



# IGNITE MY FUTURE

## LESSON TITLE

# Saving Species

## with Smartphones

*Guiding Question: How can we connect to one another?*

### SUBJECTS

Science  
Technology  
Engineering  
Math  
Computer Science

### COMPUTATIONAL THINKING PRACTICE

Collaborating Around Computing

### COMPUTATIONAL THINKING STRATEGIES

Collect Data  
Analyze Data

### MATERIALS

Writing materials  
  
Computers/devices with  
Internet access and  
word-processing capabilities

[Technology Evaluation](#)  
student capture sheet

[Plan Summary](#)  
student capture sheet

## Ignite Curiosity

- What types of information can you gather with your smartphone?
- Can smartphones and apps help protect endangered species?
- Can teenagers offer useful contributions to scientific research projects?
- How could scientists use data people collect with their smartphones?
- Why might getting data from lots of people help scientists with their research?

In this lesson, students will explore how location technology, such as the Snapchat location feature, could be used to help scientists gather data about endangered species in our ecosystems. They will also consider how it might be possible to automate the collection of important sets of data and include public volunteers in that process. Then, students will examine how collaboration on a public level can be used to analyze and interpret that data. In **THINK**, students will assume the role of a zoological research team challenged to identify endangered species living in an ecosystem. In **SOLVE**, they will design a process by which the public can participate in collecting and analyzing data about the ecosystem. In **CREATE**, students will collaborate to design a website map that demonstrates one way the public could engage in the project. In **CONNECT**, students will explore some real-life examples of how the public is invited to participate in scientific projects and identify how collaboration using technology connects to the careers and problems of tomorrow.

Students will be able to:

- **Examine** the roles of technology and public collaboration in scientific research,
- **Create** a model of a website map designed to crowdsource data, and
- **Analyze** quantitative data about species populations.



## Students will assume the role of a zoological research team challenged to identify endangered species.

**1 Read** the following scenario to the class:

*You are a member of a team of zoologists studying various ecosystems and the populations of various species in those ecosystems. Your team's goal is to track species populations, especially endangered and threatened species, to determine how to support those populations. Budget constraints mean your team is only able to take short excursions into the ecosystems and has limited hours to spend analyzing data. You have incomplete knowledge about what species are present, how many of each species are present, and where they live. You intend to utilize any helpful technology available to collect data and hope to take advantage of public volunteers to help analyze that data and identify prime locations for each species.*

**2 Discuss** the scenario with students using the following guiding questions:

What is the goal of the project? How would the extinction of a plant or animal impact other plants and animals in a food chain and food web?

- Be sure that students' answers include a recognition that the final goal is to support wildlife populations.

What must your team do to accomplish the goal?

- What type of information would be useful beyond mere population numbers for each species?

What obstacles does your team face?

**3 Introduce** a key piece of technology that will be incorporated into student solutions: location technology on mobile devices.

What other features of mobile technology could be useful data collection tools?

What existing apps make use of this technology, and could they be utilized for this project?

- Location- based push notifications and geo-fencing is an amazing concept that allows organizations to send messages to you when you are in a specific geographic area. To read more [click here](#).

**4 Introduce** the key question to consider for the [Solve](#) section (students will discuss it in groups during [Solve](#)): How can these features of mobile technology be harnessed for public contribution to this project?



Students will design and create a plan for accomplishing the scientific research that uses limited amounts of the research team's time and incorporates public volunteers and popular technology. The plan will include a dedicated website to enable volunteers to participate in the project.

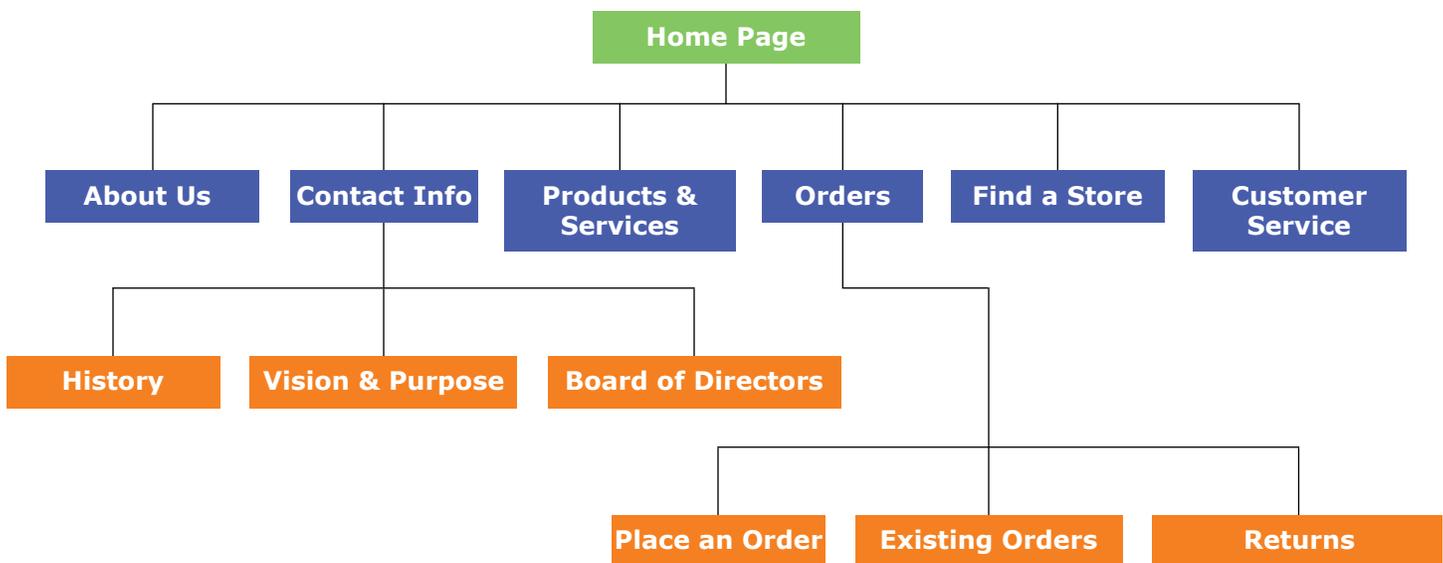
- 1 Split** students into small groups of three to five.
- 2 Explain** that each group will design a plan for how to accomplish the research.
  - The plan should include a way for the public to participate using technology commonly found in mobile devices. It can include other technology as well.
  - In the next portion of the activity, each group will create a website map that the public can use to interact with the project. The groups do not need to create that artifact yet, but they should keep in mind that a website will be part of the plan.
  - Volunteers cannot be expected to have thorough scientific training and expertise.
  - The best plan will be effective in terms of both thorough data collection and analysis and minimizing cost.
- 3 Distribute** a copy of the [Technology Evaluation](#) student capture sheet and the [Plan Summary](#) student capture sheet to each group.
- 4 Ask** each group to start with the [Technology Evaluation](#) student capture sheet. They will use it to identify and evaluate potential types of technology that could be utilized in the research project.
- 5 After identifying a list of potential technologies**, ask groups to select a few key ideas and collaborate to develop a strategic, comprehensive plan. They will use the [Plan Summary](#) student capture sheet to record and describe their plan.



Students will create a website map that provides a basic design plan for the website volunteers will access, and they will create a sample set of data that volunteers would collect (such as charts of number, type, and location of species) and provide examples of the types of analysis that can be made on those data sets.

- 1 Explain** to students that they will now design a simple graphic website map that visually represents the structure of a website that volunteers could use to participate in the project.

Show students an example of a basic website map. Here is a very simple example:



Here are some links to more examples of sitemaps:

- [https://upload.wikimedia.org/wikipedia/commons/2/20/Sitemap\\_google.jpg](https://upload.wikimedia.org/wikipedia/commons/2/20/Sitemap_google.jpg)
- <http://karlcleveland.com/165/sitemaps.htm>
- <https://i.pinimg.com/originals/84/4f/bc/844fbc1ef7211abd0976a2600556a1b8.jpg>

Discuss key terms, such as “home/landing page” and “navigation menu/links.”

Discuss: What parts need to be present on the website?

- For example: app to download, way to contribute to data analysis stage, general information about the project, contact information.
- What unique aspects of your plan need to be represented?

Ask groups to create their website map.

- Students can use pencil and paper to create their maps, or a relatively easy tool to use for this would be Microsoft Word’s “SmartArt” feature, which allows users to create hierarchical layouts.

Invite each group to present its website map to the class.



- 2 Explain** to students that they will now create a small sample data set that illustrates at least one type of analysis that could be done with the data being collected.

Discuss the types of data that might be available for analysis using the following guiding questions:

- What type of data would volunteers gather directly during the project?
- Are there additional data that volunteers could add later as they analyze raw data?
  - For example, if volunteers submit pictures from mobile devices, could other volunteers add other data to be associated with each picture, such as number of the species being shown, type of surroundings, and weather conditions?
- What external data might be useful to link to the data collected during the project?
  - For example: general climate data such as rainfall, average seasonal temperatures, and temperatures in that area on the day the data were collected.

Discuss the types of data insight that you might be looking for in the analysis process.

- Are two (or more) data categories correlated?
  - Explain what data correlation means.
- Are there trends in a given data category over time?
  - Are there corresponding trends in other data categories?

Instruct each group to create a sample set of data that demonstrate at least one identifiable insight.

- The data set should include multiple data categories.
- It can also include multiple locations and times, if desired.
- Make sure the data categories represented could reasonably be gathered through your data collection plan.

Allow each group to share its data set, and ask the other groups if they see any insights based on the data. Examples might include:

- Sightings of two animal species tending to be near each other in the same location
- Inverse relationship between the populations of two animal species; that is, as the population of one species increases, the other tends to decrease
- An animal species tending to be seen more frequently near a particular plant species
- A trend of increasing or decreasing populations of a species over time
- Common conditions under which a particular species is thriving in multiple locations

When students recognize an insight, discuss whether the insight suggests an action that could be taken to support the species under consideration. Ask students to summarize their learning using the following guiding questions:

- How does collecting and analyzing data help collaborative efforts towards a common goal?
- How could your design solution help zoologists, scientists, and others maintain a balanced and healthy ecosystem?



Students explore some real-life examples of how the public is invited to participate in scientific projects and identify how collaboration using technology connects to careers and to problems of tomorrow.

## Select one of the strategies listed below to help students answer these questions:

- **How do this problem and solution connect to me?**
- **How do this problem and solution connect to real-world careers?**
- **How do this problem and solution connect to our world?**

- 1 Write** the three questions on PowerPoint or flip chart slides and invite students to share out responses.
- 2 Display** pieces of chart paper around the room, each with one question written on it. Ask students to write down their ideas related to the questions on each sheet.
- 3 Assign** one of the questions to three different student groups to brainstorm or research, and then share out responses.
- 4 Invite** students to write down responses to each question on a sticky note, and collect them to create an affinity diagram of ideas.

### How does this connect to students?

There are endangered or threatened species in every province and territory. Students would be capable of contributing data in a project of this sort, especially if they have access to a mobile device. There are several online crowdsourced data projects in which students can participate.

### How does this connect to careers?

**Web Developers** design, create, and modify websites. They analyze user needs to implement website content, graphics, performance, and capacity. They may integrate websites with other computer applications.

**Zoologists and Wildlife Biologists** study the origins, behavior, diseases, genetics, and life processes of animals and wildlife. They may specialize in wildlife research and management, and they may collect and analyze biological data to determine the environmental effects of present and potential use of land and water habitats.

**Conservation Scientists and Foresters** manage the land quality of forests, parks, and other natural resources. Their work can protect the species that live in the ecosystems they oversee.

### How does this connect to our world?

Ecosystems are complex, and the interdependency among species is significant, though it is difficult to measure. The loss or significant reduction in numbers of any one species can have a chain effect on many other species in that ecosystem, and humans are also often impacted by these consequences.

TATA Consultancy Services has created a 150-acre home for endangered species. They are helping to save [one-horned rhinos with drones](#). You can read about this project and others [by clicking here](#).

## Curriculum Connections



“For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and **people like you.**”  
 –The United Nations

“The Sustainable Development Goals are the blueprint for a better future. And together we can reach them. By following the Good Life Goals, we can all help make tomorrow better than today. Let’s do this! #GoodLifeGoals”



LOVE NATURE Actions

15

- |   |   |
|---|---|
| 1<br>Discover the wonders of the natural world        | 4<br>Support companies that protect and restore nature  |
| 2<br>Protect native plants and animals                | 5<br>Speak up for threatened forests and natural places |
| 3<br>Never buy products made from endangered wildlife |   |



Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

SUSTAINABLE DEVELOPMENT GOALS

Source:

[The Good Life Goals by Futerra Sustainability Communications Ltd and 10-Year Framework of Programmes on Sustainable Lifestyles and Education Programme](#) is licenced under CC BY-ND 4.0.

## Global Competencies

CMEC (Council of Ministers of Education, Canada) Pan-Canadian Global Competencies Descriptions

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
Collaboration	Collaboration involves the interplay of the cognitive (including thinking and reasoning), interpersonal, and intrapersonal competencies necessary to participate effectively and ethically in teams. Ever-increasing versatility and depth of skill are applied across diverse situations, roles, groups, and perspectives in order to co-construct knowledge, meaning, and content, and learn from, and with, others in physical and virtual environments.	<p>Students participate in teams by establishing positive and respectful relationships, developing trust and acting co-operatively and with integrity.</p> <p>Students learn from and contribute to the learning of others by co-constructing knowledge, meaning, and content.</p> <p>Students assume various roles on the team, respect a diversity of perspectives, and address disagreements and manage conflict in a sensitive and constructive manner.</p> <p>Students network with a variety of communities/groups and use an array of technology appropriately to work with others.</p>
Communication	Communication involves receiving and expressing meaning (e.g., reading and writing, viewing and creating, listening and speaking) in different contexts and with different audiences and purposes. Effective communication increasingly involves understanding both local and global perspectives, societal and cultural contexts, and adapting and changing using a variety of media appropriately, responsibly, safely, and with regard to one's digital footprint.	<p>Students communicate effectively in different contexts in oral and written form in French and/or English through a variety of media.</p> <p>Students communicate using the appropriate digital tools and create a positive digital footprint.</p> <p>Students ask effective questions to acquire knowledge, listen to understand all points of view, voice their own opinions, and advocate for ideas.</p> <p>Students gain knowledge about a variety of languages and understand the cultural importance of language.</p>

## Global Competencies cont.

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
Global Citizenship and Sustainability	Global citizenship and sustainability involve reflecting on diverse worldviews and perspectives and understanding and addressing ecological, social, and economic issues that are crucial to living in a contemporary, connected, interdependent, and sustainable world. It also includes the acquisition of knowledge, motivation, dispositions, and skills required for an ethos of engaged citizenship, with an appreciation for the diversity of people, perspectives, and the ability to envision and work toward a better and more sustainable future for all.	<p>Students understand the ecological, economic, and social forces, their interconnectedness, and how they affect individuals, societies, and countries.</p> <p>Students take actions and responsible decisions that support quality of life for all, now and in the future.</p> <p>Students recognize discrimination and promote principles of equity, human rights, and democratic participation.</p> <p>Students understand Indigenous traditions and knowledge and its place in Canada, learn from and with diverse people, develop cross-cultural understanding, and understand the forces that affect individuals, societies, and nations.</p> <p>Students engage in local, national, and global initiatives to make a positive difference.</p> <p>Students contribute to society and to the culture of local, national, global, and virtual communities in a responsible, inclusive, accountable, sustainable, and ethical manner.</p> <p>Students as citizens participate in networks in a safe and socially responsible manner.</p>

## Global Competencies cont.

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
<p>Critical Thinking and Problem Solving</p>	<p>Critical thinking and problem solving involve addressing complex issues and problems by acquiring, processing, analysing, and interpreting information to make informed judgments and decisions. The capacity to engage in cognitive processes to understand and resolve problems includes the willingness to achieve one’s potential as a constructive and reflective citizen. Learning is deepened when situated in meaningful, real-world, authentic experiences.</p>	<p>Students will solve meaningful, real-life, complex problems by taking concrete steps to address issues and design and manage projects.</p> <p>Students will engage in an inquiry process to solve problems as well as acquire, process, interpret, synthesize, and critically analyse information to make informed decisions (i.e., critical and digital literacy).</p> <p>Students will see patterns, make connections, and transfer what they have learned from one situation to another, including in real world applications.</p> <p>Students will construct, relate, and apply knowledge to all domains of life such as school, home, work, friends, and community.</p> <p>Students will analyze the functions and interconnections of social, economic, and ecological systems.</p>
<p>Innovation, Creativity and Entrepreneurship</p>	<p>Innovation, creativity, and entrepreneurship involve the ability to turn ideas into action to meet the needs of a community. The capacity to enhance concepts, ideas, or products to contribute new-to- the-world solutions to complex economic, social, and environmental problems involves leadership, taking risks, independent/unconventional thinking and experimenting with new strategies, techniques, or perspectives, through inquiry research. Entrepreneurial mindsets and skills involve a focus on building and scaling an idea sustainably.</p>	<p>Students formulate and express insightful questions and opinions to generate novel ideas.</p> <p>Students contribute solutions to complex economic, social, and environmental problems or to meet a need in a community in a number of ways including; enhancing concepts, ideas, or products through a creative process, taking risks in their thinking and creating, making discoveries through inquiry research, and by hypothesizing and experimenting with new strategies or techniques.</p> <p>Students demonstrate leadership, initiative, imagination, creativity, spontaneity, and ingenuity in a range of creative processes and motivate others with an ethical entrepreneurial spirit.</p>



Find more easy-to-implement resources to integrate computational thinking practices into your classroom by visiting [ignitemyfutureinschool.ca](https://www.ignitemyfutureinschool.ca)

## Global Competencies cont.

Highlighted sections apply to this lesson

Global Competency	Definition	Student Descriptors
<p>Learning to learn and to be self-directed and self-aware</p>	<p>Learning to learn and to be self-directed and self-aware, means: becoming aware and demonstrating agency in one's process of learning, including the development of dispositions that support motivation, perseverance, resilience, and self-regulation. Belief in one's ability to learn (growth mindset), combined with strategies for planning, monitoring and reflecting on one's past, present, and future goals, potential actions and strategies, and results. Self-reflection and thinking about thinking (metacognition) promote lifelong learning, adaptive capacity, well-being, and transfer of learning in an ever-changing world.</p>	<p>Students learn the process of learning (metacognition) (e.g., independence, goal-setting, motivation) and believe in their ability to learn and grow (growth mindset).</p> <p>Students self-regulate in order to become lifelong learners and reflect on their thinking, experience, values, and critical feedback to enhance their learning. They also monitor the progress of their own learning.</p> <p>Students develop their identity in the Canadian context (e.g., origin and diversity) and consider their connection to the environment. They cultivate emotional intelligence to understand themselves and others. They take the past into account to understand the present and approach the future.</p> <p>Students develop personal, educational, and career goals and persevere to overcome challenges to reach these goals. They adapt to change and show resilience to adversity.</p> <p>Students manage various aspects of their lives: physical, emotional (relationships, self-awareness), spiritual, and mental well-being.</p>



## Plan Summary

### Summary of Plan:

### Technologies Utilized:

## Rate your plan in each of the following areas:

### Cost Efficiency



### Required Expert Involvement



### Ease of Volunteer Involvement



### Ease of Plan Implementation



### Thoroughness of Data Collection



### Thoroughness of Data Analysis

