

Lesson 3: Not Just Sugar

Curriculum Expectations

Health and Physical Education:

Grade 3: 1.1, C2.1

Grade 4: 1.1, C2.1

Grade 5: 1.1, C2.1

Grade 6: 1.1, C3.1

Grade 7: 1.1, C2.1

Science

Understanding Life Systems:

Grade 3: 2.7

Grade 4: 2.6

Grade 5: 2.5

Grade 6: 2.5

Grade 7: 2.5

Learning Goals

By the end of this lesson, students will be able to:

- Use self-awareness and self-monitoring skills to analyze the class' healthy drink choices.
- Explore the effects of various sugary drink ingredients on the body.
- Communicate research findings in a variety of forms for different audiences.

Facility: Classroom

Time: 40 minutes

Materials		
Grades: 3 - 5	Grades: 6 - 7	Shopping List
<ul style="list-style-type: none"> • Teacher Resources: <ul style="list-style-type: none"> – Teacher Resource 3: Drink Report (see lesson 2) – Teacher Resource 9: Acid in Drinks – Teacher Resource 10: "Tooth" Experiment Report • Student Resources: <ul style="list-style-type: none"> – Student Resource 1: Drink Diary Tracking Sheet (see lesson 1) – Student Resource 5: Observations of "Tooth" Experiment – Drink Diary Calculator – Drink Cut-outs (download from www.brightbites.ca) – The "Tooth" Experiment • Assessment Tools: <ul style="list-style-type: none"> – Assessment Tool 1: Anecdotal Recording Chart – Assessment Tool 2: Sip Smart!™ Ontario Drink Diary – Assessment Tool 3: Observations of "Tooth" Experiment • 8 Large sticky notes • Chalk • Optional: 2 or 3 skipping ropes 	<ul style="list-style-type: none"> • Teacher Resources: <ul style="list-style-type: none"> – Teacher Resource 3: Drink Report (see lesson 2) – Teacher Resource 7: Every Serving Counts – Teacher Resource 8: Caffeine Report – Teacher Resource 9: Acid in Drinks – Teacher Resource 10: "Tooth" Experiment Report – Teacher Resource 11: Crossword Puzzle Answer Key – Teacher Resource 12: Caffeine Symptoms – Teacher Resource 13: Caffeine Scenario – Drink Diary Calculator – Drink Cut-outs (download from www.brightbites.ca) – The "Tooth" experiment – Backgrounder: Caffeine • Student Resources: <ul style="list-style-type: none"> – Student Resource 1: Sip Smart!™ Ontario Drink Diary Tracking Sheet (see lesson 1) – Student Resource 4: Check the Caffeine! – Student Resource 5: Observations of "Tooth" Experiment • Assessment Tools: <ul style="list-style-type: none"> – Assessment Tool 1: Anecdotal Recording Chart – Assessment Tool 2: Sip Smart!™ Ontario Drink Diary – Assessment Tool 3: Observations of "Tooth" Experiment • 8 Large sticky notes • Board markers in 4 colours 	<ul style="list-style-type: none"> • 1 can regular cola • 1 can diet cola • 1 can clear pop • 1 can energy drink • 1 apple juice box • 1 glass of water • 6 clear containers (about 200 mL), ideally with lids • 6 pieces of bone (see pg. 53 for the "Tooth" Experiment explanation)

Minds On: Drink Report 2

Activity Big Idea

- The number and size of servings we drink affect the amount of sugar we consume.
- Knowing what is in drinks helps us to make healthy choices.

Activity

All Grades

- Report results of the Drink Diary from Lesson 2 to the students using Teacher Resource 3: *Drink Report*.
- Discuss results. For example: encourage class to increase consumption of water, milk, or fortified soy beverages (if needed), limit pop (if needed), etc.
- Compare the results of the *Drink Diary* from Lessons 1 and 2.
- Discuss if the class has reached their goal.
- Distribute Student Resource 1: *Sip Smart!™ Ontario Drink Diary Tracking Sheet* and ask students to fill in the Drink Diary (See Lesson 1 for details).
- If you sent home the *Sip Smart!™ Ontario Booklet* and Student Resource 3: *Crossword Puzzle* at the end of Lesson 2, take a few minutes to discuss the answers with the students. See Teacher Resource 11: *Crossword Puzzle Answer Key*.

Assessment

Teacher observation with anecdotal writing of students' application of self-monitoring skills as they demonstrate their ability to apply healthy living skills to make healthier choices using Assessment Tool 2: *Sip Smart!™ Ontario Drink Diary*.

Activity Tips

Congratulate the class on any decrease in consumption of sugary drinks and on any increase in healthy choices. If there is no progress toward positive goals, ask students why they think this is so. What is getting in the way of change?

The Punchline!

Now that we see what our class is drinking, how well are we progressing toward achieving our goal? Should we...

- Drink more water or more plain milk/ fortified soy beverages?
- Drink fewer sugary drinks?
- Celebrate our great drinking habits?
- Think about some solutions for change?

Minds On: “Bump Out”

Activity Big Idea

- Drinking sugary (or artificially sweetened) drinks “bumps out” nutritious drinks.

Activity

Grades 3, 4 & 5

- Draw a chalk line on the floor to represent the size of an imaginary stomach. Optional: use skipping ropes to outline a “stomach”.
- On 8 sticky notes write “milk or water”.
- Ask 8 students to come to the front and stand in the stomach area.
- Give each of them one of the “milk or water” sticky notes to represent the 8 cups of nutritious fluid per day. Take students through the following examples highlighting how drinking sugary drinks “bumps out” nutritious drinks.
- **Example 1:** What if you want pop at recess?
 - Assign the pop Drink Cut-out to another student.
 - Have a “pop” student enter the stomach area.
 - One pop bottle = 2 cups (500 mL) of liquid, so 2 water students get “bumped” out of stomach.
 - Ask the sugary drink students to sit down.
 - Have students count how many nutritious drinks are left (Answer: 6).
- **Example 2:** What if a friend offers you a sports drink instead of water after your soccer game?
 - Add a “sports drink” student.
 - One sports drink = 3 cups (750 mL), so take away another 3 cups (750 mL) of healthy drinks (2 water, 1 milk).
- Working in pairs, have students brainstorm how they can promote healthier drink alternatives to their classmates at recess or while at a sporting event. Have pairs who discussed a sporting event teamed up with a pair who discussed recess and have them share their responses. Have students share their responses as a large group. Consider recording student responses using a T-chart.

Activity

Grades 6 & 7

- Display Teacher Resource 7: *Every Serving Counts!*
- Colour 5 cups (1250 mL) blue (for water) and 3 cups (750 mL) green (for milk or fortified soy beverage) to show ideal intake.
- Put new colours on top of the original coloured cups to explain the displacement of healthy drinks.
- **Example 1:** What if you want pop at recess?
 - One pop bottle = 2 cups (500 mL) of liquid
 - Pop = black
 - Colour 2 water cups black.
 - Have students count how many nutritious drinks are left (Answer: 6).
- **Example 2:** What if a friend offers you a sports drink instead of water after your soccer game?
 - One sports drink = 3 cups (750 mL) of liquid
 - Sports drink = red
 - Colour 3 water cups red.
- Have students count how many nutritious drinks are left.
- Working in pairs, have students brainstorm how they can promote healthier drink alternatives to their classmates at recess or while at a sporting event. Have pairs who discussed a sporting event teamed up with a pair who discussed recess and have them share their responses. Have students share their responses as a large group. Consider recording student responses using a T-chart.

Assessment

Teacher observation with anecdotal writing of students’ ability to apply healthy living skills to make healthier choices using Assessment Tool 1: *Anecdotal Recording Chart*.

Activity Tips

Health professionals suggest students aged 7 - 12 consume no more than 65 to 85 mg of caffeine each day.

Caffeine has a larger impact on children and youth than it does in adults. For example, one cup of coffee in an adult’s body will have the effect of 4 cups (1L) of coffee in a student’s body.

The Punchline!

Think about the effects of caffeine on your body before choosing a drink that contains caffeine.

Action: “Tooth” Experiment, Part 1

Activity Big Idea

- Some ingredients other than sugar, such as acid and caffeine, can damage our health.

Activity

All Grades

- Ask students to suggest reasons why acid may harm their teeth.
- Use Teacher Resource 9: *Acid in Drinks* to explain the impact of sugar and acid on our teeth.
- Put students into 6 groups and assign one drink and one piece of bone to each group.
- Distribute Student Resource 5: *Observations of “Tooth” Experiment*.
- Ask students to do the following:
 1. Write the drink they are observing on the sheet.
 2. Hypothesize what they think will happen where it says “Based on what I already know, I think...”
 3. Draw a picture of their “tooth” and make observations of what they see, smell and feel.
 4. Place one bone piece in their plastic container.
 5. Fill their container with approximately 125 mL of their drink to be observed (e.g., pop).
 6. Write the liquid used on the plastic container.
 7. Leave the container untouched until the next Sip Smart!™ Ontario lesson.
 8. Hold on to their handout; it will be completed in the next lesson.
 9. Ask each group to share their hypothesis and collect the ideas on Teacher Resource 10: *“Tooth” Experiment Report* (Worksheet will be completed in Lesson 4).

Assessment

Teacher observation with anecdotal writing of students’ ability to communicate experiment procedure, observations, and results using Assessment Tool 3: *Observations of “Tooth” Experiment*.

Activity Tips

This is a scientific experiment that is to be carried out in groups. Students will observe how sugary drinks affect teeth.

Instead of teeth, you will be using a small piece of bone, which contains calcium and shares many of the same materials as teeth. See The “Tooth” Experiment (pg. 53) for information about bone preparation. In this lesson, students will set up the experiment. To obtain best results, the pieces of bone should sit submerged for approximately two weeks.

Through testing, we’ve discovered that using: water, cola, diet cola, clear pop, energy drink, and apple juice will likely get you the most interesting variety of results. While students may find it boring to observe the tooth in water, it is important as a comparison and for drawing conclusions.

What is the impact of acid and sugar on our teeth?

- Sugar + bacteria (in our mouths) creates acid.
- This acid attacks our teeth, and, over time, causes decay.
- Many sugary drinks are very acidic, which adds even more acid to what our mouths produce.
- The combination of acid and sugar in sugary drinks can lead to severe tooth decay.
- It is important to be sensitive to students’ backgrounds. For example, using an animal bone as a “tooth” may not be appropriate for a student’s culture and/or religion. See The “Tooth” Experiment (pg. 53) for alternate material.

The Punchline!

Think about the effects of caffeine on your body before choosing a drink that contains caffeine.



Teachers say:
“This experiment is well worth the effort!”

The “Tooth” Experiment

Part 1: Sipping Sugary Drinks and Acid Attacks

Acids are chemicals that are sometimes added to foods and beverages to alter taste and act as a preservative. One of the properties of acid is that it dissolves things.

When a person sips a sugary drink, an ‘acid attack’ occurs in the mouth for up to 20 minutes. The acid demineralizes the tooth during the attack and weakens the tooth. After about 20 minutes, saliva remineralizes the tooth and strengthens it. This balancing act is greatly challenged when a person snacks frequently on sticky foods, or sips regularly on sugar-laden drinks.

A case-in-point:

- A child takes a drink of pop and there is a 20 minute acid attack.
- The body is about to remineralize the tooth but the child takes another sip so there is another 20 minute acid attack.
- This pattern continues throughout the day. The balance is offset and the demineralization time outweighs the remineralization time and tooth decay begins.

The good news is that children can sip water all day with no worries of acid attacks on their teeth. If children have an acidic drink, such as 100% fruit juice, they should drink it in one sitting versus sipping it all day. The same applies to sugary drinks, when they are consumed as a once-in-a-while treat!

After having a sugary drink health professionals recommend rinsing your mouth with water, a fluoride mouth rinse or chewing sugarless gum. Anyone of these actions will help neutralize the acid found in the drink.

Interestingly, brushing teeth is not recommended after consuming a sugary drink. The enamel of the teeth is in a weakened state because of the erosion caused by the acid in a drink, so the mechanical abrasion of the brush actually exacerbates the problem.

Part 2: The “Tooth” Experiment

It is important to note that the tooth experiment does not simulate the processes occurring in the mouth after sipping a sugary drink. In placing the bone or “tooth” in different acidic sugary drinks, the only factor acting on the “tooth” is the acidity of the drink. There are no normal mouth bacteria present. Recall that when a child sips a sugary drink, the sugar interacts with the bacteria in the mouth to produce acid. Once this acid is made, it lasts for about 20 minutes, after which the saliva in the mouth neutralizes the acid, and the “acid attack” ends.

The tooth experiment does show the process of tooth erosion, whereby an acidic liquid chemically erodes away the hard mineralized surface of the “tooth”. Although the experiment cannot accurately capture all of the factors in the mouth that contribute to tooth decay, it is currently the best tool that we have to demonstrate the harmful effects on teeth. This hands-on approach gives an idea of the harmful effects of sugary drinks on their teeth.

In the spirit of experimentation, other drinks could be used, but we haven’t tested these or provided information in the resources. Milk may be used but it should be refrigerated and the experiment completed before the best before date, to simulate real drinking conditions. We trialed 100% orange juice and noticed that it often grew mold.

Preparing Bones for the “Tooth” Experiment:



1. Shopping

Ask a butcher to cut a beef marrow bone (soup bone) into 1 cm thick slices.

You will get about 6 - 10 “teeth” per slice and to carry out the experiment as described, 6 pieces are necessary.



2. Cleaning

Soak the gristly bones in warm water overnight. Remove the gristle bone gently with a paring knife.



3. Cutting

To quickly cut bones into pieces, use a bolt cutter. You can also use a band saw or hit the bone with a hammer or a hammer and chisel (wear eye protection).

If you use a bolt cutter it works best when the bones are wet and soft. Cut the bones in a safe environment as pieces may fly off in several directions.

Alternatives:

Demonstration using extracted adult teeth

Oral surgeons may be willing to save extracted adult teeth (usually un-erupted wisdom teeth) for classroom experiments. After extraction, the oral surgeon will rinse the teeth with water to remove blood before sending them to you. The teeth should be cleaned and then held in a sanitizing solution made with 5 mL (1 tsp) of bleach in 1 L (4 cups) of water to adequately disinfect the teeth. Once received, the teeth can then be thoroughly cleaned with a toothbrush. Any remaining tissue will not interfere with this experiment. The teeth should then be stored in new dilute bleach solution made with 5 mL (1 tsp) of bleach in 1 L (4 cups) of water until required. The teeth should be rinsed with water to remove traces of bleach before starting the experiment. For protection against such things as viruses, **the teacher should use gloves** when handling the teeth.

If using bone or extracted adult teeth is not appropriate for some students’ culture or religion, teachers have also demonstrated the acidic nature of sugary drinks by placing a copper penny in an acidic liquid such as cola. Although the penny will become shinier, this is essentially due to the top layer of metal being etched away. This is an important distinction to be made as students could easily confuse this corrosive result with cleaning (or erroneously believing that drinking cola will clean their teeth).

Consolidation: Stars and Stairs Self Reflection

Activity Big Idea

- Some ingredients other than sugar, such as acid and caffeine, can damage our health.

Activity

All Grades

- Working individually students complete an Exit Card or journal entry identifying two stars, which are things they are doing well when it comes to making healthy drink choices, and two stairs, which are steps they would like to take to make a healthier drink choice.
- Students share their responses with a partner before submitting to the teacher. Consider displaying student work on a bulletin board for reflection throughout and upon completion of the lessons.

Assessment

Teacher observation with verbal feedback of students' self-monitoring of their ability to apply healthy living skills to make healthier choices.

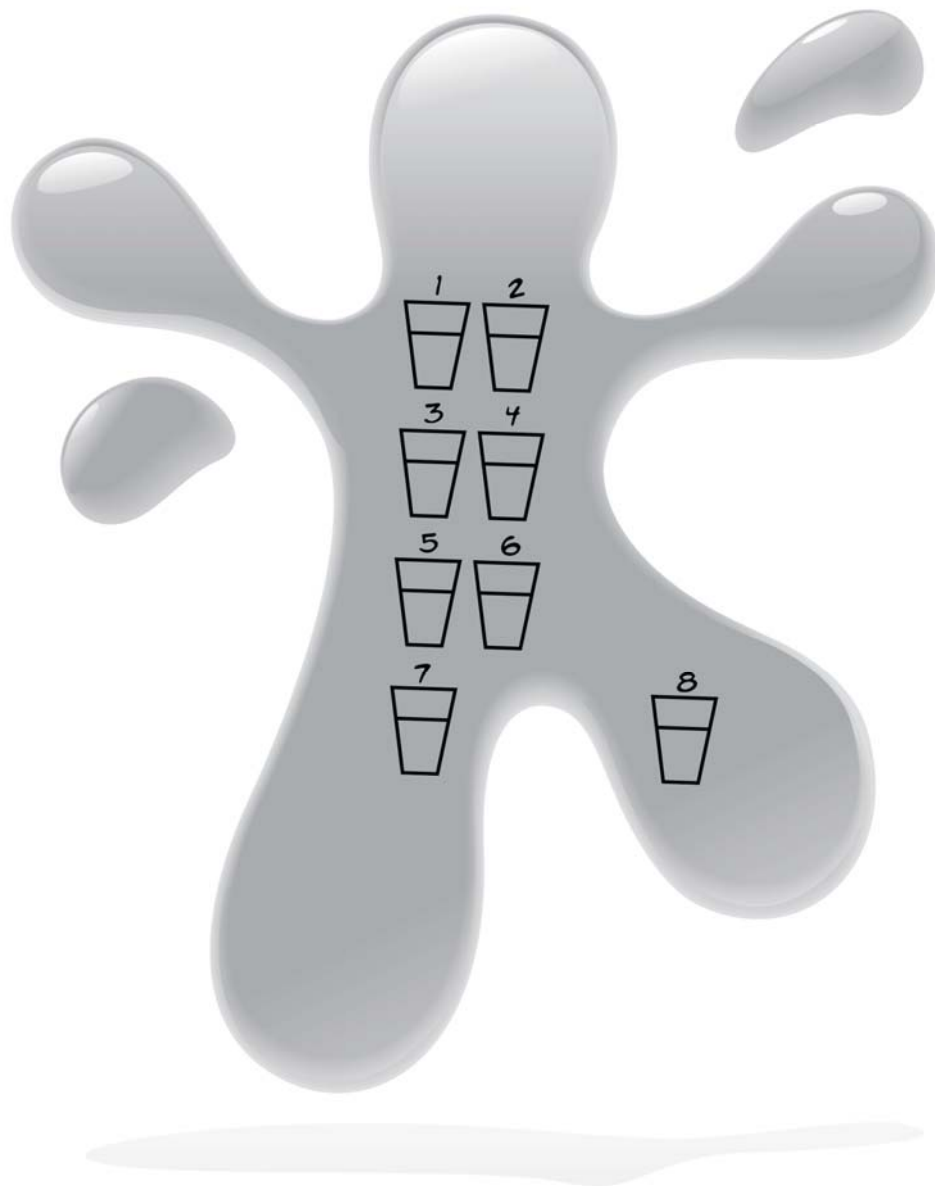
Children can sip water
all day with no worries
of acid attacks on their
teeth



Teacher Resource 7: Every Serving Counts!



EVERY SERVING COUNTS!



Sugary drinks bump out nutritious drinks!

Teacher Resource 8: Caffeine Report



	Caffeine
Caffeine from chocolate milk (7 mg/250 mL)	
Caffeine from cola (29 mg/250 mL)	
Caffeine from energy drinks (130 mg or more/250 mL)	
Caffeine from coffee (158 mg/250 mL)	
Caffeine from tea (30 mg/250 mL)	
How much caffeine did we consume?	

COMPARE!

Maximum amount of caffeine recommended per student/day = 62 to 85 mg (7 to 12 years)

Number of students in class = _____

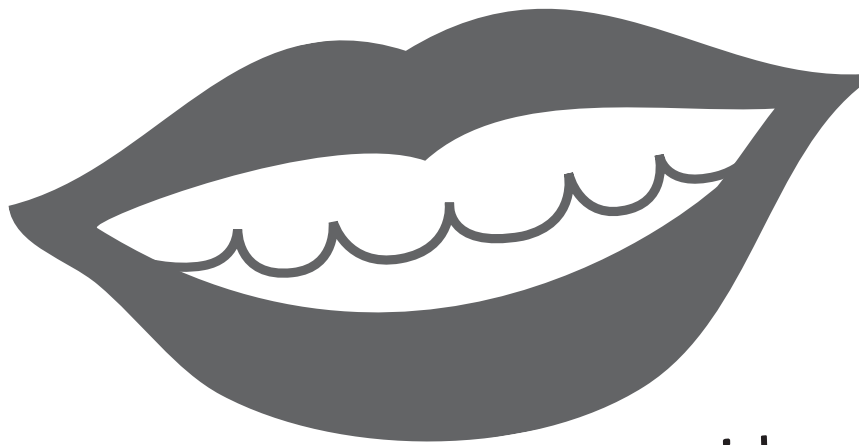
Maximum amount of caffeine recommended/class/day = _____



Teacher Resource 9: Acid in Drinks



ACID IN BEVERAGES



bacteria + sugar = acid



tooth decay!



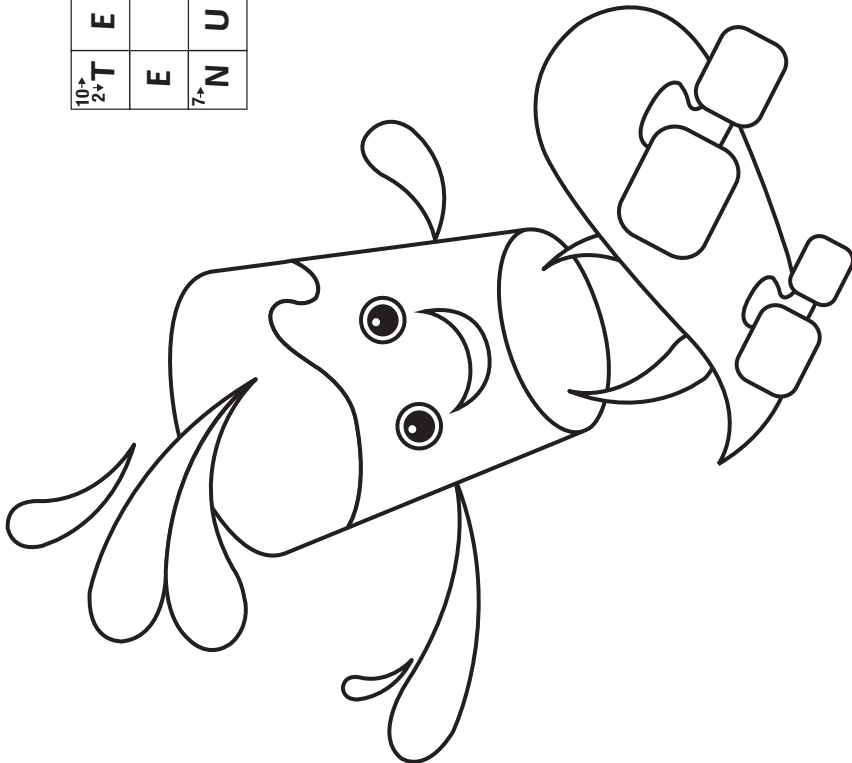
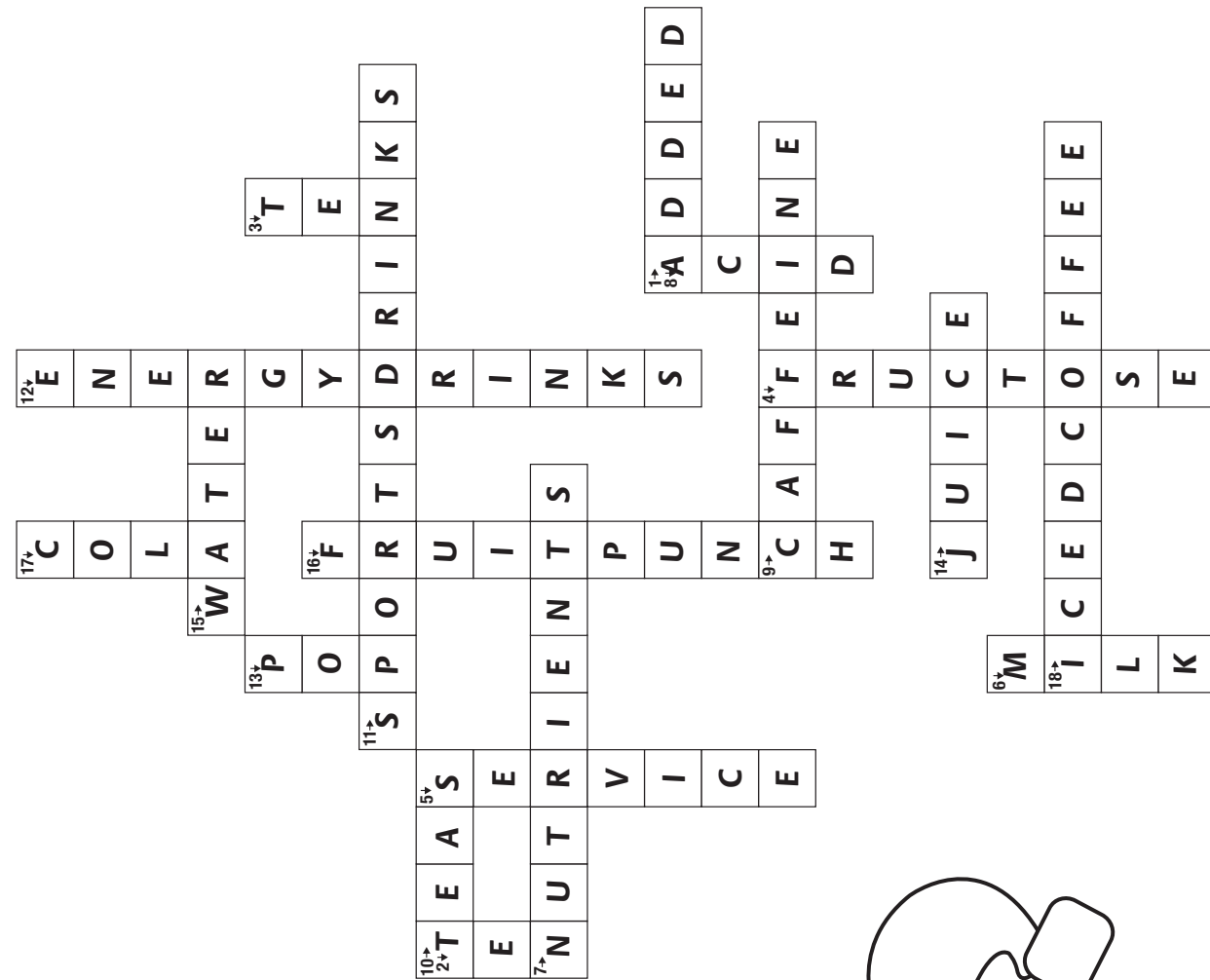
**MEANS SIPPING WATER
- NOT DRINKS!**

Teacher Resource 10: "Tooth" Experiment Report



Drink	Hypothesis	Observation
Regular cola		
Diet cola		
Clear pop		
Energy drink		
Apple juice		
Water		

Teacher Resource 11: Crossword Puzzle Answer Key



Please visit us at www.brightbites.ca

Teacher Resource 12: Caffeine Symptoms



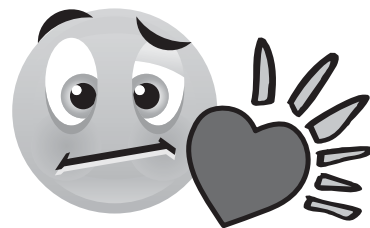
CAFFEINE SYMPTOMS



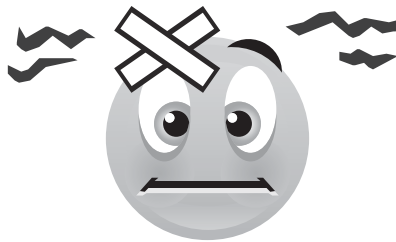
mind wandering



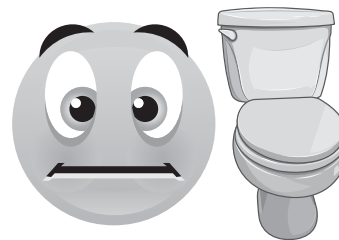
heart beating too fast



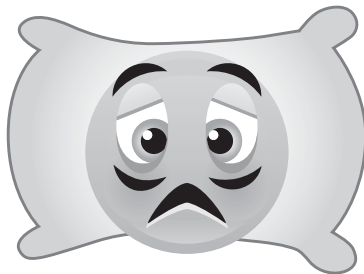
headache



more trips to the bathroom



tired/trouble sleeping



feeling sick



fidgety and restless



irritable and anxious



Teacher Resource 13: Caffeine Scenerio



CAFFEINE SCENARIO

Sip Smart!™ Ontario Caffeine Scenario

It is a hot and sunny day at the beach. Tom is thirsty so he goes to the concession stand to buy a can of ICED TEA. It's delicious and refreshing. He feels fit to play beach volleyball for another hour! After an awesome game, he craves something to pick him up while cooling him down, so he buys a medium ICED COFFEE for the walk home.

Once at home, he remembers that he has a test in school tomorrow. He sits at his desk and starts reading. He notices his mind wandering and his heart beating too fast. He is getting a headache. He also has to go to the bathroom way more often than usual. An hour later he feels tired, but he still has to study for the test. In the fridge he finds an ENERGY DRINK. He remembers that the commercial for this drink says that it wakes you up and gives you energy immediately. Exactly what he needs to focus on his studies!

Later, feeling sick, he decides to go to bed early. He feels fidgety and restless. The next morning he is irritable with his friends and anxious about just about everything.

What happened?



Student Resource 4: Check the Caffeine!



CHECK THE CAFFEINE!

Name _____
Date _____

Drink	Serving size (mL)	Caffeine (mg)
Hot chocolate	300 mL	8 mg
Cola	355 mL	40 mg
Iced tea	355 mL	25 mg
Root beer	355 mL	40 mg
Energy drink	250 mL	130 mg
Coffee (regular)	350 mL	186 mg
Coffee (decaf)	350 mL	4 mg
Iced coffee	500 mL	214 mg
Black or green tea	250 mL	30 mg
Tea (decaf)	240 mL	1 mg

How much caffeine did Tom drink?

Iced tea	_____ mg
Iced coffee	+ _____ mg
Energy drink	+ _____ mg
TOTAL	= _____ mg

What is the maximum amount of caffeine that students can safely have in one day?
→ Age 7 to 12 years: _____ mg

Check or highlight the beverages that you've tried before!



Values in table sourced from Caffeine and Kids (Health Canada) and Caffeine in Food (Health Canada) and from manufacturer's website.

Student Resource 5: Observations of “Tooth” Experiment



Name:

Drink being observed:

Use your senses to observe your tooth. What does it look like? What colour is it? How big is it? What does it feel like? How does it smell?

➤ **FIRST OBSERVATION:**

What I observe: _____ _____ _____ _____ _____	Drawing of “tooth” before the experiment:
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Hypothesis:

Based on what I know, I think...

➤ **FINAL OBSERVATION:**

What I observe: _____ _____ _____ _____ _____	Drawing of “tooth” after the experiment:
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Conclusion:

Assessment Tool 3: Observations of “Tooth” Experiment

Teacher Assessment Rubric

➔ Observations of “Tooth” Experiment

Grades 3 to 7

Name: _____

First observation addresses colour, texture and shape of “tooth”	8	6	4	2
First drawing matches first observation	8	6	4	2
Identifies ingredients of assigned drink in hypothesis (Does it contain sugar or acid?)	8	6	4	2
Predicts impact of ingredients on “tooth”	8	6	4	2
Second observation addresses clear differences in colour, texture and shape of “tooth”	8	6	4	2
Second drawing matches second observation	8	6	4	2
Conclusion demonstrates understanding of how the ingredients in the drink contribute to “tooth” erosion and theoretical decay	8	6	4	2
Score	_____ / 56			

Key:

8 = Exceeding expectations

6 = Meets expectations

4 = Approaching expectations

2 = Not yet meeting expectation



