Appendix A

2009 Minnesota Academic Life Science Standards Grade 5

Minnesota Standards

The curricular unit focused on the life science strand of the Grade 5 Science Minnesota State Standards. The standards that were used to design the curricular unit were Standards 5.4.1.1 and 5.4.4.1.

Life Science Standards

Standard 5.4.1.1 Living things are diverse with many different characteristics that enable them to grow, reproduce and survive.

The standard included the following benchmark:

5.4.1.1.1 Structures & Survival

Describe how plant and animal structures and their functions provide an advantage for survival in a given natural system.

For example: Compare the physical characteristics of plants or animals from widely different environments, such as desert versus tropical, and explore how each has adapted to its environment.

Standard 5.4.2.1 Natural systems have many parts that interact to maintain the living system.

The standard included the following benchmarks:

5.4.2.1.1 Relations in Living Systems

Describe a natural system in Minnesota, such as a wetland, prairie or garden, in terms of the relationships among its living and nonliving parts, as well as inputs and outputs.

For example: Design and construct a habitat for a living organism that meets its need for food, air and water.

5.4.2.1.2 Changes in Natural Systems

Explain what would happen to a system such as a wetland, prairie or garden if one of its parts were changed.

For example: Investigate how road salt runoff affects plants, insects and other parts of an ecosystem.

Another example: Investigate how an invasive species changes an ecosystem.

Standard 5.4.4.1 Humans change environments in ways that can be either beneficial or harmful to themselves and other organisms.

The standard included the following benchmark:

5.4.4.1.1 Humans & Natural Systems

Give examples of beneficial and harmful human interaction with natural systems.

For example: Recreation, pollution, or wildlife management. ("Minnesota Academic Standards," 2009).

Appendix B
SIOP Lesson Plan
Lesson 1 & 2
Week 1

MN State Standard: 5.4.1.1.1

Describe how plant and animal structures and their functions provide an advantage for survival in a given natural system.
For example: Compare the physical characteristics of plants or animals from widely different environments, such as desert versus tropical, and explore how each has adapted to its environment.

Building Background

Students should understand that animals have specific structures that allow them to survive and thrive in a specific environment. Students should be taught about Earth's different habitats or biomes and be able to describe the characteristics of some of the plants and animals living in each. Students should know that organisms live in very different environments such as oceans, deserts, tundras, forests, grasslands, and wetlands. These organisms are different from one another because their environments are different. For example, animals with thick fur are able to survive a cold habitat. Gills allow fish to obtain oxygen from water, whereas lungs allow mammals to obtain oxygen from the atmosphere. Desert plants and animals have adapted by conserving the small amount of water they require. The thick, waxy leaves of some plants prevent water loss. Many desert animals are nocturnal and search for food during the cool of night.

Cross Cutting Concept
The cross cutting concept is structure and function ("A Framework", 2012). Intermediate students can example complex structures in organisms and consider the relationship of the shapes of the parts to their functions. Students can observe a model of Galapagos and create a similar model of an organism of their choice. In the model, the student should label the structures of the organisms and the adaptation. Visualizing the model helps students connect adaptations to survival and more difficult concepts in later grades ("A Framework", 2012).

Lesson Preparation
Goal: Describe how plant and animal structures and their functions provide an advantage for survival in a given natural system.

Language Objectives: Students will
- Watch the Living River Online Fabulous Floodplain video
- Discuss verbally how river animals have adapted to life in the river and the floodplain forest
- Research and write a paragraph describing how one specific structure provides an advantage for survival
- Present their findings to the class
- **Content Objectives:** Students will
- Recognize and recall ecosystem vocabulary words: plant structures, animal structures, advantage, survival, natural system
- Describe plant and animal structures
- Describe how plant and animal structures help them to survive

Vocabulary:

Nouns:
Plant structures
Animal structures
functions
advantage
survival
Natural system

Verbs:
Describe

Strategies

Materials

- I-pad, textbook, science interactive notebook

Motivation

- The teacher will read aloud Adaptations by Monica Davies (2015). The teacher will explain that overtime adaptations have helped animals survive and change over time. The teacher will read aloud pg. 9 and discuss how cats, dogs, humans, bears and skunks have adapted to their environment. The teacher will ask students "How are their adaptations advantageous to survival?" The teacher will then ask students to think-pair-share and discuss an animal in Minnesota that has adaptations. The teacher will conclude the mini lesson and remind students of their center activity using their center sheet.

Center Activities

- Students will complete two center activities per day. The center activities should take approximately 30 minutes.
- Students will read the ecosystem encyclopedia entry and search for vocabulary words and use context clues to get a better understanding of vocabulary https://www.nationalgeographic.org/encyclopedia/ecosystem/Students will interact with vocabulary using nearpod.
- Determine the kind of ecosystem found along the Mississippi River by watching the **Living River Online Fabulous Floodplain video**. https://sites.google.com/parkconnection.org/livingriveronline/fabulous-floodplain While watching the video, students will rationalize how river animals have adapted to life in the river and the floodplain forest. They will write about how these adaptations are advantageous to survival.
- Students will read in groups Chapter 3 Lesson 1: What are some physical structures in living things? Students will engage in science student talk by reading with a group and discussing the question in Lesson 1: Growth and Survival Worksheet.

Practice/Application

While students are working, the teacher is working with students who have already watched the video. The teachers will review informational writing and facilitate student responses to the question: *How have river animals adapted to life in the river and the floodplain forest? How are their adaptations advantageous?*

Application
When students have completed the informational text writing assignment, have them present their writing to the class. Have the audience ask engaging questions and discuss responses.

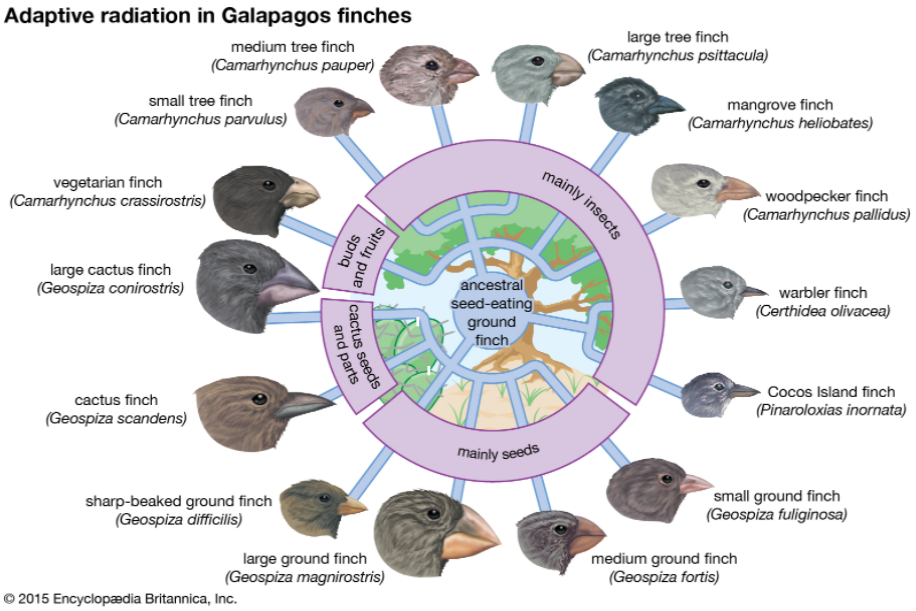
Review & Assessment
Assess students using a mastery assessment that include vocabulary, multiple choice, extended response higher order thinking questions with diagrams.

Students will also self assess their learning using Marzano scales using student handout 5.

Student Handout 1 - Using Models to Explain Adaptation

Name: _____ **Date:** _____

Directions: Observe the model of the adaptations of the Galapago finches. Describe the bird's diet, bill shape, species and adaptations in the chart below.



(Encyclopædia Britannica inc., 2015)

Note: Unit diagram for implementation of cross cutting concepts

Bird's Diet	**Shape of Bill**	**Name of Species**	**Adaptation**

Student Handout 2- Living River Online Fabulous Floodplain
Informational Writing Response

Name: _____ Date: _____

River animals have adapted to life in the river and the floodplain forest. Write an informational essay explaining different adaptations of river animals are advantageous to survival.

Include in your essay:

- two to three plants or animals
- adaptations that increase survivability

Format:

- an introduction paragraph
- a body paragraph containing information from the video and other sources
- a conclusion paragraph

Student Handout 3- Chapter 3 Lesson 1: Growth and Survival
Notes/Handout
Interactive Science Grade 5, 2016

Name: _____ **Date:** _____

Big Question: How do plants and animals grow and change?

Page number	Teacher Notes	Student Notes
101	You will learn about how organisms interact with their environments. Some organisms change over time as a result of these interactions. These changes may help plants and animals survive. Humans play a role in these changes as well. This will help you understand changes in your own environment and how organisms interact with it.	**Make a Prediction:** How do plants and animals grow and change? _____
N/A		What are the needs of living things? _____ _____ _____

		_____ _____
108		Why do you think its important that male painted buntings are brightly colored?_____ _____ _____ _____ _____ _____ _____ _____ _____ _____
109	Physical structures provide benefits to both plants and animals. Plant seeds have tough coverings that help it to survive and snakes camouflage to conceal themselves from both prey and predator.	Explain how the physical structure of <u>white tail deer</u> helps it survive harsh winters? _____ _____ _____ _____ _____ _____ _____ _____ _____
110	Plants have stems that stretch toward the sunlight and can hold the weight of leaves and fruit. Some plants such as trees, have wood in their stems and branches	Higher leaves are more likely to get sunlight. How is this helpful to a plant?

	for additional support.	
112	Animals and plants breathe in different ways. Animals such as turtle break through the mouth or nose using lungs Fish take in oxygen from water through gill and insects take in oxygen from structures called spiracles.	Click on Diagram of different ways organisms breath. How are the ways the organisms breathe similar? How are they different? _____ _____ _____ _____ _____ _____ _____ _____ _____
All pages	Review pages 100-112 and your notes.	What adaptations allow plants and animals to meet needs in different environments?_____ ___

Student Handout 4- Adaptations Assessment

Name: _____ **Date:** _____

Habitat Change

A small, short-furred, gray animal called a divo lives on an island. This island is the only place on Earth where divos live. The island habitat is warm and provides plenty of the divos' only food—tree ants. The divos live high in the treetops, hidden from predators.

One year the habitat experienced a drastic change that lasted for most of the year. It became very cold and even snowed. All of the ants died. The trees lost their leaves, but plenty of seeds and dried leaves were on the ground.

(Keeley, 2007)

1. Circle any of the things you think happened to most of the divos living on the island after their habit changed. ***2 pts***

   A The divos' fur grew longer and thickers.

   B The divos switched to eating seeds.

   C The divos dug holes to live under the leaves or beneath rocks.

   D The divos hibernated through the cold period until the habitat was warm again.

   E The divos died.

2. Explain your thinking. How did you decide what effect the change in habitat would have on most of the divos? ***5 pts***

   _____

   _____

   _____

_____

_____

3. Loggerhead sea turtles are large turtles that live in the ocean and nest on the Florida coast. The female loggerhead sea turtle lays more than 100 eggs in the beach sand. How is laying so many eggs an important adaptation that helps these turtles to survive? ***2 pts***

A. Large nests of eggs help keep the eggs warm enough to allow more turtles to hatch

B. If many turtles hatch, they can help defend each other against predators in large numbers.

C. The more eggs that are laid, the greater the chance that more turtles will live to become adults.

D. A large number of eggs in one place makes it possible for the mother to lie on the eggs until they hatch.

4. What questions do you have about adaptations?

_____

_____

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Student Handout 5 - Marzano Scales Self Assessment

Name: _____ **Date:** _____

Self assess your learning. **Circle** your level of understanding of adaptations.

Level	
4	I understand adaptations so well I can teach it to someone.
3	I can describe how plant and animal structures and their functions provide an advantage for survival in a given natural system
2	I can identify plant and animal structures. I can select a function that provides an advantage for survival when given choices
1	I can define adaptations
0	I need help

Give reason to support the level you selected. What do you need to review to change your level?

_____
_____
_____
_____
_____
_____
_____

Lesson 3 & 4
Week 2

MN State Standard: 5.4.1.1.1

> Describe how plant and animal structures and their functions provide an advantage for survival in a given natural system.
> *For example:* Compare the physical characteristics of plants or animals from widely different environments, such as desert versus tropical, and explore how each has adapted to its environment.

Building Background

For any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all. Organisms interact with one another in various ways besides providing food. Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful.

Cross Cutting Concept
The cross cutting concept is structure and function ("A Framework", 2012). Intermediate students can examine complex structures in organisms and consider the relationship of the shapes of the parts to their functions. Students can understand the adaptations of birds by using representations of beaks to explain the proper habitat for each bird. Students examine structure and function by using hands-on materials such as tongs, tweezers, and other utensils to understand adaptation.

Lesson Preparation
Goal: The student will learn and describe how different kinds of birds' beaks have adapted to feed on different foods within a specific habitat.

Language Objectives: Students will
- Read about the four habitats and discuss compare and contrast.
- Summarize the habitat they are best suited to

Content Objectives: Students will
- Navigate through simulated habitats using an assigned "beak" and pick up as many food items as possible
- Use the habitat record sheet to determine the most suitable habitat
- Describe how the bird's beak helped them survive

Vocabulary:

Nouns:
Plant structures
Animal structures
functions

Verbs:
Describe

advantage
survival
Natural system
Marsh
Pond
Forest
Prairie

Materials

- Big River Journey Teacher Guide p. 64-70
- Simulation habitat equipment
- 2 containers of water: one shallow (2" of water), one deep (10" or more water)
- 4 tweezers
- 4 tongs with tape over tong
- 4 long handled salad tongs
- 4 pliers
- 1 package of rice or popcorn
- 1 packages of sunflower seeds
- 1 stump with holes in it for rice or popcorn any floating and non-floating objects, such as cut-up straws 1/2 inch long, raisins

Motivation

- Read and explain the content and language objectives of this lesson to the students. Say, "Let's look at our language objectives for today" and then read language objectives aloud and discuss. "Now let's look at our content objectives for today." Read content objectives and cross cutting concepts aloud and discuss. Tell students that they are going to become different types of birds and use tools to identify the habitat and diet of the bird. Have students discuss what the tools represent and make predictions of which birds are best suited for which habitat.

Presentation

- Tell the students that they are going to become different kinds of birds. Show them the different "beaks." These include the tongs, tweezers, and other utensils. Explain to the group that their job is to find the proper habitat for which each bird is suited. Mention that the tools or "beaks" give some clue of what a bird eats and where it may live. Show the students four habitats. See Simulated Habitats (Insert A). As you move into each new habitat, give a short description of the habitat and have students talk and discuss living and non living components of the habitat.

- The four habitats are marsh, pond, forest, and prairie. Divide students into groups of four. Each group receives a different tool (i.e. one group receives pliers; one group receives tweezers, etc.). Groups will keep the same tool throughout the whole activity. Tell the students they will move from one habitat station to the next. They will have 30

seconds at each habitat station to eat as many food items as possible. The students must keep one hand behind their backs and cannot let their hand get wet.

- Explain to students for food to qualify as eaten:
  Marsh: Floating objects must be dropped in another container and hands can't touch the water.
  Pond: Sinking objects or other non-floating objects must be dropped in another container and hands can't touch the water.
  Forest: Rice/popcorn must be dropped in another container, can't be dropped on the floor.
  Prairie: Sunflowers must be crushed over a container and the nut taken out.

- Emphasize to students that they are not competing against one another. Remind them that they are trying to find the habitat that they are best suited to. Have the students record the number of food pieces eaten on the Habitat Record Sheet (Insert B).

Practice/Application
Students move through one habitat station to the next in 30 second intervals. The students must keep one hand behind their backs and cannot let their hand get wet. Students must also follow the guidelines for food to qualify as eaten. Students record the number of pieces eaten on the habitat record sheet.

Application
When the activity is completed, have the student graph their results and discuss.

Review & Assessment
Have groups summarize their learning using the Habitat Record Sheet (Insert B). Have the audience ask engaging questions to the group and discuss responses

Student Handout 5-Birds, Beaks, and Adaptations

Directions: Have all groups record the number of food pieces "eaten" from each habitat with each tool.

	Pond	Marsh	Forest	Forest	**RESULTS**
BEAKS					
Pliers					
Short Tongs					
Long Tongs					
Tweezers					

Summarize

Write a summary explaining the best suitable habitats for each beak. In your summary, use the facts from Simulated Habitats (Insert A) to support your writing.

SIOP Lesson Plan
Lessons 5 to 8
Week 4

MN State Standard: 5.4.4.1.1
Give examples of beneficial and harmful human interaction with natural systems. *For example:* Recreation, pollution, or wildlife management.

Building Background

Human activities have major effects on land, vegetation, streams, ocean, air and outer space. Human activities in agriculture, industry and everyday life can impact the environment in a beneficial or harmful way. Individuals and communities are making efforts to reduce their environmental imprint by reducing the amounts of materials they use, treating sewage and imposing rules and restrictions on water use and regulating sources of pollution such as emissions from factories, power plants, or the runoff from agricultural activities ("A Framework", 2012).

Cross Cutting Concept
The cross cutting concept is system and system models ("A Framework", 2012). A unit of investigation can be referred to as a system. A system is an organized group of related objects that form a whole. In the context of this lesson, the system refers to the natural system and the beneficial and harmful interactions within the system. The natural system will serve as the focal point and the human interactions and the effects of those actions are represented outside of the boundary.

Lesson Preparation
Goal: Students will be able to explain beneficial and harmful human interactions with natural systems. *For example: Students will research the environmental impact of everyday plastics. Students will learn which plastics are beneficial to the environment and which plastics are harmful or hazardous.*

Language Objectives: Students will
- Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
- Present information that using powerpoint or other visual aids to help the audience connect and understand their information

Content Objectives: Students will
- Create a mind map using PIXIE to explain beneficial human interactions with natural systems
- Create a mind map using PIXIE to explain harmful human interactions with natural systems

Vocabulary:

Nouns:	**Verbs:**
Human interactions	Explain
Beneficial interactions	Integrate
Harmful interactions	Create

Materials

- Creative Learning Systems Smart Lab Program
- Science Interactive Textbook
- Notebook
- computer

Motivation

- The teacher will review expectations in the **S**cience **T**echnology **E**ngineering **A**rts and **M**athematics lab prior to starting the lessons. The students will open the launchpad, login and click on the sustainability tab.
- The teacher will present students with engaging questions to introduce the lessons for the next 3-5 days. The teacher will ask: *What is plastic? How do humans use plastic? Is plastic beneficial or harmful to the environment?* Students will discuss their responses verbally.

Presentation

- The teacher will direct students to read the challenge section in the Level 1- Reusing and Recycling Plastic Module. The teacher will explain to students that the module consists of four sections. The four sections are: *Your challenge, What You Should Know, Do It!, and Extend Yourself.* The timeline of each section varies with some students finishing in three days and other students finishing in four or five days. If students finish in a shorter time frame, direct students to the *Extend Yourself* section.
- The teacher will then tell students to read the *Your challenge* section and ask students to discuss what they will learn. Students will write their learning goals and targets in their science interactive notebooks.

Practice/Application

- Below is a possible guideline of activities and assignments.
- **Day 1 -** Students will answer the questions on the What you should know worksheet. Students will bring one to three examples of plastics they use at home and/or school.
- **Day 2 -** The teachers will collect the plastics and place four to ten plastics at each peninsula. The students start the second section: *Do It!* by reading about plastic codes. The students will determine the types of plastic codes they are using by completing the *Plastic Codes* worksheet .
- **Day 3 -** Students will open PIXIE program and review how to use PIXIE by going to Recipes4success in PIXIE. “Recipes” are projects to help you learn Pixie. “Snacks” are tips and tricks for using PIXIE. Students will create a comic that will teach others about

the benefit and harm of human interactions with the natural system. They will include what they learned from the Level 1- Reusing and Recycling Plastic Module.

Review & Assessment

- **Day 4 -** Students will create a mind map of the harmful and beneficial human interactions and the impact on the natural system. Students will use Pixie and the Mind Mapping Diagram Template to create the mind map. This will be the culminating activity.

- **Application**
  When students have completed the mind map, have them present their mind map to the class. Have the audience ask engaging questions and discuss responses.

Student Handout 6-What You Should Know

Name: _____ **Date:** _____

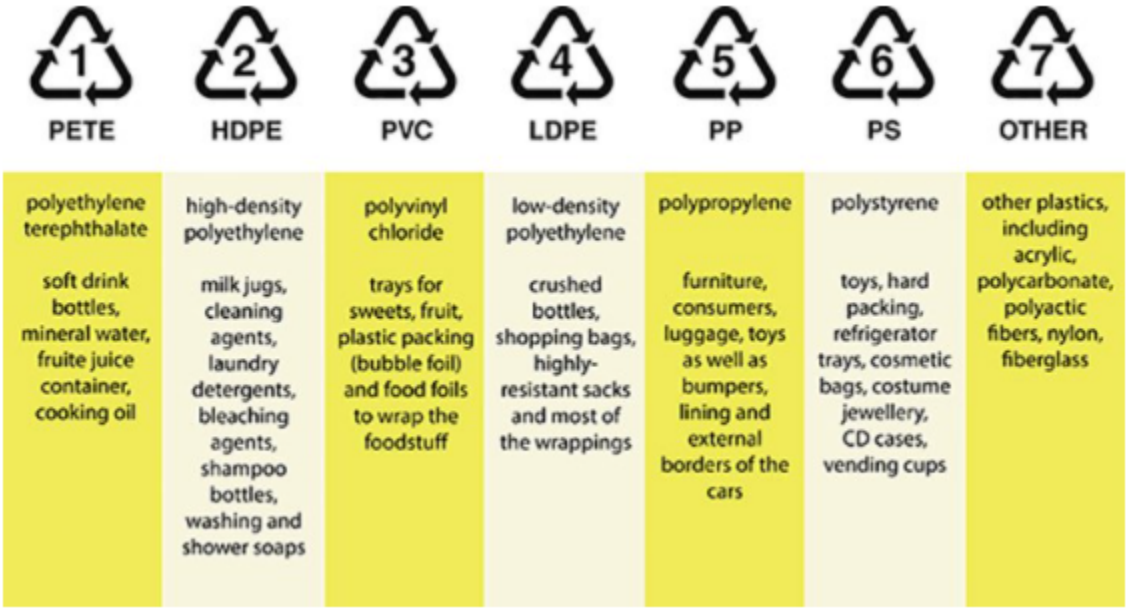
Question	Answer

What is plastic?	
Are plastics decomposable? How long does it take for plastic to break down?	
Where do plastics often end up?	
What is the Great Pacific Garbage Patch?	
What is the most commonly used plastic?	
What is the most commonly recycled plastic?	
What plastic is used for food wrapping, computer cables and gardening equipment? Is this plastic recyclable?	
What plastic is reusable, but not always recyclable?	
Which plastic is reused and recycled, but at a percentage rate of less than 10%?	
What plastic is used to make baby bottles, water bottles and other common plastic products?	
What alternatives are being developed to replicate plastic?	

Student Handout 7- Plastic Codes

Name: _____ **Date:** _____

Directions: Observe each plastic item at your peninsula. Use the image below to identify plastic code. Use the *What You Should Know* section to classify the item as recycle, reusable, both or neither. Then, research the environmental impact of the product using the internet.



(Creative Learning Systems, 2021)

Item	Plastic Code	Recyclable? Reusable?	Environmental impact Beneficial/Harmful

Student Handout 8- Alternatives to Plastic

Name: _____ **Date:** _____

Reduce Your Use

Did you know that is takes 15 to 1,000 years for a typical plastic grocery bag to break down? Are there items you use everyday that are made out of plastic that you could find an alternative for? Can you reduce your plastic use? Research alternatives for commonly used items like food and drink containers, plastic wrap, plastic bags, water bottles, etc.

Directions: Research alternatives for commonly used items like food and drink containers, plastic wrap, plastic bags, water bottles, etc.

What are alternatives to food and drink containers?

_____

_____

_____

What are alternatives to plastic wrap?

_____

_____

_____

What are alternatives to plastic bags?

_____

_____

_____

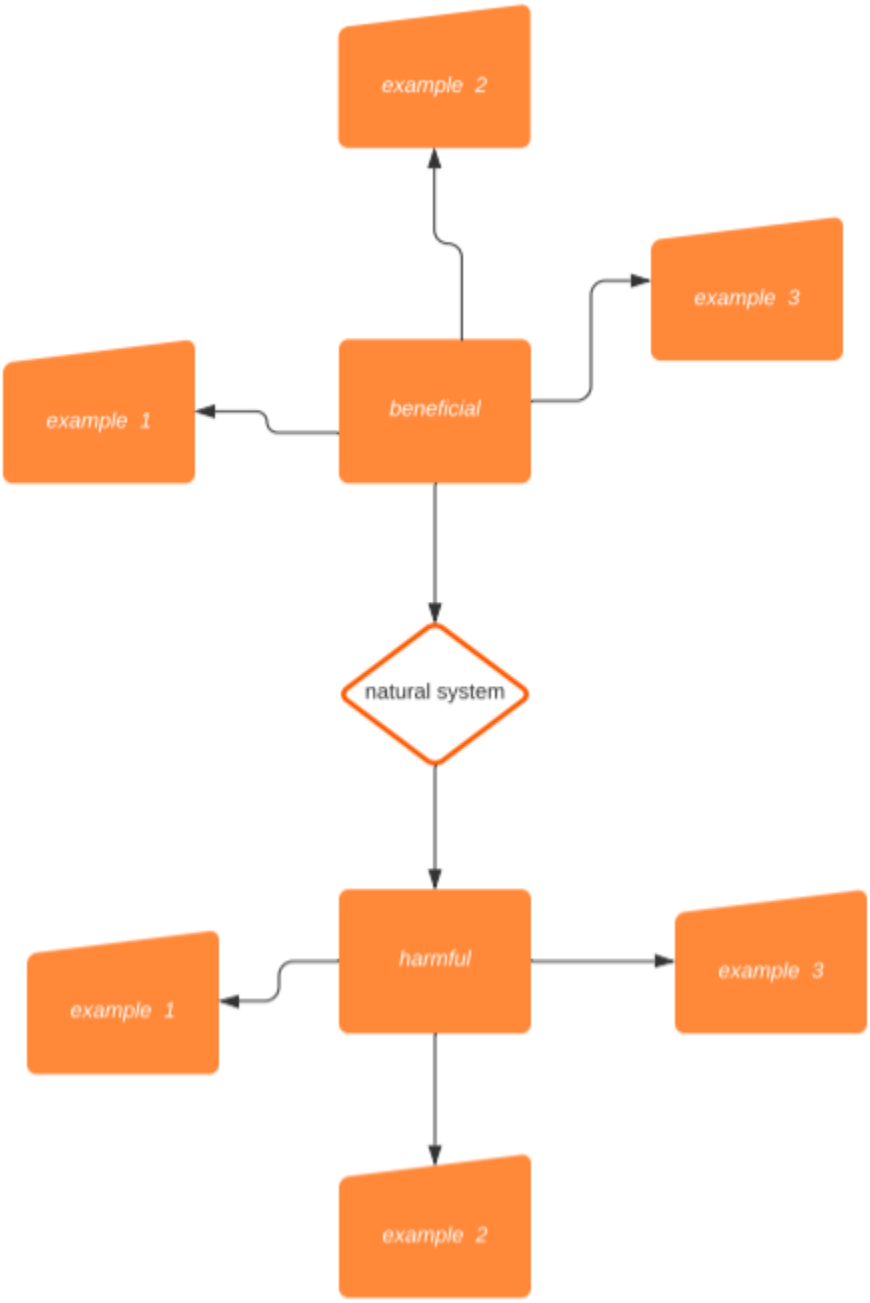
What are alternatives to water bottles?

_____

_____

_____

Student Handout 9- Mind Mapping Diagram Template



Appendix C

Table 1. Assessment of Project

Statement	**Response**
	Strongly Disagree Disagree Neutral Agree Strongly Agree
The curriculum unit provides opportunities for students to engage in inquiry and hands-on learning.	
The curriculum provides opportunities for students to engage in student centered learning.	
The curriculum provides opportunities for students to engage in academic writing.	
The curriculum uses phenomenon based instruction (i.e cross cutting concepts).	
The curriculum uses rigorous assessments.	
The project effectively answers the capstone question.	

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