Lesson 5
Elaborate

What Keeps Your Mouth Healthy?

AT A GLANCE

Overview

Lesson 5 asks students to participate in a dramatization through which they act out the oral disease process. Students realize that eating fewer sugary and starchy foods and brushing their teeth regularly with fluoride toothpaste can help reduce plaque and tooth decay. In the dramatization and in a CD-ROM animation, students learn how sealants and fluoride can protect their teeth.

Purpose

In this lesson, students will

- become aware of the actions of oral bacteria in the mouth that lead to tooth decay and
- understand how they can keep their mouths healthy by considering when and what they eat and by brushing their teeth with fluoride toothpaste regularly and thoroughly.

Objectives

After completing this activity, students will

- reinforce their understanding that bacteria are like other living things: they take in nutrients, they reproduce, and they produce waste products;
- explain the oral disease process: bacteria + sugars and starches → acid → tooth decay;
- understand that certain foods, and how often they are eaten, enable bacteria in the mouth to produce acid, which can lead to tooth decay; and
- recognize that eating healthy foods, removing plaque from their teeth daily, and using fluorides and sealants contribute to good oral and overall health.

BACKGROUND INFORMATION

Tooth decay (dental caries) is a common, chronic, but entirely preventable, bacterial disease that affects people throughout their lives. Dental caries in children can lead to significant problems including pain, infection, and missed school days. When it occurs in very young children or toddlers, tooth decay can cause severe harm to the primary teeth and result in problems with eating, growth, and speech. Practicing good oral hygiene and maintaining a healthy diet can help prevent these problems.

The Importance of Fluoride

Fluoride is a mineral that is beneficial to teeth. At a low dose over a length of time, fluoride can prevent tooth decay. Fluoride works mainly through direct contact with the surface of the teeth. Fluoride is also important during formation of the tooth enamel before teeth erupt through the gums. People can obtain fluoride in two ways: topically and systemically. Topical fluoride is applied directly to the surface of the teeth. Fluoride toothpaste, fluoride mouth rinses, and fluoride treatments given by a dental professional are examples of topical fluorides. Fluoride taken systemically enters the body by drinking from community water supplies, by taking dietary supplements (such as tablets or drops), and through the food we eat and the beverages we drink. Although systemic fluorides are important, they do not provide the same benefits as topical fluorides in protecting teeth from decay. To get the most benefit from fluorides, daily exposure to small quantities is important. Most adults and children can prevent tooth decay by brushing with a fluoride toothpaste and drinking fluoridated water.

Did You Know?
Fluoride is added to community water supplies to help people fight tooth decay.

Most bottled water does not contain fluoride at a level recommended for tooth decay protection. If you drink only bottled water, you may be missing the benefits of fluoridated water.

Fluoride protects teeth through three mechanisms.

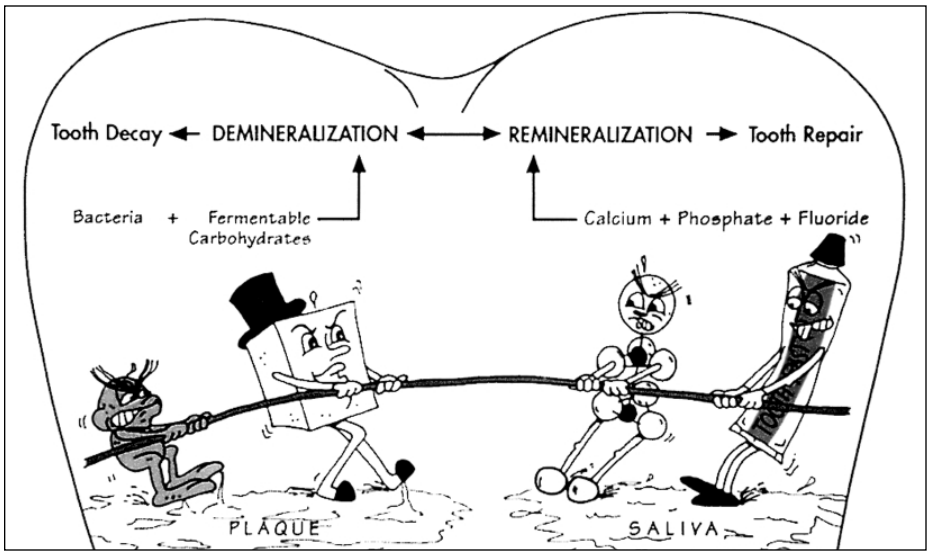
- Fluoride can reduce the ability of oral bacteria to produce acid.
- Fluoride promotes remineralization, the repair of the tooth surface, and inhibits demineralization of the tooth enamel.
- Fluoride strengthens the enamel before the tooth erupts.[1]

The following sections provide additional information on how fluoride works with other minerals to protect and strengthen teeth.

Helping Teeth Repair Themselves

Throughout the day, a tug of war is taking place inside our mouth. Whenever we eat or drink, oral bacteria produce acids that begin to eat away the enamel of our teeth. However, as time passes between episodes of eating or drinking, the amount of acid decreases and the weakened tooth enamel

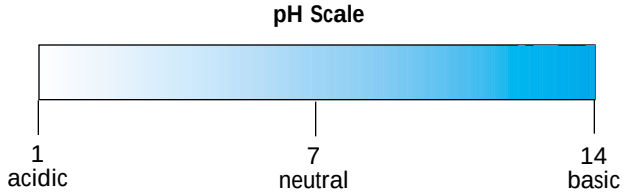
may repair itself. Our teeth go through this constant and natural process of **demineralization** and **remineralization**. Scientists have learned that the tooth surface can, in the presence of fluoride and other minerals, repair itself if demineralization has not passed a certain point.



Cartoon created by the Ohio Department of Health—Robert Hill, graphic artist.

Demineralization

Demineralization is the loss of minerals from the tooth enamel caused by the acidic waste products of oral bacteria. Each time we eat foods containing sugars or starches, the pH in our mouth drops because oral bacteria produce acid. This more acidic environment causes small amounts of minerals of the tooth enamel to dissolve. How fast demineralization occurs depends on how acidic the oral environment becomes (how much the pH decreases).[1] The more often we eat, especially foods high in sugars, the more frequently the pH in our mouth drops and the less time the oral environment has to correct itself by raising the pH. That is why it is as important, if not more important, to monitor *how often* we eat as well as *what* we eat.



Demineralization occurs just below the surface of the enamel. The enamel and the dentin located just below the enamel of the tooth are made up of many mineral crystals. These crystals are very soluble in acid. So, when we ingest food, the oral bacteria produce acids, and the acids break down the mineral structure of the tooth surface. If the acids remain on the tooth, it will continue to lose minerals.

We can see evidence of demineralization as white spots, called *white spot lesions*, on the teeth. When teeth lose minerals, more light goes through the surface of the enamel, causing it to appear chalky white. If demineralization outweighs remineralization, tooth decay continues and a cavity eventually forms.

Remineralization

Remineralization is the process that replaces the minerals in tooth enamel after demineralization. Saliva greatly enhances remineralization as it regularly bathes the teeth with buffering components, such as bicarbonate, phosphate, and peptides, that neutralize the acids produced by the oral bacteria. This buffering action then raises the pH level in the oral environment, creating the opportunity for remineralization to occur.

Saliva is 99 percent water with protein, enzyme, and ion components. Saliva contains calcium, phosphate, and fluoride, which combine to form a new, more fluoride-rich surface on the tooth that can better resist demineralization by acid. Fluoride speeds this process by attaching to the surface of the tooth and attracting calcium ions. Consequently, the use of fluoridated toothpaste and fluoride mouthwash increases the reservoir of fluoride in the mouth and aids the remineralization process.

This new understanding of tooth decay as a process is changing the way that tooth decay is treated. Treatments now focus on preventing, stopping, or reversing tooth decay and reducing the risk factors that lead to demineralization rather than waiting to treat the hole in the tooth with a filling. Maintaining a healthy diet, reducing the frequency of snacking, using fluorides, keeping the teeth clean, and having regular checkups can go a long way to maintain a healthy mouth.

Brushing the Teeth

Because fluoride plays such a pivotal role in preventing demineralization and enhancing remineralization, brushing the teeth with fluoride toothpaste is an essential practice for maintaining oral health. Dental professionals recommend brushing after eating or at least two times per day, preferably in the morning and in the evening. The step-by-step procedure for brushing effectively is outlined in the take-home activity, *Brushing to the Beat!* Dental professionals may recommend additional fluoride for people who are at higher risk for tooth decay.

Sealants

Sealants are another highly effective way to protect teeth from decay. SealantsÄ are thin plastic coatings that are applied to the chewing surfaces of theÄ molars.[2] The chewing surfaces of the molars have small pits and grooves thatÄ trap food particles and bacteria. TheseÄ areas cannot be cleaned well with aÄ toothbrush. Sealants cover the pits andÄ grooves and form a physical barrierÄ that protects the teeth from the decay-Ä causing acids produced by oral bacte-Ä ria. Bacteria that are trapped beneath the sealant cannot spread because they cannot reach their food supply.[3]

Photo: Corel

Most tooth decay in children and adolescents occurs in the molars. Sealants are most effective when applied soon after the molars erupt and before decay begins. The first molars appear when a child is around six years of age; the second molars erupt when a child is around twelve years old. Sealants are an excellent way to prevent tooth decay. Along with saving the tooth structure, sealants save money, time, and the discomfort of some dental procedures. One sealant application may last from five to ten years, but sealants should be checked regularly to ensure that they are intact.

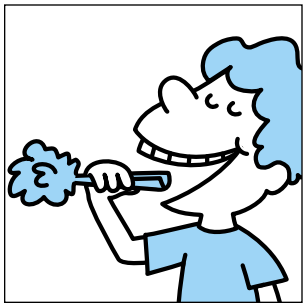
A Healthy Diet

Choosing healthy foods helps us grow and keeps our mouths and bodies healthy. Our eating habits, including our food choices, directly affect the health of our teeth. Sugars belong to the carbohydrate group of nutrients. This group includes simple sugars such as sucrose (table sugar), fructose (fruit sugar), and glucose. The group also includes complex carbohydrates such as starches. Foods containing sugars and starches contribute to tooth decay because oral bacteria use these carbohydrates efficiently and produce acids that damage the tooth's enamel. The more often you eat foods that contain sugars and starches, and the longer these foods remain in your mouth before you brush your teeth, the greater your risk for tooth decay.

Some high-sugar foods, such as candy, cookies, and soft drinks, provide calories but lack the nutrients that our bodies need. Other foods, including fruits, milk, yogurt, bread, cereals, and vegetables, also contain sugars and starches, but these foods nourish the body by providing important vitamins, minerals, and fiber.[4]

The best way to maintain good health for both the body and the mouth is to eat a balanced diet that gives your body the nutrients it needs.[5] Choose foods according to the food pyramid of the U.S. Department of Agriculture (USDA). The USDA recommends eating a majority of foods from the grain, vegetable, and fruit groups, followed by foods from the milk and meat groups. The food pyramid specifies that fats and sweets should only be eaten occasionally. Take care not to let soft drinks or other sweets crowd out other foods you need to maintain health.[5]

Remember the demineralization-remineralization tug of war? Every time we eat foods containing sugars, we get an acid attack that lasts approximately 20 minutes. If nothing else containing sugars is eaten, the saliva in the mouth will fight off the acid attack. However, if we eat frequently, especially sugars and refined carbohydrates, the repeated cycles of acid attack will cause greater tooth demineralization to occur. Limiting between-meal snacks will reduce the number of acid attacks on your teeth. Also, eating or drinking sweet or starchy foods between meals is more likely to harm teeth than eating the same foods with meals. Saliva production increases



during meals and helps buffer the acids and rinse food particles from the mouth. It's best to eat sweets as dessert after a main meal instead of several times a day between meals.[6]

To protect teeth from decay, remember to:

- choose nutritious foods and snacks in moderation.
- eat few foods or beverages containing sugars or starches between meals. (If you do eat them, brush your teeth afterward.)
- brush at least twice a day with fluoride toothpaste.

IN ADVANCE

Activities that include the CD-ROM

Activity Number	CD-ROM
Activity 1	yes
Take-home Activity	no

Photocopies

Activity Number	Master Number	Number of Copies
Activity 1	none	none
Take-home Activity	Master 5.1, *Take-home Activity 3: Brushing to the Beat!*	1 copy for each student

Materials

Activity 1

For the class:

- CD-ROM
- computer
- 1 skein of red yarn
- 12-15 pads of small sticky notes, any color
- 1 small whiskbroom with handle (or another type of small brush to use as a pretend toothbrush)
- 1 sheet of white construction paper, 8½-by-11 inches
- 1 sheet of black construction paper, 8½ - by-11 inches
- 2 sheets of construction paper, 11-by-17 inches, any color
- old magazines that contain pictures of a variety of foods
- scissors
- glue
- 1 bicycle helmet (or an umbrella)

Take-home Activity

For each student:

- 1 copy of Master 5.1, *Take-home Activity 3: Brushing to the Beat!*

Preparation

- Gather the materials needed for the activities.
- Duplicate Master 5.1, *Take-home Activity 3: Brushing to the Beat!*, 1 for each student.
- Cut pictures of a variety of foods from the old magazines and make two food collages as follows:
    - * "high-nutrition foods" (select foods such as those from the bread, cereal, rice and pasta group, the vegetable group, the fruit group, and the milk group). See note in Activity 1 (page 83).
    - * "low-nutrition foods" (select foods that do not belong to the five main groups of the food guide pyramid, such as candies, nondiet soft drinks, cookies, cakes, and potato chips).
- Glue pictures onto the sheets of construction paper to make the two collages needed in the dramatization.
- Cut a circle from the white construction paper and a "blob" shape from the sheet of black construction paper. The white circle indicates a white spot lesion forming on the tooth and the blob represents a cavity in the dramatization.
- Set up a computer center so that students can view the CD-ROM in small groups at the end of Activity 1.
- Have students' *Mouth Journals* (prepared in Lesson 1) available for the Wrap-up exercise.

Tip from the field test: If you run out of time to make the food collages, hold a brainstorming session with students to list foods that belong in each category. Write the lists on two separate pieces of construction paper and use them in the dramatization in place of the collages.

PROCEDURE ≠

Activity 1: Let's Pretend—A Dramatization About Teeth, ≠ Bacteria, and Tooth Decay ≠

The purpose of this activity is to help students visualize the oral disease process.

Note: Foods that contain sugars and starches can contribute to tooth decay. Almost all foods, even those that have important nutrients, contain some type of sugar or have sugar added to them during processing. Choosing nutritious foods helps promote overall good health and brushing the teeth with fluoride toothpaste helps protect the teeth from decay.

Before beginning this activity, read through the entire dramatization so that you can visualize the roles you and your students will play. The number of students playing the different parts in this dramatization can be changed to allow all students to participate in some way.

Content Standard C:
Organisms and their environment.

In this dramatization, some students pretend to be bacteria and put sticky notes onto other students who pretend to be teeth. If you think this might cause problems, instruct the students to place sticky notes only on the backs of other children or cut out oversized images of teeth and have the "bacteria" place the sticky notes onto the paper teeth. The dramatization is more fun if children play the role of the teeth, but follow any school or district guidelines regarding student interactions of this nature.

1. **Conduct the following dramatization with the students. Read the script as indicated and instruct students to carry out the actions.**

   Setting the Stage: Using red yarn, make a large outline of an open mouth on the floor of the classroom. The area should be large enough to hold up to 15 students at one time. Explain that the yarn outlines a mouth for the dramatization.

   Gather students in a group area near the yarn mouth so that all canÄ see and participate in the action, as appropriate.Ä

   Assign the following roles (modify for your class size):Ä

   - 4 students to represent teethÄ
   - 4 students to represent bacteriaÄ
   - 1 student to represent high-nutrition foodsÄ
   - 1 student to represent low-nutrition foodsÄ

   Give each bacterium a pad of sticky notes. Give the collages of high-Ä and low-nutrition foods to the appropriate students.Ä

   Note: The role of the toothbrush is somewhat complex in this drama-Ä tization so we think that it is best played by the teacher. Once stu-Ä dents understand the actions of the toothbrush, you might assign theÄ role to a student.Ä

Script: Begin the activity by saying: **Some of what happens in our mouths is impossible to see. Let's try to imagine what might be happening in our mouths by acting it out. We will start by putting some teeth in our mouth.**

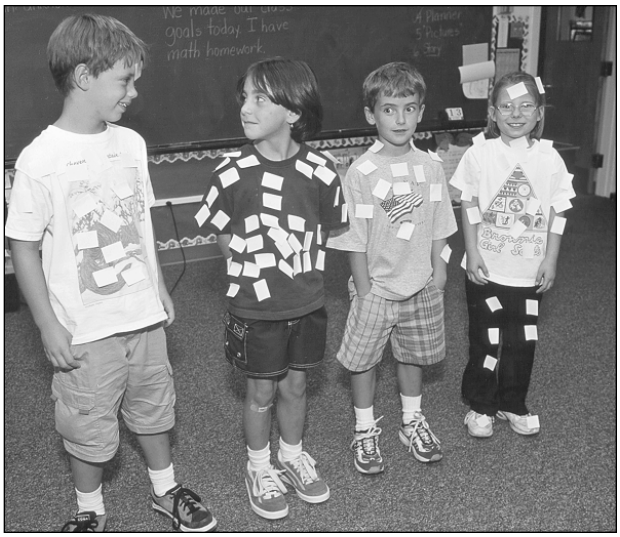
Action: Have the four student "teeth" stand close together in a semicircle.

Script: Continue the introduction by stating: **We know that there are lots of bacteria in our mouths. Let's pretend that we can actually see the tiny bacteria that cause tooth decay. We don't have enough people in our class to show the *real* number of bacteria that live on and around our teeth. There are not enough people in our whole *school* to show that! We'll just remember that each person pretending to be one bacterium will represent a million tiny bacteria.**

Action: Instruct the student "bacteria" to enter the mouth and to kneel, sit, or stand by the student "teeth." Tell them not to do anything until you give them a signal.

Script: Explain the actions of the bacteria this way: **Remember from the story that the bacteria produce acid. The sticky notes are like the acid and plaque that stick onto our teeth and cause tooth decay.**

Action: Say **Start** and have the bacteria put sticky notes all over the teeth as fast as they can. After about 30 seconds or so, say **Stop** and ask the bacteria to be seated.



Script: Ask a student to apply a pea-sized amount of imaginary toothpaste to the whiskbroom that signifies a toothbrush. Now, hold up the whisk broom and say: **When we brush our teeth with a toothbrush and a pea-sized amount of fluoride toothpaste, we make the teeth stronger and brush away some of the plaque. When we brush away plaque, we also brush away bacteria and the acid they produce.**

Action: Enter the mouth and brush off some (but not all) of the sticky notes from the teeth. As you are brushing, brush one of the student bacteria out of the mouth, too. (There are now three bacteria in the mouth.)

Script: **When we eat foods that our body needs to be healthy, such as bread, milk, rice, cereal, fruits, and vegetables, the bacteria can use them to make acid and form plaque.**

Action: Ask the "high-nutrition foods" student to "feed" the collage of high nutrition foods to the mouth. (The student might place the collage inside the mouth or walk through the mouth while holding the collage.)

Script: **These bacteria also make some new bacteria.**

Action: Instruct *one* student bacterium that is currently in the mouth to walk out of the mouth and to choose another child to become a new bacterium. (This represents some reproduction within the bacterial colony, but not a lot.) Give the new bacterium a pad of sticky notes. There should now be four bacteria in the mouth.

When you say **Start**, all four bacteria continue to put sticky notes onto the teeth. After about 30 seconds, say **Stop** and ask the bacteria to be seated. (Encourage all students to notice what is happening to the teeth; they are being covered with acid.)

Script: **When we snack on foods like candy, soft drinks, chips, and crackers, we aren't giving our body what it needs to be healthy. These foods also feed the bacteria so that they keep making acid.**

Action: Ask the "low-nutrition foods" student to feed the collage of low-nutrition foods to the mouth. (Again, the student might place the collage inside the mouth or walk through the mouth while holding the collage.)

Script: **And they also make more bacteria!**

Action: Instruct *each* student bacterium that is in the mouth to choose one additional student from the class to become new bacteria. Give each new bacterium a pad of sticky notes. Now there should be 8 bacteria in the mouth. Say **Start** and ask all 8 bacteria to put sticky notes onto the teeth as fast as they can. After about 30 seconds, say **Stop** and ask everyone to observe what is happening to the teeth. Now there is more acid on the teeth.

Script: **The more often we snack in between meals without brushing our teeth, the more time the bacteria have to coat our teeth with plaque and acid.**

Action: Instruct *two* student bacteria that are in the mouth to choose two additional children from the class to become new bacteria. Give each new bacterium a pad of sticky notes. Now there should be twelve bacteria in the mouth. Say **Start** and all twelve bacteria put sticky notes onto the "teeth" as fast as they can. After about 30 seconds, say **Stop** and ask everyone to observe what is happening to the teeth. Now there is A LOT of acid on the teeth.

Script: **Brushing our teeth helps make them stronger and gets rid of bacteria and plaque.**

Action: Have someone apply toothpaste to the imaginary toothbrush and enter into the mouth. Brush the teeth by taking a few strokes at each tooth. Also, brush eight bacteria out of the mouth. (Important note: As you brush, purposely leave a lot of sticky notes on one area of one back tooth. This represents a "hard to reach" place in our mouth.)

Script: **If we snack often in between meals and we don't brush our teeth carefully with fluoride toothpaste, the acid begins to make a hole in the tooth. First, the acid attack makes a white spot on the tooth.** (Indicate that the tooth has lots of attached sticky notes.)

Action: Tape the white circle over some of the sticky notes on that area of the tooth.

Script: **These white spots don't always become cavities. But, if we continue to snack and not brush our teeth, the plaque and acid that build up begin to attack the tooth.**

Action: Put the black blob of paper over the white circle. The black blob represents a cavity, or a rotten spot on the tooth.

Script: As you can see, some parts of our teeth are hard to reach **with a toothbrush and do not get cleaned well enough. The bacteria that are left continue to make acid that eats away at the tooth. This is called a cavity** (point to black blob).

One way we can protect those places is to have sealants put on our back teeth. Sealants protect our teeth like a helmet protects our head if we fall off a bicycle. A sealant covers the tooth and doesn't let the bacteria harm the tooth. Sealants can help protect against cavities.

Action: Ask a student who represents a back tooth to put a bicycle helmet on his or her head (alternatively, you can have the student hold an umbrella over his or her head). Leave the helmet on as the class repeats the dramatization. Draw students' attention to how the helmet protects the tooth from the acid (sticky notes). Show the students that the acid and plaque stick to the sealant (the helmet) and not to the tooth surface. The sealant protects the surface of the tooth from acid and, therefore, from decay.

2. **Repeat the dramatization as long as students are interested and time allows. Discuss each action until students understand the process of decay and the importance of brushing their teeth regularly with toothpaste and limiting the number of snacks they eat.**

   Encourage students to suggest the actions they want to happen in the dramatization that might *promote* tooth decay (adding low-nutrition foods, adding snacks, not brushing) and the actions that might

prevent tooth decay (limiting snacks, choosing high-nutrition foods,Ä brushing the teeth). Help them relate the decay process to the actionsÄ of the bacteria by asking questions such as these:Ä

- When you eat and drink, what do the bacteria do?Ä
- When you use a toothbrush with toothpaste, what happens to theÄ teeth?Ä
- What actions make *more* bacteria and acid in the mouth?Ä
- What actions make *fewer* bacteria and *less* acid in the mouth?Ä

3. **Give students time to view the animation movie about how brushing their teeth with fluoride toothpaste and the application of sealants can protect their teeth from decay.**

On the main menu, click on *What Keeps Your Mouth Healthy?*

Take-home Activity: Brushing to the Beat!

In this lesson, students complete the final take-home activity. Because the focus of this lesson has been on keeping the mouth healthy, the take-home activity shares information about oral health with parents and encourages parents and students to practice proper tooth brushing techniques.

1. **Introduce the take-home activity to the students. Review the activity with the students and perform a demonstration, if appropriate, so that they know what is expected of them at home.**

   This take-home activity, *Brushing to the Beat!*, engages children and parents in proper brushing techniques, particularly with respect to the length of time they should be brushing. You might choose a song that students know and help them time the song and determine how many repetitions of the song fit into a two-minute period.

2. **Point out the Certificate of Completion and inform students that you would like their parent or guardian to send the completed form back to school. The parent and child should keep the activity page at home to refer to again and again.**

   Encourage students to choose a different song at home with their parent, one that the parent likes too. The purpose of the activity is to promote parent-child interaction and not for the child to repeat exactly what she or he did at school.

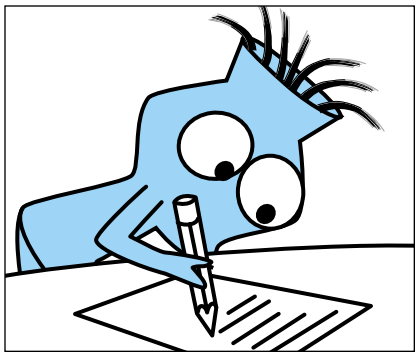
NS ES

Content Standard F:
Personal Health.

Assessment:
You can collect the *Mouth Journals* and assess your students' individual understanding of the concepts presented in the lesson. For Lesson 5, students should demonstrate an understanding of the actions that lead up to a cavity in a tooth and how the choices they make can stop or slow down those actions.

3. **Send 1 copy of Master 5.1, *Take-home Activity 3: Brushing to the Beat!*, home with the students and wait for results!**

   When students return with the Certificate of Completion signed by their parent, ask them to share with other students the results of their activity. How many different brushing songs did the students in the class use?

Wrap-up

Instruct students to use their *Mouth Journals* to write or draw about what they learned in this lesson. Help them decide what to include by suggesting that they answer the question, "What would you tell Exee about the mouth *now*?"