and what is real, so we need to communicate the science in ways the public can understand and have that information be timely and relevant to the decisions they have to make. (Mark Balschweid)*
  - B) *Scientific knowledge helps people to be better-informed and make the best decisions possible with the best available knowledge.*

Invite students to discuss in partners what each of these quotes tells about the importance of scientific literacy. Chart the class ideas ensuring students understand the following two reasons why it is important that all people become scientifically literate:

- to discern information that is reliable vs. unreliable
- to make sound decisions based on scientific truths

14. Connect the above two ideas to the process of the scientific method. For example, discuss with students how the scientific method involves making a

hypothesis based on current scientific knowledge and understanding, that is then tested thoughtfully using the evidence gathered to draw a reasoned conclusion.

15. Ask students, working in small groups of 3-4 to generate additional ideas on why it is important that all people become scientifically literate. Add them to the charted list.

16. Invite students to consider the following additional reasons for why it is important that all people become scientifically literate and to affirm, revise and extend the ideas on the charted list.

- a) to appreciate the world around them;
- b) to make informed personal choices;
- c) to be able to intelligently discuss public issues
- d) to appreciate everyday activities;
- e) to be able to synthesize information from various topics
- f) to be able to evaluate information to decide a suitable course of action
- g) to communicate ideas clearly, succinctly and appropriately for a specific purpose and audience.

17. Ask students to consider the following question: If you found out a close friend or family member was diagnosed with diabetes and you wanted them to consider the best ways to lead the healthiest life possible, how could you use scientific literacy to guide your thinking. Help students connect their response to the criteria for scientific literacy (Appendix 5-3).

18. Provide students with time to apply what they have learned about scientific literacy to identify the best ways for people with diabetes to lead the healthiest life possible and to communicate their ideas in the form of an infographic using the software Canva or other method they are comfortable with. Encourage students also identify a specific audience for the infographic (might be someone they know with diabetes, a specific age-group or demographic, or a specific type of diabetes, or to increase general awareness, to name a few). Note that students can draw on the ideas they came up with in this lesson or grow and refine these ideas by gathering more research. Additional research may be necessary if the student's audience is tightly targeted.

### **Share your infographic (where is it going?)**

19. Encourage students to share their infographic with a peer, family member or teacher to gather feedback on its effectiveness. Students may use the

criteria for scientific literacy and the following criteria for an effective infographic in the feedback process:

- focused on a clear, single message or goal
  - concisely includes only most important, actionable information
  - information included is accurate and credible
  - includes a clear, concise and captivating title that grabs the reader's attention
  - uses simple combination of primary colours chosen with specific reasons
  - elements are well-spaced out allowing clean spaces (spaces without text)
  - use no more than three fonts (one for title; one for body; one for flavour)
  - spelling and grammar mistakes do not distract or confuse the reader
- Encourage students to make independent, justifiable choices about what feedback to heed.

20. Encourage students to share or post their infographic so that their intended audience can have access to it. Where appropriate encourage them to use a social media platform that appeals most to their audience.

### **Wrap up learning**

21. Have students revisit their list of the most essential attributes for a groundbreaking scientist. Encourage them to consider to what degree being scientifically literate fits into their list. Are there descriptors of scientific literacy that they have already captured? Are there descriptors that are missing and should be added to the list? What percentage of the overall list of essential attributes describe being scientifically literate? What role does participation in science communication play in validating scientific literacy or characterizing a groundbreaking scientist?
22. Invite students to consider if and in which ways a person with diabetes can lead the healthiest life possible could be included in their compelling story of the discovery of insulin, particularly as they try to inspire future actions.