RECYCLE YOUR ELECTRONICS

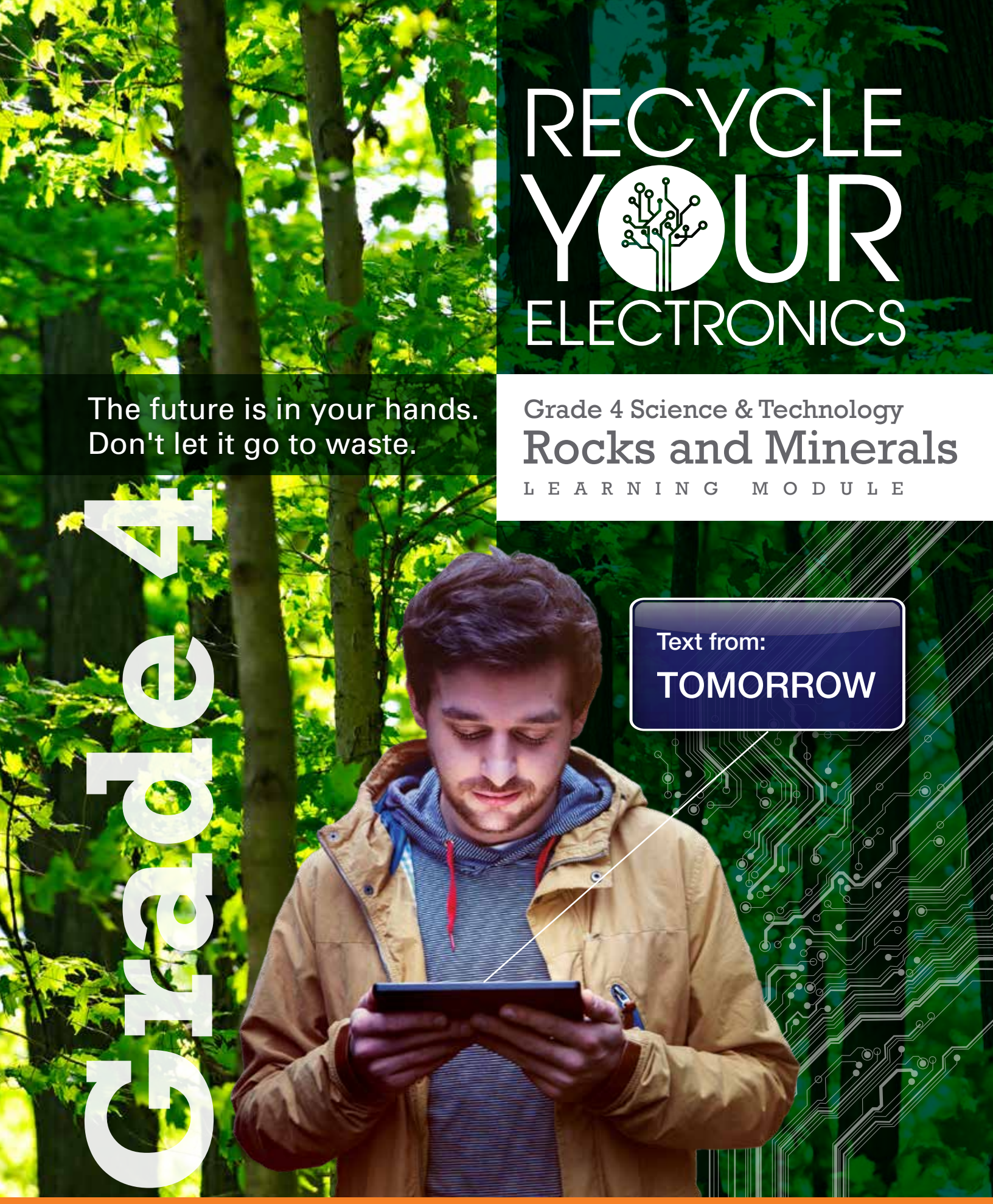
The future is in your hands.
Don't let it go to waste.

Grade 4 Science & Technology

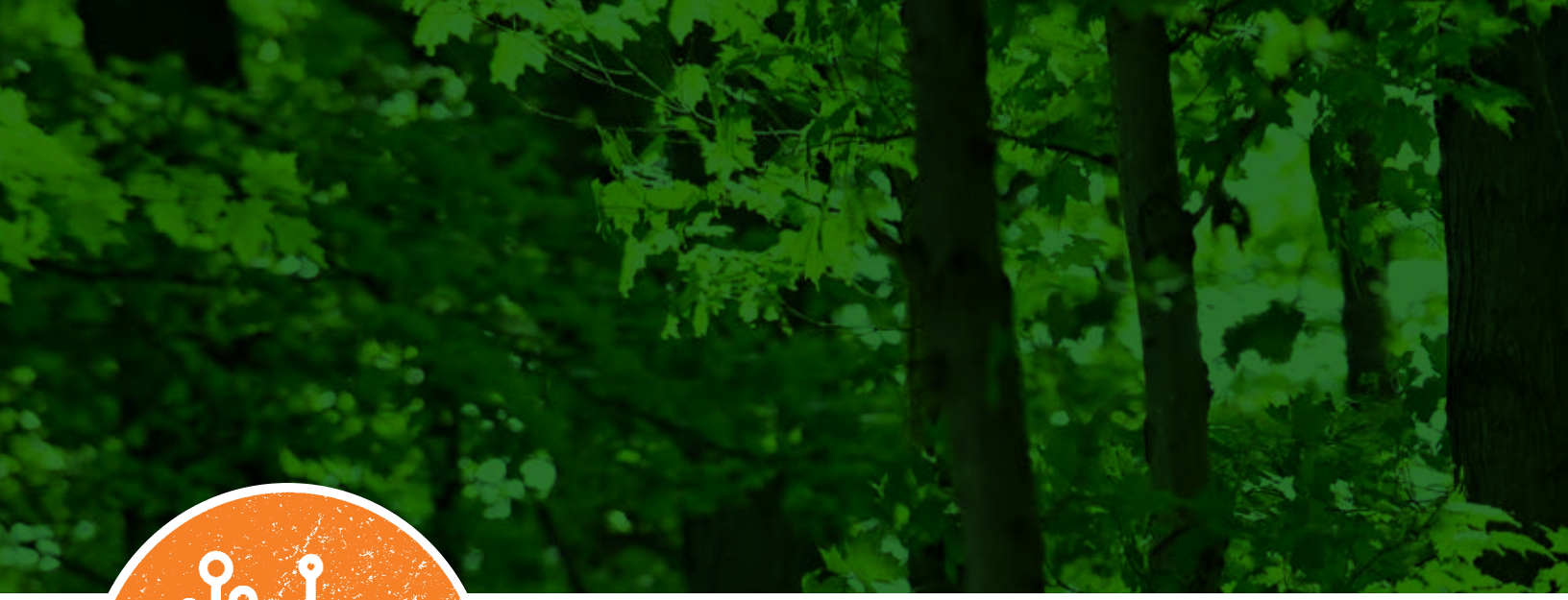
Rocks and Minerals

LEARNING MODULE

Grade 4



Ontario Electronic Stewardship



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Let's Get Started

Notes: For Teachers and Parents

Students, Parents and Educators,

When I was a student I remember thinking; "When am I going to use this in real life?"

I wondered how and why all the information I was learning was relevant and if I would ever actually use it.

Ontario Electronic Stewardship is helping to make the connection between elements of the Ontario curriculum and recycling end of life electronics.

Electronic devices are part of our everyday. We rely on them. All of those lessons in math and science, lessons about electricity and the elements, plus minerals and systems — are now sitting right in my hand, because together, they make up my electronic devices.

What happens to those electronic devices when we are done with them? They contain valuable commodities such as gold, aluminum, copper, glass and plastics. Shouldn't they be recycled responsibly so that we can reuse these resources?

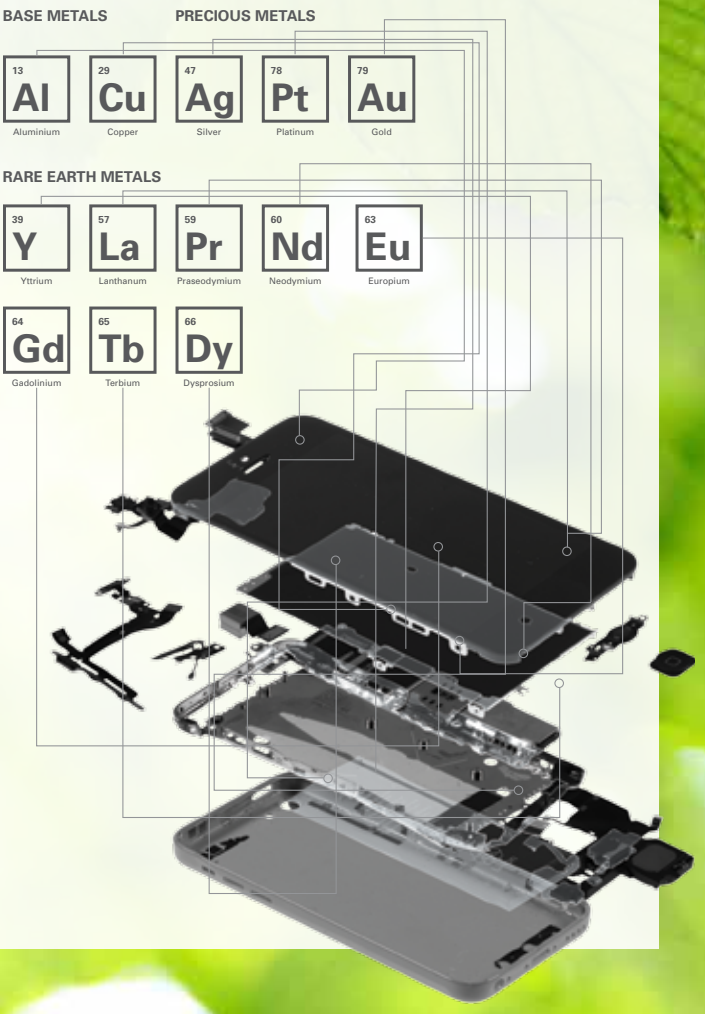
This is where Recycle Your Electronics, Ontario's electronic waste recycling program — operated by Ontario Electronic Stewardship, comes in. We want people to know that they can easily and effectively recycle their electronics. In fact, there's a drop off location within about 10 km of you, if you live in Ontario. You can find one by entering your postal code into our drop off location finder on our website.

Check out: www.recycleyourelectronics.ca

This learning module aims to engage students in determining how they can take responsible actions to reduce, reuse, and recycle electronics. If the environment were able to send us a text or give us a call from the future – it would ask us for our help. How will we answer?

The future is in our hands.
Don't let it go to waste.

Melanie Wilde,
Executive Director
Ontario Electronic Stewardship



The Misinstry of the Environment and Climate Change has regulated obligated end of life electronics under the Onatrio Waste Diversion Act (220). Ontario Electronic Stewardship (OES) is the not for profit industry led organization that fulfills obligations set out by Ontario's Waste Diversion Act.

Curriculum Connections

This e-waste recycling module was developed to support the following expectations of the Ontario Grade 4 Science and Technology (2008) curriculum:

GRADE 4
Understanding Earth and Space Systems: Rocks and Minerals

Fundamental Concepts	Big Ideas
Sustainability and Stewardship	The properties of rocks and minerals determine society's possible uses for them.
Structure and Function	Our use of rocks and minerals affects the environment.

Overall Expectations

By the end of Grade 4, students will:

1. assess the social and environmental impacts of human uses of rocks and minerals;
2. investigate, test, and compare the physical properties of rocks and minerals;

Specific Expectations

1. Relating Science and Technology to Society and the Environment

By the end of Grade 4, students will:

- Assess the social and environmental costs and benefits of using objects in the built environment that are made from rocks and minerals
- Aluminum is used to make soft drink containers and trash cans. It can be recycled many times, and recycling uses much less energy than making aluminum from ore. Aluminum can also be found in electronics.

2. Developing Investigation and Communication Skills

- Use scientific inquiry/research skills to investigate how rocks and minerals are used, recycled, and disposed of in everyday life

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What Happens to Our Electronics?

Lesson 1

Lesson 1 TEACHER NOTES

Opening Discussion and Activity: What Happens to Our Electronics?

Class Discussion

On a screen, show the class the following image:

What Electronics Can Be Recycled - Ontario
http://www.recycleyourelectronics.ca/home/what-can-be-recycled/

Scroll down the page slowly, allowing all the students to see the devices.

Ask the students:

- What do you call all these devices? Is there is common name for all of them?

Prompt if necessary: Has anyone heard of the term "electronic device"
These are all considered electronics.

Write the word electronics on the board.

Is there a word that you recognize that is similar to this? (Electricity)

What do all of these devices have in common? (They use electricity.)

Activity – Add Up The Electronics

Hand out the sheet: Add Up The Electronics (found on pages 11-13)

Have the students complete the sheet, adding up all the electronics they have at home.

Gather all the student totals and add them up for a class total.

Typical families have 20-40 electronic devices in their homes.

Here's the math:

If every student in our class has approximately 20 electronic devices in their home, how many electronic devices are being used?

How many for the families in the entire school?

TEACHER NOTES

Class Discussion

Ask the class:

- Are you surprised by this number?
- What are the most popular devices? List them.

Each student lists how many of these popular devices they have at home.

Tally up the total for your class.

Ask the class:

- What happens when they are no longer useful?
- What does your family do with them?

Record the students' ideas.

Think about how many devices we have in this class.
Think about how many devices the students in this school may have.
How about the people in our community?

Ask the class:

- What do you think is the best way to deal with electronics when they are no longer needed?

ICT Connection

Let's take a look at what happens when end of life electronics are not recycled properly. Show the link.

Go to: http://www.pbs.org/frontlineworld/stories/ghana804/video/video_index.html

On this site, beneath the video is the script of the narration to review after viewing.
Find Ghana on the map.
Lead a discussion afterwards: ask for first impressions –what surprised the student most.

Further questions

- How do we define e-waste or electronic waste?
- Why do you think the electronic waste ends up in Ghana and China?
- What responsibility do we have for taking care of these devices after we are finished with them?

Think Critically

What are some of the questions you have about what you've just seen?

Which of these questions would we like to learn more about?

How are we going to answer these questions?

Ontario Electronics Stewardship (OES) is an industry-led not-for-profit organization, working to keep end of-life electronics out of landfills through convenient and regulated electronics recycling programs. Here are two videos about responsibly recycled electronics:

http://recycleyourelectronics.ca/helpful-resources/Why Recycle Your Electronics

Go to: GEEP, Barrie, Ontario - 'Electronic Recycling Processing Facility'
https://vimeo.com/29998353

What questions do you have after seeing these videos?

Summary Discussion:

- What have you learned about the differences in the ways electronics are dealt with after they are used?
- Why is it important for all Ontario Residents to responsibly recycle end of life electronics?

Add Up The Electronics

Circle the devices you have at home: in-use and out-of-use.

Indicate the number of each device. Add up the total number of the devices.

Audio Player
(tape, disk, digital)

Number of devices

Audio Recorder
(tape, disk, digital)

Number of devices

Camera
(tape, disk, digital)

Number of devices

CD-ROM Drive

Number of devices

Computer Disk Drive

Number of devices

Computer Flatbed Scanner

Number of devices

Computer Keyboard

Number of devices

Computer Mouse

Number of devices

Computer Terminal

Number of devices

Amplifier

Number of devices

Copier

Number of devices

Equalizer

Number of devices

STUDENT ACTIVITY

Opening Discussion and Activity:
What Happens to Our Electronics?

Fax Machine

Number of devices

Micro Computer

Number of devices

Mini Computer

Number of devices

Answering Machine

Number of devices

Desktop Computer

Number of devices

Laptop Computer

Number of devices

Modem

Number of devices

Monitor

Number of devices

Pager

Number of devices

PDA

Number of devices

Preamplifier

Number of devices

Printer

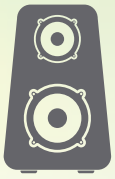
Number of devices

Projector

Number of devices

Radio

Number of devices



Speakers

Number of devices

Tablet

Number of devices

STUDENT ACTIVITY

Opening Discussion and Activity: What Happens to Our Electronics?

Television
Number of devices

Turntable
Number of devices

Cordless Phone
Number of devices

Landline Phone
Number of devices

Mobile Phone
Number of devices

Typewriter
Number of devices

Video Player
Number of devices

Video Recorder
Number of devices

Total number of electronic devices:

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How Recyclable are our Electronics?

Lesson 2

Inquiry Preparation

Give the students empty aluminum cans and pieces of aluminum foil.
Have them examine the samples. Ask the difference between them.

- What is the same?
- What are they made from?

What do we know about aluminum? List the students' thoughts.

(can be recycled, shiny, can be rolled thin, shaped into cans, light weight, conducts electricity, not magnetic, safe to touch food, plentiful – 3rd most plentiful element on Earth)

Let's look at where aluminum comes from:

Go to: http://www.aludtchallenge.co.uk/wp-content/uploads/2012/05/Aluminium-life-cycle11.jpg

Here's a closer look at the way bauxite is mined. It's the mineral containing aluminum.

http://www.hydro.com/en/About-aluminium/Aluminium-life-cycle/Bauxite-mining/

Aluminum appears in electronics as a conductor for heat.

In our inquiry we will investigate three different electronics.

Can we find the things we know we can recycle?

Think Critically

Smart phones, laptops and other electronics contain materials made from minerals mined around the world. Electronics also contain other materials that come from non-renewable resources.

With more and more electronics in our lives, the environmental impact of making and using them grows. When we replace an old electronic device with a new one, what can we do to lower the environmental impact?

Research Question

Are there recyclable materials in common electronics? What are they?

Focus the Inquiry

Look at a laptop, computer and/or other electronic device in your classroom.

Predict whether or not they contain recyclable materials.

Yes ○ No ○

Research some of the minerals that are contained in smart phones.

Go To: http://www.compoundchem.com/wp-content/uploads/2014/02/The-Chemical-Elements-of-a-Smartphone.pdf

Record any of the minerals that you recognize.

Use this to help you look for recyclable minerals in the electronics you investigate.

Minerals in the cellphone that I recognize are:

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The Benefits of Recycling

Lesson 3

Class Discussion:

Show the class the following illustrations. Ask the students to identify the recyclable materials.

Here's an example of how computers are recycled:

http://www.pc3r.jp/images/recycling_image_e.gif

This is what a cellphone looks like when it is dismantled:

http://gadgetstress.com/wp-content/uploads/2010/08/035-test3-disassembled.jpg

Here are the materials in cellphones:

http://thetyee.cachefly.net/News/2014/03/22/cellphonecontents600px.jpg

Name the recyclable materials.

To identify the value of recycling over mining, show the class the difference between mining bauxite to make aluminum and recycling aluminum.
Look at the image of the aluminum lifecycle. It takes a great deal of raw ore to extract the metal.

http://www.hydro.com/en/About-aluminium/Aluminium-life-cycle/Production-steps/

Further Extensions:
With so many electronics being produced, how does that affect our need for materials to make them?

- What are the key minerals in a cell phone?
- Why are they used (what properties do they contain?)

Review Elements of a Smartphone

http://www.compoundchem.com/wp-content/uploads/2014/02/The-Chemical-Elements-of-a-Smartphone.pdf

Brainstorm Communications

Electronics contain refined materials that can be recycled.
Out-of-use electronics are valuable for these materials alone.

Have the class brainstorm what they would like to communicate about they've learned:

- The value of the materials in electronics;
- Their recyclability, and/or
- Reducing the environmental impact of making and using electronics through recycling.

Think Creatively

Ask students to think about some ideas, and messages they wish to convey.
Have them share these ideas with the class.

What are the best ways to convey these messages?
(Striking images, key words and phrases that would communicate these ideas, etc.)

Prompt students for some ways they could reach their audience with their messages:
letters home, posters, school assemblies, announcements, flyers, presentations,
notices on the school web site, etc.

Have students decide whom they wish to target as their audience for these communications.

What would they like to see as the outcomes for these communications?

Example: we have collected out-of-use electronic for our inquiry.
Collect more from the school community and take them to a collection depot

**To find an authorized Recycle Your Electronics drop off location,
go to: http://www.recycleyourelectronics.ca/home/**

Enter your postal code for nearest Recycle Your Electronics drop off location.

If you wish you to explore the benefits of recycling vs. the use of newly mined materials, list the metals known to be in electronics:

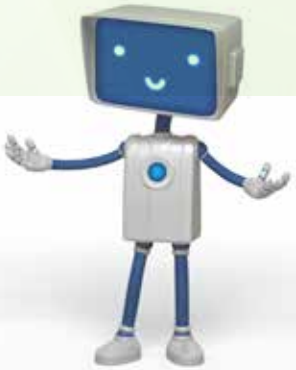
- aluminum
- copper
- gold
- silver
- nickel

Research how much mined ore it takes to yield the refined elements.
Then compare this to extracting the refined metal from out-of-use electronics.

Lesson 3 STUDENT ACTIVITY

My Communication and Action Plan

I want to communicate:



I want my audience to take action in this way:

The date for that action is:

I will communicate this action through:

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Acknowledgements

Ontario Electronic Stewardship would like to acknowledge the work of the educators who volunteered their time and expertise to help develop and review this program. Their input has made this a more valuable and accessible way to engage Ontario's grade 4 students in taking action to mitigate the environment impact of our use of electronics.

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