

# Applying Universal Design for Learning to OER

Josie Gray (she/her)

BCcampus

[jgray@bccampus.ca](mailto:jgray@bccampus.ca)

May 31, 2023

Download slides:  
[bit.ly/beyondaccessibility](https://bit.ly/beyondaccessibility)

# Session Topics

- Review of first session
- Social model of disability
- Universal design for learning (UDL)
- Multimodality and multiple formats
- Accessible math
- Image descriptions

# Review: Technical Accessibility

- Assistive technologies
- Web Content Accessibility Guidelines (WCAG)
- Specific accessibility guidelines for different types of content

# Accessibility Checklists

## Strengths

- Easy to understand and follow
- Highlight the most important technical considerations to make sure students with disabilities can access the material

## Weaknesses

- Accessibility as something that we can go back and fix later
- Do not ensure good design
- Do not account for the multiple formats of OER
- Students face challenges not addressed in standard accessibility checklists
- Does not ensure equal access to learning outcomes

# Medical Model vs. Social Model of Disability

## **Medical Model:**

"Disability as an individual problem, affliction, or deficit that needs a cure or accommodation."

## **Social Model:**

Disability as a spectrum that can affect different people in different ways depending on their context, environment, and the tools they have access to, and is a product of history and culture.

What is the  
result of these  
different  
models?

## **Medical Model:**

- Student must request accommodations
- Instructor does not make permanent changes to their teaching
- Only the student who made the request receives the accommodation

## **Social Model:**

- The designer works to reduce/eliminate barriers from the beginning
- Assumption that students are diverse and have a variety of access needs and preferences

# What is "accessibility"

Accessibility is what happens when we design and create resources, experiences, tools, and spaces that make space for and support the diversity of our bodies and minds and centres the needs of people with disabilities to ensure they can engage in the ways that work best for them.



**BCcampus**  
Learning. Doing. Leading.

# What is an average student?

The classroom, “far from neutral, is constructed for a mythical, “able-bodied,” neurotypical norm that neither reflects nor accommodates the wide range of diverse learners within it, regardless of whether these learners have been diagnosed with a disability” (Wilson, 2017).





**BCcampus**  
Learning. Doing. Leading.

# What else affects accessibility?

- **Day-to-day life**
- **Digital literacy**
- **Access to technology**

# Universal Design for Learning (UDL)

Provide multiple means of

- Engagement (WHY)
- Representation (WHAT)
- Action and Expression (HOW)

# Multiple Means of Representation

Guidelines:

1. Perception
2. Language and symbols
3. Comprehension

# Guideline 1: Perception

Interact with flexible content that doesn't depend on a single sense like sight, hearing, movement, or touch.

1. Offer ways of customizing the display of information
2. Offer alternatives for auditory information
3. Offer alternatives for visual information


---

CAST (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from <http://udlguidelines.cast.org>

# Provide Multiple Formats

Web, HTML, PDF, EPUB

**Math for Trades**  
Volume 2



[open.bccampus.ca](https://open.bccampus.ca) **BCcampus** OpenEd

**Download this book** ▲

- EPUB3
- Digital PDF
- Print\_\_pdf
- XHTML

# Multimodality

Combining text, images, video, audio, and interactivity to give students multiple ways to engage with content.

Examples:

- Text-to-speech
- Audiobooks
- Videos
- H5P

# Text-to-speech

Linear measurements represent a single dimension. This means there is only one line or one plane being measured. Basically it means that it's a line of some type, either straight, curved or

which is long and straight or it could be a road in the Columbia which can be narrow and windy. If the item or object you are measuring is straight on, you're measuring will only have a length.

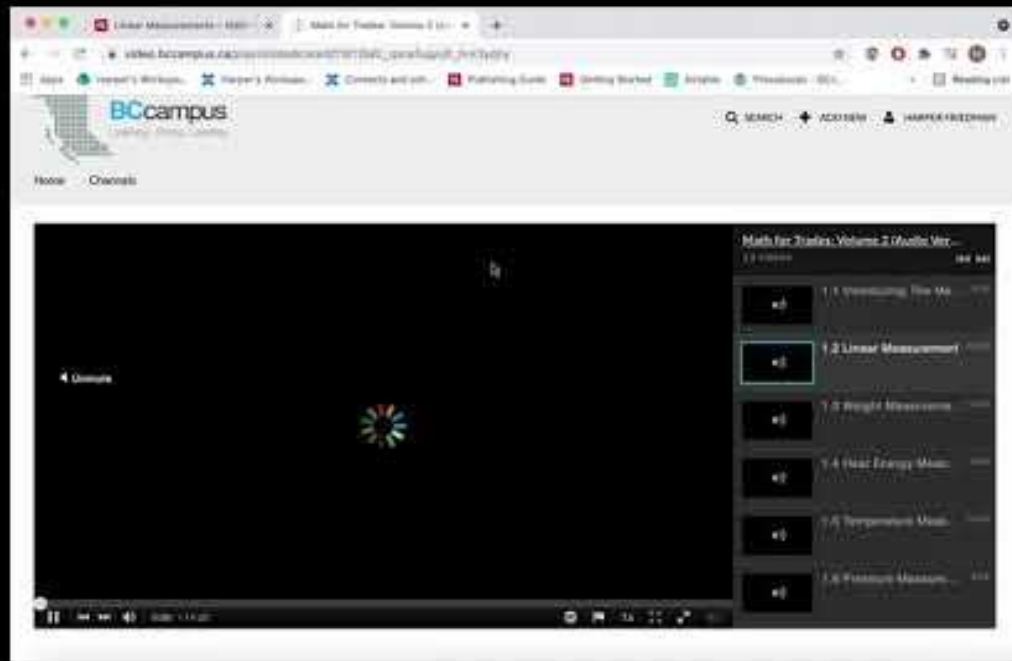
Measuring length can be accomplished using many different types of units. You've heard of a mile, foot, yard and inch but have you ever heard of a furlong, link, pole or a league? Those are all examples of imperial linear measurement.

How about on the metric side. We have the metre, the centimetre and millimetre. These would all be familiar to us. But how about

Linear measurements represent a single dimension. This means there is only one line or plane

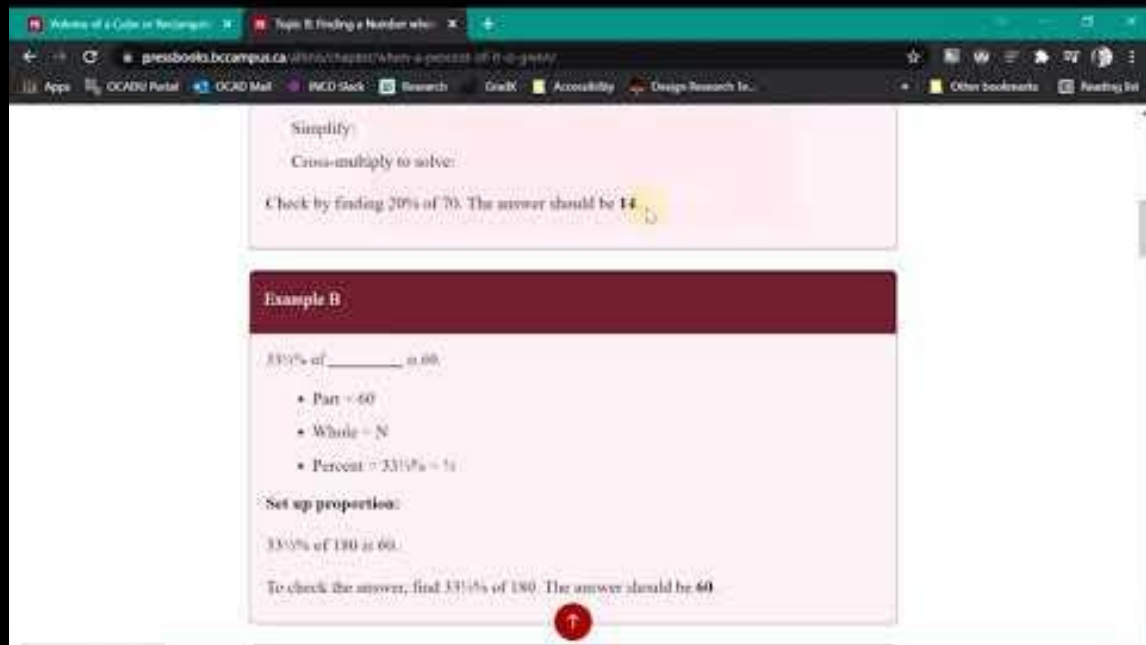
being measured. Basically it means that it's a line of some type, either straight, curved,

# Audio books





# MathJax - Zoom



The screenshot shows a web browser window with two tabs. The active tab is titled "Topic B Finding a Number when..." and the address bar shows the URL "pressbooks.bccampus.ca/afms/chapter/when-a-percent-of-it-is-given/". The browser's bookmark bar includes links to "Apps", "OCADU Portal", "OCAD Mail", "INCO Slack", "Research", "Globe", "Accessibility", and "Design Research Inc.". The main content area displays a page with a pink background. A section titled "Simplify:" is followed by the instruction "Cross-multiply to solve:". Below this, a text box contains the sentence "Check by finding 20% of 70. The answer should be 14." with the number "14" highlighted in yellow. A second section, titled "Example B" in a dark red header, contains the text "33 1/3% of \_\_\_\_\_ is 60." followed by a bulleted list: "• Part = 60", "• Whole = N", and "• Percent = 33 1/3% = 1/3". Below the list, it says "Set up proportion:" and "33 1/3% of 180 is 60." The final sentence in this section is "To check the answer, find 33 1/3% of 180. The answer should be 60." A red circular icon with a white upward-pointing arrow is positioned at the bottom center of the page.

Simplify:

Cross-multiply to solve:

Check by finding 20% of 70. The answer should be 14.

**Example B**

33 1/3% of \_\_\_\_\_ is 60.

- Part = 60
- Whole = N
- Percent = 33 1/3% = 1/3

Set up proportion:

33 1/3% of 180 is 60.

To check the answer, find 33 1/3% of 180. The answer should be 60.

# Guideline 2: Language and Symbols

Communicate through languages that create a shared understanding.

1. Clarify vocabulary and symbols
2. Clarify syntax and structure
3. Support decoding of text, mathematical notation, and symbols
4. Promote understanding across languages
5. Illustrate through multiple media

---

CAST (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from <http://udlguidelines.cast.org>

# Glossary

## Ohm's Law

Combining the elements of **voltage**, **current**, and **resistance**, George Ohm developed the following formula:

The difference in electric potential between two points, which is defined as the work needed per unit of charge to move a test charge between the two points. It is measured in volts (V).

- $E$  = Voltage in volts
- $I$  = Current in amps
- $R$  = Resistance in ohms

"Ohm's Law" screenshot is from *Basic Motor Control* by Aaron Lee and Chad Flinn. Licensed under a [CC BY 4.0 licence](#).

# Video demonstrations

## Video: Global Virgin Application – Oxidative Colour

Note: Video has no sound.



# Screen reader reading math

So what we end with is:

$$1 \text{ ft}^3 = 1728 \text{ in}^3$$

Now we can answer the question:

How many cubic feet are there in a tank which contains 2652 cubic inches?

What you do here is take the number of cubic inches you have and divide it by the number of cubic inches there are in one cubic foot.

$$\text{ft}^3 = \frac{\text{in}^3}{\text{in}^3/\text{ft}^3}$$
$$\text{ft}^3 = \frac{2652 \text{ in}^3}{1728 \text{ in}^3/\text{ft}^3}$$
$$\text{ft}^3 = 1.53$$

Let's go through another example and once again we'll put a spin on the question.

# Guideline 3: Comprehension

Construct meaning and generate new understandings.

1. Activate or supply background knowledge
2. Highlight patterns, critical features, big ideas, and relationships
3. Guide information processing and visualization
4. Maximize transfer and generalization

---

CAST (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from <http://udlguidelines.cast.org>

# Structure of Information

- Scaffolding new knowledge
- Resource navigation options
- Chapter and heading titles
- Numbering systems (i.e., headings, figures, tables)
- Consistent chapter elements and structure

# H5P

<https://h5p.org/>

and

<https://kitchen.opened.ca/>

- Interactive web-based activities and formative assessments
- Available in Pressbooks – activities can be embedded in the webbook
- Can build your own activities or reuse and remix activities created by others



# H5P: Multiple Choice

Mark all of the fragments in the list of sentences below.

☒ To find the perfect apartment.

☒ Working without taking a break.

☐ I needed to bring work home.

☒ Unless the ground thaws before spring break.

☐ You'll find what you need if you look.

☐ We try to get as much work done as we can in an hour.

☐ We won't be planting any tulips this year.

☐ Deidre scoured the classifieds each day.

☒ In order to meet the deadline.

☒ On the shelf next to the potted plant.

 Check

 Reuse  Rights of use  Embed

H5P

"Fragments" activity by Brenna Clarke Gray was adapted from content from *Writing for Success - 1st Canadian Edition*, which is licensed under a CC BY-NC-SA 4.0 licence.

# H5P: Interactive Video



“Hand washing interactive video” by Michelle Hughes is licensed under a CC BY-NC 4.0 licence.

# H5P: Image Hotspots

## + Clear, Informative Title

### Clear, informative headline +

+ Topic sentence that's related to the organizational pattern you're using. Supporting information that supports the topic sentence, provides examples, identifies causes, defines effects or otherwise supports the claim made. +

+ Transitional paragraph that summarizes the previous point, introduces the next point and shows how the two are related.

### Clear, informative headline parallel to first

Another topic sentence that states the paragraph's main point. Supporting information as necessary. Transitional sentence that sets up the paragraph list:

- + Topic sentence: Supporting details.
  - Topic sentence parallel with first: supporting details.
  - Topic sentence parallel with second: supporting details.

Reuse <> Embed

H5P

"Organizing Information" activity by Arley Cruthers is licensed under a CC BY-NC 4.0 licence.

# Textboxes

Can be used to:

- Highlight the most important ideas of a section.
- Walkthrough key processes or procedures.
- Provide concrete examples or case studies to support main ideas.

*Example A*

Express 4:5 in higher terms.

$$4:5 = \frac{4}{5} \rightarrow \frac{4}{5} \left( \frac{\times 2}{\times 2} \right) \rightarrow \frac{8}{10}$$

4:5 is equivalent to 8:10

# More information on UDL

## Universal Design for Learning Guidelines

- Explore all of the principles in more detail
- Read about the guidelines and checkpoints, which provide more detail about what each principle includes.
- Lots of concrete examples.

(<https://udlguidelines.cast.org/>)



**BCcampus**

Learning. Doing. Leading.

# Designing for Print

ANNOTATE: Why might someone want a print copy?

# Print Design Considerations

- Text size
- Links to additional resources
- Access to multimedia content

Move through the slides at your own pace. You can use the quiz questions to test your knowledge. After you're done, you'll be invited to reflect on what you learned.



An interactive H5P element has been excluded from this version of the text. You can view it online here:

<https://kpu.pressbooks.pub/businesswriting/?p=1322#h5p-38>





**BCcampus**  
Learning. Doing. Leading.

Let's practice describing  
images!

# Tips for Writing Image Descriptions

## **What to describe**

- Content/purpose of the image.
- Will depend on audience/context

## **How to describe**

- Be objective
- Be concise.
- If image is complex, go from general to specific

# Starry Night by Vincent van Gogh



“Starry Night” by Vincent van Gogh is in the public domain.

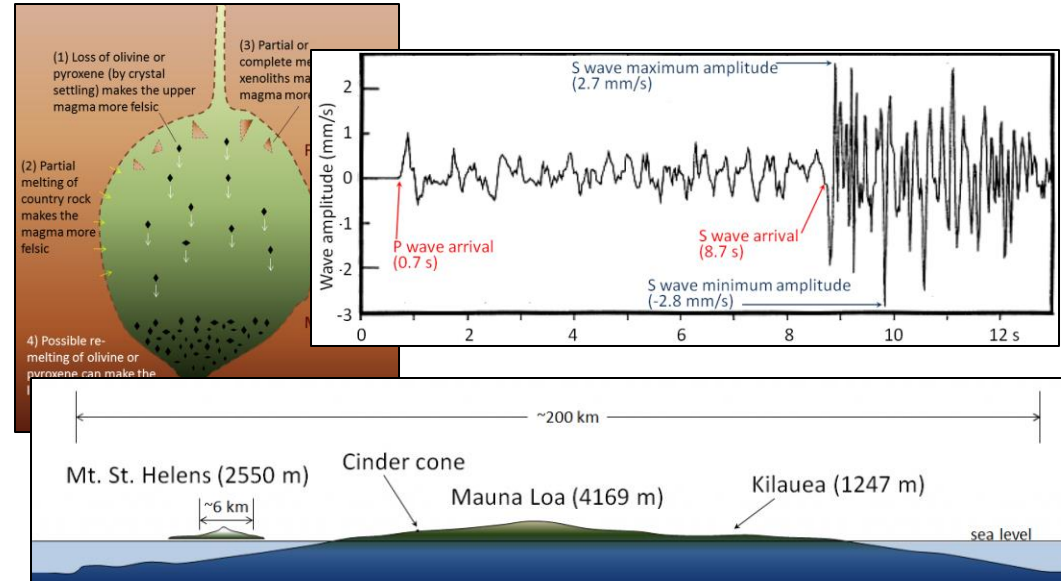
# Where to describe an image

1. Alternative text field (ALT text).
2. Surrounding text or caption.
3. Long description linked somewhere else in the resource.

# Long Descriptions for Complex Images

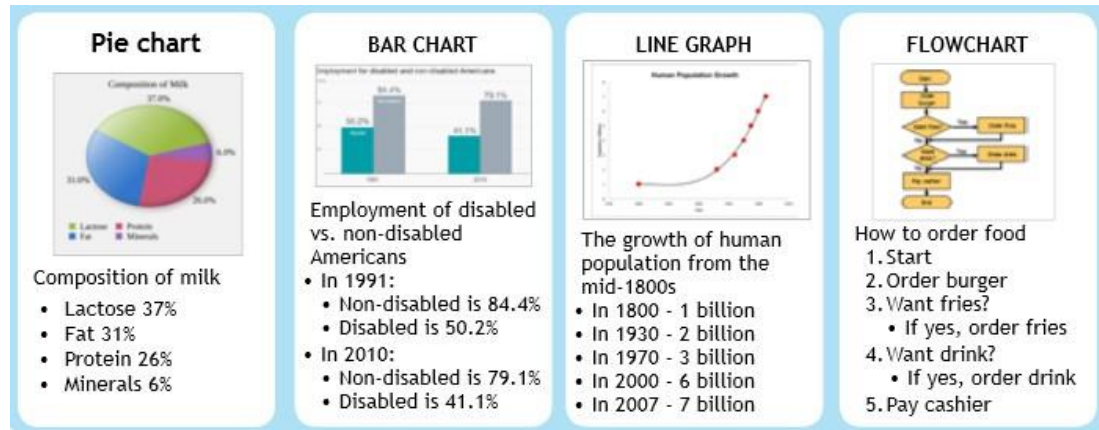
## Examples

pie charts, bar charts, line graphs, flow charts, diagrams, illustrations, math graphs, and maps



Magma Chambers, P and S Waves, and Volcano Size © Steven Earle. CC BY

# Lists



Bulleted and numbered lists can be used to present information found in

- Pie charts
- Bar charts
- Line graphs
- Flow charts

Adapted from © Supada Amornchat. [Complex Images for All Learners \[PDF\]](#). CC BY-NC-SA.

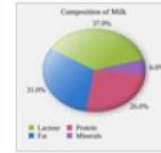
# Data Tables

Data tables can be used to present information found in

- Complex tables
- Bar charts
- Line graphs
- Pie charts

## PIE CHART

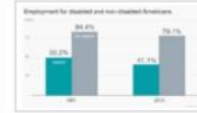
List the numbers from smallest to largest.



| Composition | %  |
|-------------|----|
| Minerals    | 6  |
| Protein     | 26 |
| Fat         | 31 |
| Lactose     | 37 |

## BAR CHART

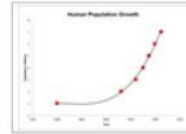
Briefly describe the chart & a summary, and provide title and axis labels.



| Year | Non-disabled | Disabled |
|------|--------------|----------|
| 1991 | 84.4%        | 50.2%    |
| 2010 | 79.1%        | 41.1%    |

## LINE GRAPH

List the numbers from earliest to latest year.



| Year | Population |
|------|------------|
| 1800 | 1 billion  |
| 1930 | 2 billion  |
| 1970 | 3 billion  |
| 2007 | 7 billion  |

## COMPLEX TABLE

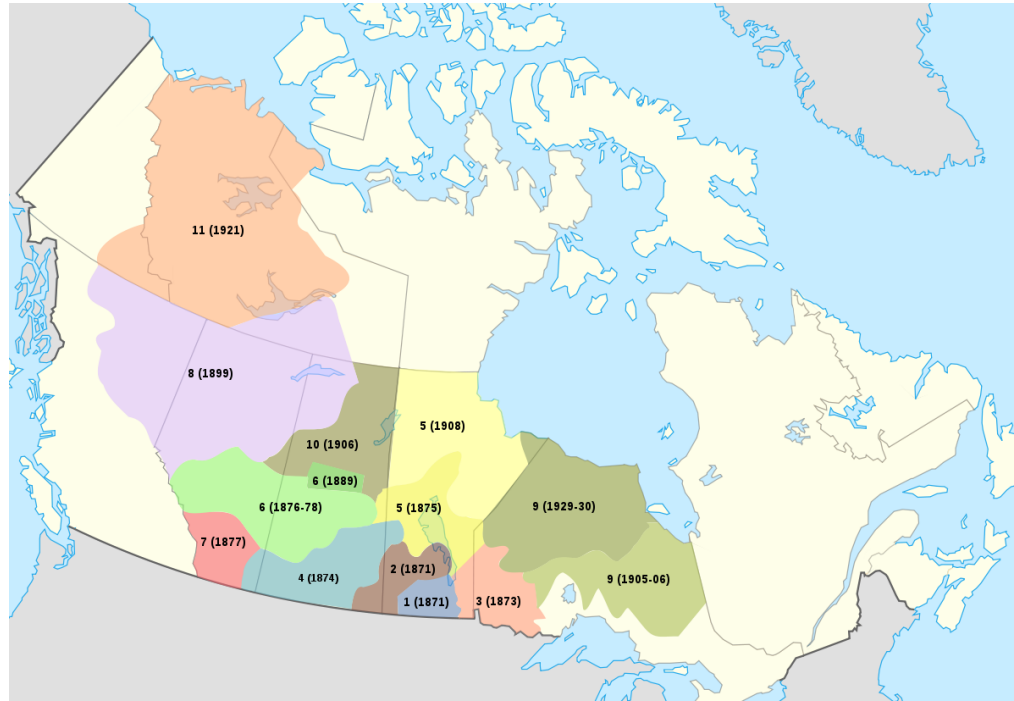
Data separated into 3 tables aids cognitive overload in navigation.



Adapted from © Supada Amornchat. [Complex Images for All Learners \[PDF\]](#). CC BY-NC-SA.



# How would you describe: Map of the Numbered Treaties



"[Numbered Treaties Map](#)" by [Themightyquill](#) is licensed under a [CC BY-SA 2.5](#) licence. Adapted from work by [STyx](#) and [Yug](#).



# Things to consider:

- What information is already provided in the surrounding text? What information is only conveyed in the image? What do I want students to take away from this image?
- How to order the treaties
  - Based on date (i.e., old to new)
  - Based on location (i.e., south east to north west)
  - Based on size (i.e., big to small)
- How much detail to include
  - How much area is covered by each treaty
  - What borders each treaty

# How would you describe this image?

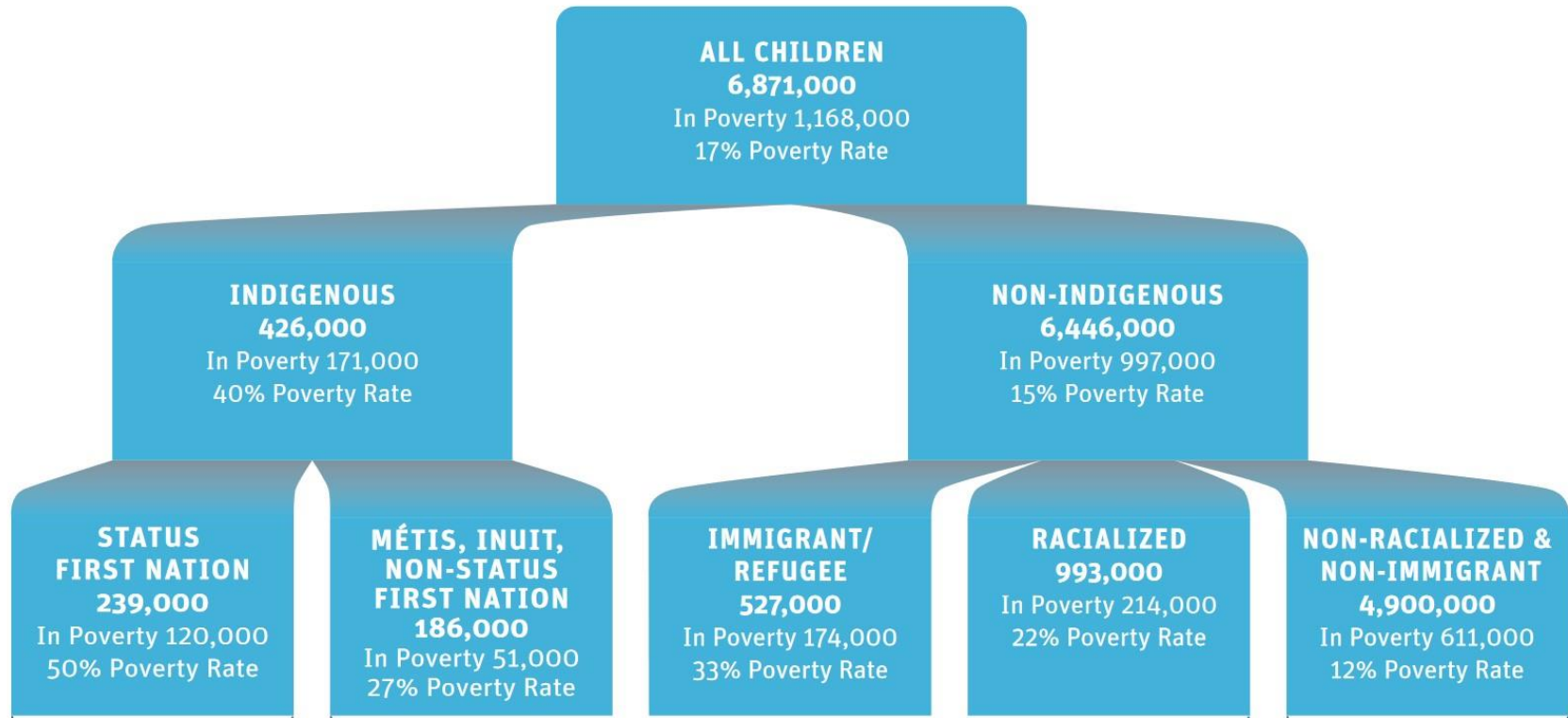


Image source: Macdonald, D., & Wilson, D. (2013). [Poverty or Prosperity: Indigenous Children in Canada \[PDF\]](#). Canadian Centre for Policy Alternatives. Not openly licensed.

# Option 1: Bulleted List

A flow chart describing the poverty rates of different groups of children in Canada based on 2006 census data.

- **6,871,000 total children:** 1,168,000 in poverty, 17% poverty rate.
- **426,000 Indigenous children:** 171,000 in poverty, 40% poverty rate.
  - 239,000 Status First Nation children: 120,000 in poverty, 50% poverty rate.
  - 186,000 Métis, Inuit, Non-Status First Nation children: 51,000 in poverty, 27% poverty rate.
- **6,446,000 Non-Indigenous children:** 997,000 in poverty, 15% poverty rate.
  - 527,000 Immigrant/refugee children: 174,000 in poverty, 33% poverty rate.
  - 993,000 Racialized children: 214,000 in poverty, 22% poverty rate.
  - 4,900,000 Non-racialized and non-immigrant children: 611,000 in poverty, 12% poverty rate.

# Option 2: Table

A flow chart describing the poverty rates of different groups of children in Canada based on 2006 census data. The data is provided in the below table.

| Group  | Total Children | Total In Poverty | Poverty Rate |
|--|----------------|------------------|--------------|
| All children                                       | 6,871,000      | 1,168,000        | 17%          |
| All Indigenous children                            | 426,000        | 171,000          | 40%          |
| Status First Nation children                       | 239,000        | 120,000          | 50%          |
| Métis, Inuit, and Non-Status First Nation children | 186,000        | 51,000           | 27%          |
| All Non-Indigenous children                        | 6,446,00       | 997,000          | 15%          |
| Immigrant/Refugee children                         | 527,000        | 174,000          | 33%          |
| Racialized children                                | 993,000        | 214,000          | 22%          |
| Non-racialized & Non-Immigrant children            | 4,900,000      | 611,000          | 12%          |

# POET Training Tool

[poet.diagramcenter.org/](https://poet.diagramcenter.org/)

- When to describe images
- How to describe images
- Practice describing images

Lots of examples.

# Session Recap

- Social model of disability
- Universal design for learning (UDL)
- Principle of Multiple Means of Representation
  - Perception
  - Language and Symbols
  - Comprehension
- Image descriptions

# OER Production Series Webinars

- Find, Use, and Share OER
- Introduction to Pressbooks
- Technical Accessibility
- Applying UDL to OER
- Advanced Pressbooks

Recordings at <https://bccampus.ca/events/>



# Questions?

Download slides and list of links: [bit.ly/beyondaccessibility](https://bit.ly/beyondaccessibility)