Ontario Agri-Food Education Inc.

Nature's Sweet Mystery

An Integrated Curriculum Resource for Grades 4–6

An exploration of food energy through a series of four missions

carbon dioxide + water + sunlight = sucrose + oxygen

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About this Resource

Nature's Sweet Mystery is an exciting learning adventure for students in grades four to six. This integrated curriculum resource is designed to guide students in an exploration of food energy through a series of four Missions:

Mission 1: *Exploring Food Chains*
Mission 2: *Exploring Food from Field to Table*
Mission 3: *Exploring the Human Body*
Mission 4: *Exploring Energy Balance*

Each Mission includes:
✓ Curriculum connections, teacher background information, and teacher planning notes
✓ Reproducible evaluation rubrics and suggestions for assessing student achievement
✓ Glossaries for defining key words and suggestions of additional resources
✓ Reproducible student activity sheets and overhead masters

Although this resource is designed as a teaching unit, the individual Missions and activities may be used separately.

The teacher background information and student activities in each Mission have been developed primarily to support the achievement of curriculum expectations and learning outcomes for students across Canada in the areas of Science, Health, and Physical Education. The cross-curricular nature of the activities also provides opportunities for students to develop knowledge and skills in English Language Arts, Mathematics, and Social Studies.

The activities and experiments in *Nature's Sweet Mystery* encourage students to investigate, question, plan, observe, record and draw conclusions.

Evaluation
This resource has been classroom tested by Canadian teachers and their ideas and suggestions have been incorporated into the final kit. In order to continually improve this resource, we would like to hear from you! By visiting the catalogue link on the Ontario Agri-Food Education Inc. (OAFE) website, at www.oafe.org, you can rate and write a review of *Nature's Sweet Mystery*. Feedback can also be provided directly to the Canadian Sugar Institute at info@sugar.ca. Your feedback is greatly appreciated.

We hope you and your students enjoy this teaching resource as much as we enjoyed developing this program for you!

From the Nutrition Professionals of the Canadian Sugar Institute,
Nutrition Information Service
Visit our website at: www.sugar.ca

Testimonials

"Great ideas! They covered science, social studies, and health expectations."
Grade 3/4 teacher, Ontario

"It has elements that reach many grade levels in Ontario, and the units are well capsulated."
Grade 3/4 teacher, Ontario

"Very good resource for nutrition segment in health curriculum."
Grade 4 teacher, Manitoba

"There are lots of neat activities to do with your class."
Grade 4 teacher, Saskatchewan

Acknowledgements

Nature's Sweet Mystery was created in 1994, with an extensive revision in 2001 through collaboration with a variety of talented partners including, Valerie Steele, Nutrition-Wise Communications, Toronto, Ontario; Susan E. Morgan, Nutrition Consultant, Brooklin, Ontario; Ontario Agri-Food Education Inc.; and a team of teacher advisors from across Canada. The Canadian Sugar Institute is grateful to the following individuals of Ontario Agri-Food Education Inc. (OAFE) for their contribution to the 2009 revision of *Nature's Sweet Mystery*:

Jan Robertson	Marketing & Communications Manager
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Seal of Approval

The Ontario Agri-Food Education Inc. Seal of Approval ensures that this resource has met eight critical criteria. Resources are reviewed by an independent panel represented by both the agri-food and education sectors to ensure the following:

1. Factual information is current.
2. Information is accurate and authentic.
3. Learning expectations are clear and concise.
4. A balanced perspective is presented.
5. Assessment and evaluation of student achievement must be addressed.
6. The presentation of information is bias-free.
7. A copyright clearance statement is included.
8. Inclusive language is used wherever applicable.

Table of Contents

Exploring Food Chains

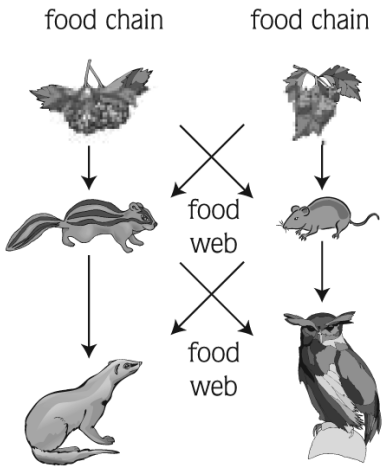
MISSION 1

Exploring Food Chains provides information and activities designed to lead students in exploring the natural sequence of feeding relationships between organisms in a variety of ecosystems.

Curriculum Connections for Grades 4 - 6

Students will:

1. Demonstrate an understanding of a food chain as a system in which energy from the sun is eventually transferred to animals.
2. Investigate the dependency of plants and animals on their habitat and the interrelationships of the plants and animals living in a specific habitat.
3. Recognize the sun as the principle source of energy for life.
4. Investigate the process of photosynthesis as the first step in all food chains.
5. Understand that plants make their own food in the form of sugar.
6. Construct food chains of different plant and animal species.
7. Classify organisms according to their role in a food chain (primary producer, secondary consumer, etc.).
8. Classify animals as omnivore, carnivore, and herbivore.
9. Identify various factors that affect plants and animals in a specific habitat.
10. Communicate the procedures and results of their food chain investigations.



Teaching Background Information

FOOD FOR LIFE

All living organisms, both plants and animals, need food to live. Food provides the nutrients plants and animals need to build and repair their body parts. Food also provides plants and animals with the energy they need to grow. Animals, including humans, also need energy for their hearts to beat, their brains to think, their lungs to breathe and their muscles to move.

FOOD CHAINS

Plant and animal needs are all interrelated and dependent on each other. Food chains are sequences of feeding relationships through which plants and animals depend on each other for food. There are countless food chains involving different plant and animal species in different habitats all around the world. Every plant and animal belongs to at least one food chain. Food chains can be very simple or very complex. When an animal from one food chain eats a member of another food chain, two food chains connect, creating food webs.

ENERGY FROM THE SUN

The sun is the primary source of energy for all life. Even living organisms that seem to flourish in darkness feed on plants, insects, animals or microorganisms that depend on sunlight for their survival. The sun provides energy that plants can use to make their own food. This is the first step in every food chain.

NATURAL FOOD FACTORIES

All green plants can do something truly amazing and unique that no other living thing on earth can do. They can make their own food energy using sunlight, air and water. The process by which plants produce food energy in this way is called *photosynthesis*. The word photosynthesis comes from two Greek words. *Photo* means light and *synthesis* means putting things together to make something new. Overhead 1:1 (page 6) illustrates the process of photosynthesis.

PHOTOSYNTHESIS IN ACTION

Green plants have a special chemical in their leaves called chlorophyll - the substance that makes leaves green. The chlorophyll found in the chloroplasts of green leaves allows the leaves to act like miniature solar panels capturing and storing the sun's energy far more efficiently than anything ever devised by humans. Green plants use energy from sunlight, carbon dioxide gas from the air, and water from the soil to produce their own food.

NATURAL FOOD ENERGY

Plants use the process of photosynthesis to make sugars, called glucose and fructose. The glucose and fructose is combined to produce sucrose: a sugar found naturally in all plants - the exact same sugar you find in your sugar bowl. These sugars are the basis for all food energy. The sugars that plants produce are stored in the root, leaf, seed, or fruit of the plant. Plants can turn these sugars into other sources of food energy, including other sugars, starches, proteins, and fats; all the different kinds of food energy that plants and animals need for life.

PRODUCERS AND CONSUMERS

Green plants are called primary producers because they are the first link in the food chain and they produce food. Plants provide animals and humans with food, both directly and indirectly. For example, humans eat many plants directly in the form of vegetables and fruit. Indirectly, humans receive plant food through animals called primary consumers. An example of a primary consumer is a cow that feeds on grass. Humans then get energy from drinking the milk that cows produce using the energy from the grass they ate. In this food chain, humans can be called secondary consumers. Food energy from sugar is transferred through this natural sequence in food chains starting with its formation in plants and ultimately providing energy for the human body.

HERBIVORES, CARNIVORES AND OMNIVORES

Animals can be further classified as herbivores, carnivores, and omnivores depending on the foods they eat. Herbivores are animals, like rabbits, that eat only plants. Carnivores are animals, like foxes, that only eat other animals. Herbivores are usually near the bottom of a food chain and carnivores near the top (e.g. the fox eats the rabbit). Omnivores are animals, like humans, that eat both plants and animals.

Teacher Planning for Student Activities

Activity 1:1 FIND OUT ABOUT PHOTOSYNTHESIS

PURPOSE: To help students recognize the key ingredients necessary for photosynthesis, the process by which plants produce their own food to sustain their growth.

CURRICULUM CONNECTIONS:
4, 5

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, English Language Arts, Art

TEACHER NOTES:
This activity is designed to help students understand and illustrate the process of photosynthesis, the first step in every food chain. Overhead 1:1 (page 6) can be duplicated onto a transparency to illustrate the process and generate class discussions. This activity helps students learn the language associated with photosynthesis. The research and illustrations will help students discover how plants naturally produce food energy in the form of sugar, a basic element of every food chain, essential to the growth and life of all living organisms.

ASSESSMENT AND EVALUATION:
Students should be able to describe the process of photosynthesis in their own words.

Activity 1:2 PHOTOSYNTHESIS IN ACTION

PURPOSE: To help students recognize the key ingredients necessary for photosynthesis, the process by which plants produce their own food to sustain their growth.

CURRICULUM CONNECTIONS:
3, 4, 9, 10

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, English Language Arts

TEACHER NOTES:
This activity provides students with an opportunity to conduct an experiment in which they create different environments where plants will either grow well, grow poorly, or won't grow at all. They will observe and record the effects of depriving plants of sunlight, water or air, the key ingredients for the process of photosynthesis, which is essential for plant growth. When students have finished planting their four containers, ask each team to predict what will happen and share their "hypothesis" with the rest of the class.

NOTE Bean seeds sold for food in grocery stores have often been heat-treated and will not grow. It is important to use bean seeds intended for planting for this activity. Check with a local nursery or garden centre. Bean seeds are an ideal choice for this activity because they grow more quickly than many other types of seeds.

ASSESSMENT AND EVALUATION: The following information should be used as criteria to evaluate the students' reflections on photosynthesis in their responses to questions 3 and 4 on the student activity page (page 15).

Students will observe that the seedlings in:

CONTAINER #1 - carry out photosynthesis most successfully because they have all the elements they need to produce their own food through the process of photosynthesis. The plants in the container with sunlight, water and air grow the best and are the healthiest.
CONTAINER #2 - grow tall and quickly but are not healthy; without light for photosynthesis they appear white, thin and weak looking. These plants use the energy reserves in the seed to grow and search for light, but because photosynthesis cannot occur without light, they cannot produce energy to sustain their ongoing growth and will die.
CONTAINER #3 - cannot grow without water.
CONTAINER #4 - will grow and be healthy for some time, because there is some air trapped in the bag. But without fresh air, the plant will use up all the carbon dioxide in the bag over time. Since the carbon dioxide in the air is essential for the process of photosynthesis, the plant will eventually die. Photosynthesis cannot occur and plants cannot grow properly without light, water or air.

Activity 1:3 CREATE A FOOD CHAIN

PURPOSE: To help students understand the basic elements of a food chain; how plant, animal and human needs are all interrelated; and the classification of organisms according to their role.

CURRICULUM CONNECTIONS:
1, 2, 3, 6, 7, 8, 9, 10

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, Art, English Language Arts

TEACHER NOTES:
This activity provides students with an opportunity to investigate and illustrate a food chain of their own choice. Their findings can be used as the basis for a class discussion on conservation and environmental issues, and the impact these have on food chains. Once students have presented their food chain posters, you may wish to post them in the classroom.

ASSESSMENT AND EVALUATION:
The rubric included with this Mission (page 7) may be used to assess students' posters.

Activity 1:4 MAKE YOUR OWN MINI FOOD CHAIN

PURPOSE: To show students how they participate in food chains every day.

CURRICULUM CONNECTIONS:
1, 2, 5, 6, 10

KNOWLEDGE AND SKILL DEVELOPMENT:
Science, English Language Arts, Health and Physical Education

TEACHER NOTES:
We are involved in a food chain every time we eat a meal or a snack. In this activity, students will become actively involved in the making of bread, which is part of a food chain they enjoy regularly. In bread making, the action of yeast converts sugar and some starches into carbon dioxide gas and alcohol. The alcohol is lost during baking. The production of carbon dioxide is necessary in causing the dough to rise.

Read over the directions for this activity and ensure that you have all equipment and supplies.

NOTE Food safety is a primary concern when cooking in a classroom with children. Prior to this activity a discussion on safe food practices and handling must take place. All surfaces and equipment used for this experiment must be clean and sanitary. Dough should be properly stored to ensure food safety.

Organize students into groups of 4 or 5 in order to ensure success for all students. In their groups students will follow the instructions on the handout provided in order to make bread. Each member of the group will have one of the following jobs to do during the activity (note more than one student may be assigned to a job):

- **Equipment Manager** - collects all utensils, equipment and ingredients needed for the activity
- **Director** - reads the recipe/instructions and helps all members of the group to complete their task successfully
- **Cook** - mixes the dough and kneads, teaches other members of the group to knead as well
- **Sanitation Manager** - ensures that all members of the group use sanitary work habits, cleans up work area and equipment

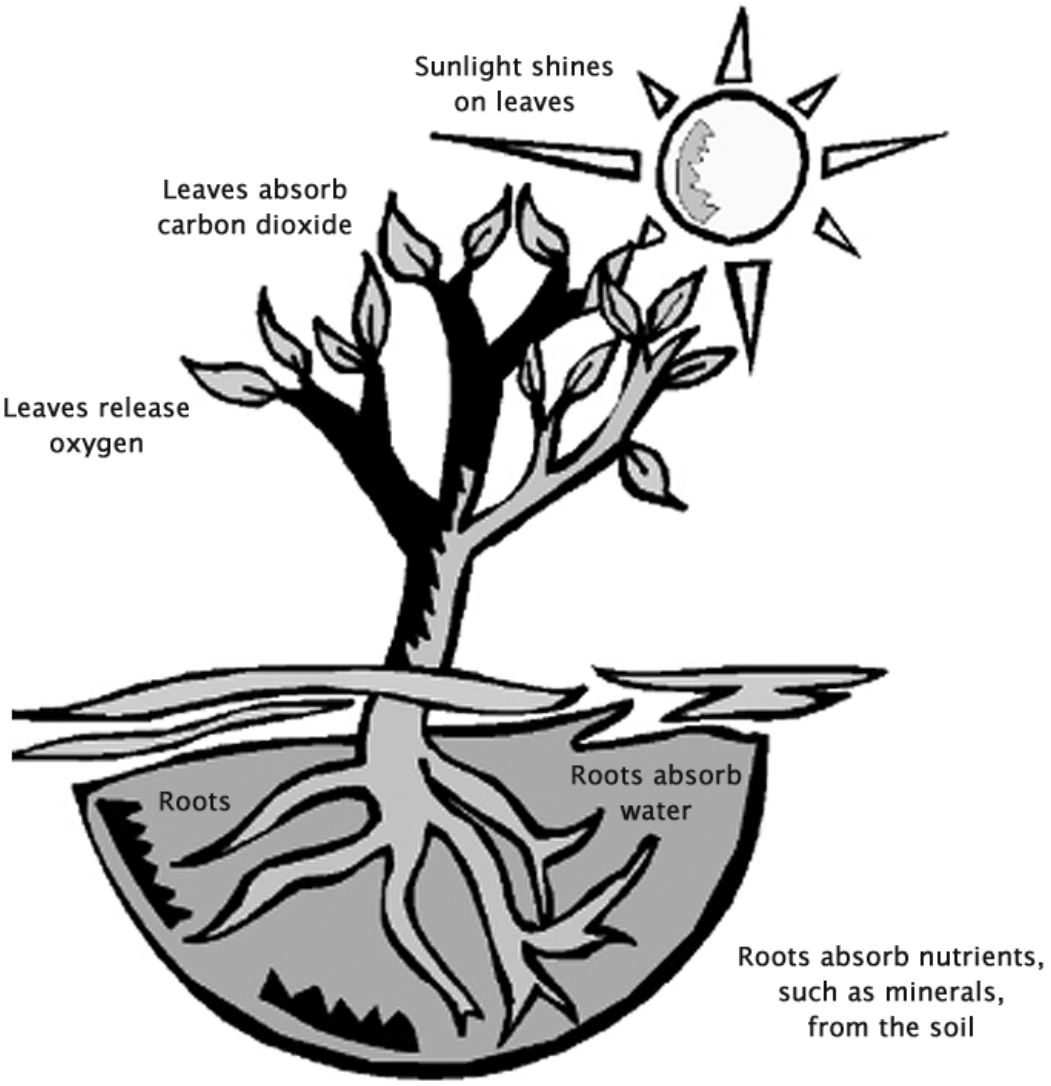
The Student Directions provide specific instructions for students to work through the activity.

The bread will need to be baked for 15 to 20 minutes in an oven at 190°C / 375°F. If there is an oven in the school it can be baked at school, if not it will have to be sent home to bake. If you are sending it home, advise parents ahead of time that the dough will be coming home.

ASSESSMENT AND EVALUATION:
Students will be evaluated on their completion of their job in the activity. Use the Evaluation tool provided (page 8).

KNEADING INSTRUCTIONS:
1. Place the dough on a clean work surface that has been dusted with flour.
2. To begin kneading, fold the dough over toward you.
3. Then press it away from you with the floured heel of the hand, give it a quarter turn and press away again. The pressure exerted on the dough should be neither heavy nor rough.
4. Use more flour as necessary on your hands and work surface to overcome stickiness.
5. Repeat the process until the dough becomes smooth and elastic.
6. Air blisters will appear just under the surface coating, try not to break the coating.
7. The dough should no longer stick to the work surface when it is ready to be set aside to rise.

OVERHEAD 1:1


Sunlight shines on leaves
Leaves absorb carbon dioxide
Leaves release oxygen
Roots
Roots absorb water
Roots absorb nutrients, such as minerals, from the soil

Evaluation Page

ACTIVITY 1:3

Poster Evaluation Rubric

Criteria	Level 4	Level 3	Level 2	Level 1
Understanding concepts	Demonstrates a high degree of understanding of the connections in the food chain	Demonstrates considerable understanding of the connections in the food chain	Demonstrates some understanding of the connections in the food chain	Demonstrates limited understanding of the connections in the food chain
	Demonstrates a high degree of skill in making real life connections	Demonstrates considerable skill in making real life connections	Demonstrates some skill in making real life connections	Demonstrates limited skill in making real life connections
	Demonstrates a high degree of understanding of the supports for food chains	Demonstrates considerable understanding of the supports for food chains	Demonstrates some understanding of the supports for food chains	Demonstrates limited understanding of the supports for food chains
Communication of Results/Visual Presentation	Communicates results of their inquiries in a detailed, sequenced and organized manner with a high degree of skill	Communicates results of their inquiries in a detailed, sequenced and organized manner with considerable skill	Communicates results of their inquiries in a detailed, sequenced and organized manner with some skill	Communicates results of their inquiries in a detailed, sequenced and organized manner with limited skill
	Communicates the results of their inquiry by identifying titles, labelling key components and using learned vocabulary with a high degree of accuracy	Communicates the results of their inquiry by identifying titles, labelling key components and using learned vocabulary with considerable accuracy	Communicates the results of their inquiry by identifying titles, labelling key components and using learned vocabulary with some accuracy	Communicates the results of their inquiry by identifying titles, labelling key components and using learned vocabulary with limited accuracy

Evaluation Page

ACTIVITY 1:4

Evaluation Checklist for Group Activity – Make Your Own Mini Food Chain

Group member's name: _____

Group member's job: _____

Criteria	Level 4	Level 3	Level 2	Level 1
Understood job and completed tasks effectively				
Supported other members of the group in the performance of their tasks				

Glossary

MISSION 1

CARBON DIOXIDE - gas that is absorbed from the air by plants to make their own food using photosynthesis; a gas produced naturally by humans and other animals and released when breathing out.

CARNIVORES - animals, like foxes, that eat only other animals.

CHLOROPHYLL - the green pigment inside chloroplasts in the leaves and stems of plants that captures light energy for photosynthesis.

CHLOROPLASTS - structures found in the leaves of green plants that allow them to capture and store energy from the sun.

FOOD CHAINS - the sequence of feeding relationships through which plants and animals depend on each other for food.

FOOD WEBS - the connection of two or more food chains.

FRUCTOSE - a sugar produced naturally by plants as a source of energy through the process of photosynthesis.

GLUCOSE - a sugar that is the primary source of energy for humans, produced naturally by green plants through the process of photosynthesis.

HERBIVORES - animals, like rabbits, that eat only plants.

OMNIVORES - animals, like humans, that can eat both plants and animals.

PHOTOSYNTHESIS - the process by which green plants use the sun's energy to turn carbon dioxide gas and water into sugars (plant food) and oxygen.

PRIMARY CONSUMERS - animals that eat (consume) only green plants (primary producers) for food energy.

PRIMARY PRODUCERS - the first link in the food chain; green plants that naturally produce their own food using energy from the sun.

SECONDARY CONSUMERS - animals that rely on food energy from other animals that are primary consumers.

SUCROSE - a sugar made of glucose and fructose, naturally produced by plants as a source of energy through the process of photosynthesis.

Additional Resources

MISSION 1

BOOKS

I am a Living Thing
By Bobbie Kalman
Series: Science of Living Things
Crabtree Publishing Company
24 Pages (2007)
ISBN 0778732290
This new book explains in a simple way why people are living things. We need sunshine, air, water, and food. We grow and change. We need places to live. Young children will be amazed to learn that, as living things, they share many similarities with plants and animals.

What are Food Chains and Webs?
By Bobbie Kalman
Series: Science of Living Things
Crabtree Publishing Company
32 Pages (1998)
ISBN 0865058768
A simple introduction to food chains and webs, featuring both herbivores and carnivores, and discussing energy, food production, and decomposition in various ecosystems.

A Teacher's Guide To Nature's Food Chain: Lesson Plans To Teach Nature's Food Chains
By Carol Malnor
Dawn Publications; Teacher edition
48 Pages (2000)
ISBN 1584690070
Different types of food chains, habitats, and animal relationships are explored using approaches that incorporate multiple intelligences including movement, art, music, writing, and math activity centers for both individual and group work.

Photosynthesis and Respiration
By William G. Hopkins
Chelsea House Publications
168 Pages (February 2006)
ISBN 0791085619
Presenting plants as photosynthetic machines, this book follows the flow of energy and carbon through the natural processes of photosynthesis and respiration, spotlighting the role plants play in balancing the global carbon budget.

ELECTRONIC RESOURCES

ECOKIDS
www.ecokids.ca/pub/index.cfm
An environmental website for kids, teachers and parents with interactive activities based on Ontario Curriculum.

NATIONAL GEOGRAPHIC XPEDITIONS
www.nationalgeographic.com/xpeditions/
Interactive geography activities and lesson plans for all grades.

PARKS CANADA
www.pc.gc.ca/apprendre-learn/prof/itm2-crp-trc/crp-trc1_e.asp
Canadian educational resources categorized by curriculum, province and grade.

EARTH GUIDE at Scripps Institution of Oceanography
earthguide.ucsd.edu/earthguide/diagrams/photosynthesis/

That Beet is Sweet!
By Sarah Morrison, Statistics Canada
Approximately one third of the world's production of refined sugar comes from sugar beets! Learn more about the history, production, and processing of sugar beets.
http://www.sugar.ca/english/pdf/That_Beet_is_Sweet_Stats_Canada_08.pdf

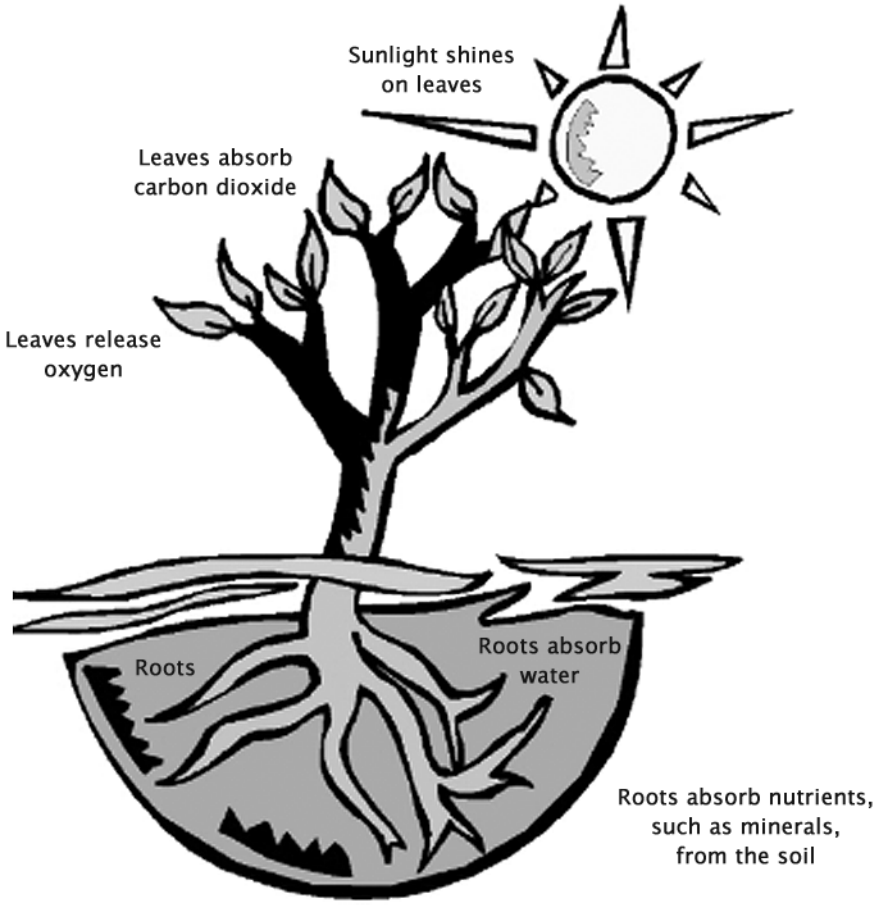
Exploring Food Chains

ACTIVITY 1:1

Find Out About Photosynthesis

Plants can do something truly amazing. They can make their own food using the energy from the sun. This process is called photosynthesis. The leaves and stems of green plants act like solar panels. They contain a green chemical called chlorophyll that can capture the sun's energy. They use this energy to combine water from the environment and carbon dioxide from the air to make food.

The foods that plants make using photosynthesis are sugars. Plants store the sugars they make in the root, leaf, seed or fruit. They also use these sugars to make other sugars, starches, fats and proteins - all the different kinds of food energy needed by plants and animals. The natural production of sugar by plants using photosynthesis is the first step in making food energy for all life on earth.



Student Directions

1. Use a dictionary or an encyclopedia to look up definitions of the following words that are used to describe how plants produce energy using sunlight, water, and carbon dioxide from the air.

Student Responses

PHOTOSYNTHESIS: _____

_____

CHLOROPHYLL: _____

_____

CARBON DIOXIDE: _____

_____

SUGAR: _____

_____

ENERGY: _____

_____

2. Draw your own picture to show how photosynthesis works, below or on a separate piece of paper. Be sure to use the new words you have learned to label your picture.

ACTIVITY 1:2

Photosynthesis in Action

Seeds contain stored plant food (nutrients and energy) that the plant needs to begin growing under the soil. This stored plant food lasts until the seedlings are able to trap energy from the sun to make their own food, in the form of sugars, through photosynthesis.

Plants use energy from the sun to make their own food through a process called photosynthesis. They use water from the environment and carbon dioxide gas from the air to make two types of sugars - glucose and fructose. Plants also combine glucose and fructose to make another sugar called sucrose. Sucrose is exactly the same kind of sugar that you find in your sugar bowl at home. The sugars that plants make during photosynthesis supply the energy that they need to grow strong and healthy.

Student Directions

Try this experiment to see how well plants can live with and without sunlight, water, and air.

1. Work in the group/team assigned by your teacher.

2. With your teammates, collect:
- ✓ 3 coffee cans (empty and clean with lids removed)
- ✓ 1 self-watering pot (a pot with a saucer attached at bottom for watering)
- ✓ 20 bean seeds (the kind used for planting)
- ✓ 1 clear plastic bag (large enough to cover the self-watering pot)
- ✓ potting soil
- ✓ 1 measuring cup (250 mL)
- ✓ masking tape
- ✓ 1 marker
- ✓ 1 rubber band

3. Soak the bean seeds in a bowl of cool water overnight. This softens the seed case so the new plant can break it more easily and sprout more quickly.

4. Fill the three coffee cans and the self-watering pot with soil to about 1.5 cm from the top.

5. Place five seeds in each container and push them down so they are just covered with soil.

6. Label the three cans:
#1 GOOD GROWING CONDITIONS
#2 NO SUNLIGHT
#3 NO WATER

7. Label the self-watering pot: #4 NO AIR

8. Prepare each can as directed:

#1 **GOOD GROWING CONDITIONS** - Add water until soil is just moist (about 50 mL) and place on a sunny windowsill. Do not cover the can and do not over-water.
#2 **NO SUNLIGHT** - Add water until soil is just moist (about 50 mL) and place in a dark closet. Close the closet door. Do not cover the can and do not over-water.
#3 **NO WATER** - Place on a sunny windowsill; do not add water and do not cover.

9. Prepare the self-watering pot as directed:

#4 **NO AIR** - Place the plastic bag over the top half of the pot and secure it with the rubber band so that the bottom half of the pot is not covered. Pour as much water as possible into the container at the bottom of the pot and place the pot on a sunny windowsill.

10. Rotate the plants on the windowsill daily. Water all plants, except for #3, when the soil is dry (about every 2 to 3 days). Be careful not to over-water the plants.

Student Responses

1. Note how many days it takes for the first plant to break through the soil in each container.

	CONTAINER #1 Good Growing Conditions	**CONTAINER #2** No Sunlight	**CONTAINER #3** No Water	**CONTAINER #4** No Air
Days to first Sprout				

2. Use the table below to note your observations on the plant growth over a period of 4 weeks after you plant the seeds. Record the height and describe the appearance of the plants in each container every week. After 2 weeks you should see some noticeable differences.

WEEK	**CONTAINER #1** Good Growing Conditions	**CONTAINER #2** No Sunlight	**CONTAINER #3** No Water	**CONTAINER #4** No Air
1				
2				
3				
4				

3. Which seedlings carried out photosynthesis most successfully? Why? _____

_____

_____

_____

4. Can photosynthesis occur, allowing healthy plant growth, without: Light? Water? Air? Why?

_____

_____

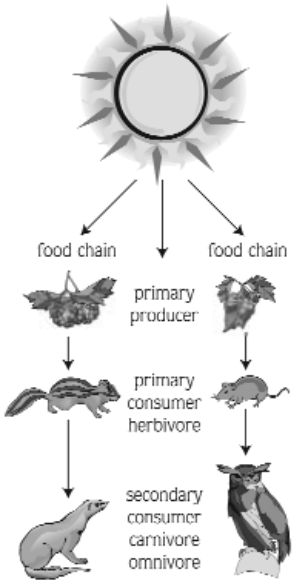
_____

_____

Exploring Food Chains

ACTIVITY 1:3

Create a Food Chain



All living plants and animals depend on food energy for life. The transfer of food energy from one living organism to another is called a food chain. Every plant and animal belongs to at least one food chain. There are many food chains taking place every day all around you - in nearby parks or fields, in far away jungles, in little ponds, and in the great oceans.

Food chains all start with energy from the sun. Green plants are called primary producers because they are the first link in the food chain and they produce food using energy from the sun. Herbivores, or animals that feed on plants, are the next link in the food chain - they are primary consumers. Animals called carnivores feed on other animals. Animals that eat both plants and animals are called omnivores. Carnivores and omnivores are called secondary consumers. Food chains allow for energy from the sun to be transferred from one living organism to another.

Student Directions

1. Choose a food chain to investigate using an encyclopedia, a book, or the internet. Start with the sun and work your way up to a secondary consumer.

2. Based on your research, create a poster that illustrates a food chain. Your poster should include real life examples of all of the following:

   - primary producers
   - herbivores
   - primary consumers
   - carnivores
   - omnivores
   - secondary consumers

   Your poster should also show what is provided in the environment (air, water, soil) to support the food chain.

3. Label your food chain with the words listed above to describe the different roles of the plants and animals in the food chain.

Student Responses

1. Make a list of things that affect the plants and animals in your food chain like the availability of water, food sources, light, soil conditions, weather.

2. Brainstorm a list of things that may cause "breaks" in your food chain (e.g. pollution). What do these breaks do to your food chain?

3. Present your food chain and your findings to your group or class. Explain:

- the roles of the plants and animals
- other things in the environment that can affect your food chain in a good or bad way

ACTIVITY 1:4

Make Your Own Mini Food Chain

Every meal and snack that you eat each day connects you to different food chains. Food chains allow for the energy from the sun to be transferred from one living organism to another, and another, without being lost. For example, when you eat chicken, you use the energy that the chicken stored from the grain that it ate. The grain stored the energy from the sun while it was growing in the field.

Student Directions

This bread baking activity recreates a mini food chain that you probably participate in every day.

1. Your teacher will assign students to a group and each member of the group to a different job:

a. **Equipment Manager** - collects all utensils, equipment and ingredients needed for the activity
b. **Director** - reads the recipe/instructions and helps all members of the group to complete their task successfully
c. **Cook** - mixes the dough and kneads, teaches other members of the group to knead as well
d. **Sanitation Manager** - ensures that all members of the group use sanitary work habits, cleans up work area and equipment

2. Equipment manager - gather the following items:

✓ 1 sponge, soap and hot water
✓ several sheets of paper towel
✓ 1 large mixing bowl
✓ 1 medium size mixing bowl
✓ 1 soup bowl
✓ 1 measuring cup for liquids
✓ 1 set of measures for dry ingredients
✓ 1 tablespoon (15 mL) measuring spoon
✓ 1 mixing spoon
✓ 15 mL (1 tbsp) yeast (fast acting)
✓ 45 mL (3 tbsp) sugar
✓ 15 mL (1 tbsp) salt
✓ 30 mL (2 tbsp) cooking oil
✓ 750 mL (3 cups) flour
✓ plastic wrap

3. Sanitation Manager - clean the surface of a work table well using the sponge, soap and hot water. Dry the surface with the paper towel.

4. **All group members** - wash your hands.

5. **Equipment Manager** - fill the measuring cup with 250 mL (1 cup) of lukewarm tap water, and add it to the large bowl.

6. **Cook** - empty the yeast into the large mixing bowl. Put the sugar and salt into the large bowl and mix gently with the mixing spoon.

7. **Equipment manager** - measure 30 mL (2 tbsp) of cooking oil using the tablespoon and place in the soup bowl.

8. **Cook** - measure 15 mL (1 tbsp) of this oil and add it to the large mixing bowl.

9. **Cook** - measure 750 mL (3 cups) of flour using your dry ingredient measures, into your medium size mixing bowl. Then put 500 mL (2 cups) of this flour into the large mixing bowl. Leave the remaining 250 mL (1 cup) of flour in the medium bowl to use later (in step 11).

10. **Cook** - mix all the ingredients in the large bowl with the mixing spoon.

11. **Cook** - three times in a row, measure 50 mL (1/4 cup) of flour (from the medium bowl) and add to the large bowl, mixing it in each time until a ball of dough is formed.

12. **Cook** - powder the work table with a bit of the leftover flour (in the medium bowl) and place the ball of dough on this surface.

13. AFTER WATCHING YOUR TEACHER SHOW YOU HOW, take turns kneading the dough 5 or 6 times each. Knead the dough about 25 times altogether.

14. **Cook** - cover the ball of dough with a bit of the leftover cooking oil (from the soup bowl) and place the dough back into the large bowl. Cover the bowl with plastic wrap.

15. **Leave the bowl to sit for one hour in a warm area** - in the sun or near a radiator for example. This warmth will allow the yeast to live and do its work. BE CAREFUL NOT TO PUT THE BOWL TOO CLOSE TO VERY HIGH HEAT OR THE YEAST WILL DIE.

16. **Each Group Member** - record observations on the rising of the dough on the worksheet provided.

17. **Cook** - punch the ball of dough to release the carbon dioxide. Divide the dough into pieces, one for each member of the team.

18. **Each Group Member** - take your ball of dough and knead it 5 more times, then shape it. Oil the dough and wrap it loosely in plastic wrap to allow for it to swell again.

19. Once the dough is ready, bake the bread for 15 to 20 minutes in an oven at 190°C / 375°F.

Student Responses

1. Leave the dough to rise and record your observations for the following time intervals:

a. 15 minutes _____

_____

b. 30 minutes _____

_____

c. 45 minutes _____

_____

d. 1 hour _____

_____

2. In the bread dough, the yeast has everything it needs to live and reproduce: a humid area with an ideal temperature and food.

What is that food? _____

_____

3. The yeast eats and breathes in the dough. Like us, the yeast breathes out carbon dioxide.

a. What happens to this carbon dioxide?

_____

_____

_____

b. What happens to the bread dough?

_____

_____

4. When you eat the bread, you are participating in a food chain. Draw this mini food chain below.