

Unit: Nutrition and Diabetes
Lesson 1: You're the Doctor!

Grade: 5

Lesson Time: 1 hour

Lesson Objectives:

Students will...

- Be exposed to healthcare professions involved in the diagnosis of diabetes.
- Act as physician's assistants, doctors and lab technicians.
- Discover that diabetes is a disease in which a person cannot handle the sugar in his or her body. This results in high blood sugar.

Overview:

The presenter introduces a person with diabetes, and the class tries to diagnose the patient by asking questions and using the answers as clues. Students role play doctors, physicians assistants, phlebotomists, and lab technicians. They work in groups of four to test fake urine and blood samples with urine strips and glucometers.

Key Terms:

- Diabetes: A disease in which the body does not properly control the amount of sugar in the blood. As a result, the level of sugar in the blood is too high.
- Diagnosis: The process by which a doctor determines what disease a patient has by studying the patient's symptoms and medical history and by interpreting any tests performed (blood tests, urine tests, brain scans, etc.).
- Glucose: A type of sugar. All of the sugar and other carbohydrates—as well as much of the other food—we eat is turned into glucose by our bodies.
- Symptom: A sign that something is wrong with a patient. Any change in the body or its functions, noticed by the patient or doctor, which could indicate the presence of disease. Symptoms of diabetes include blurry vision, tingling feet, thirst, and frequent urination.
- Long-term complications: Physical effects of a disease that develop over months or years. Long-term complications associated with diabetes include blindness, high blood pressure, kidney failure, and amputation.
- Anemia: A condition where a person does not have enough red blood cells. Some of the symptoms of anemia match those of diabetes.
- Acute Pancreatitis: A condition in which an organ called the pancreas becomes inflamed due to gallstones. Chemicals made by the pancreas are usually used to digest food in the small intestine. When these chemicals cannot enter the intestines, they begin to digest the pancreas itself, causing severe stomachaches and nausea. Some of the symptoms match those of diabetes.

Occupations of the Day:

- **Physician's Assistant:** A physician's assistant is like a doctor, but goes to a different type of school and goes through less training than a doctor. They often work with doctors and can do a lot of the same work as a general-practice doctor, such as seeing patients and diagnosing them.
- **Doctor:** Doctors are people who help people stay healthy. They diagnose and treat patients with diseases. There are many types of doctors. Some have general practices and see many different kinds of patients. Others are specialists, such as cardiologists, or heart doctors, who only deal with patients with heart problems.
- **Medical Lab Technician:** Medical lab technicians perform tests in laboratories that help doctors diagnose and treat diseases. They analyze body tissues and fluids. They work with equipment such as computers and microscopes. Medical lab technicians work in many different environments such as hospitals, universities, and the military.
- **Phlebotomist:** Phlebotomists are specialists who draw blood from patients. They have the responsibility of taking blood without hurting the patient. The blood then goes to a lab so that it can be analyzed. They work with all types of people, from children to the elderly. Phlebotomists work in hospital laboratories, private laboratories, clinics, large medical offices, and blood banks.

Materials:

- 1 worksheet per student
- 1 overhead listing the symptoms of high blood sugar
- 1 overhead color chart for urine-strip test results
- 1 set of seeded questions
- 1 overhead of diabetes symptoms
- 1 set of blood test materials per group of four students:
 - 4 urine test strips
 - 1 glucometer test strip
 - 1 glucometer
 - 1 small bottle of fake blood with high sugar level: mix 1 liter of water, 15 mg of dextrose, and 3 drops of red food coloring. Leave liquid overnight in the refrigerator and divide into small bottles.
 - 4 small plastic pipettes
 - 1-oz cup labeled "1"
 - 1-oz cup labeled "2"
 - 1-oz cup labeled "3"
 - 1-oz cup labeled "4"
- 3 1-liter bottles filled with fake urine (one drop of yellow food coloring may be added to each liter):
 - 1 liter of water labeled "low sugar"
 - 1 liter of water mixed with 2.5 mg of dextrose, labeled "normal"
 - 1 liter of water mixed with 15 mg of dextrose, labeled "high sugar"
- Pour the fake urine into containers for the groups following this pattern:

Cup	Urine Sample
1.	Low Sugar
2.	High Sugar
3.	Normal Sugar
4.	High Sugar

Procedure:**Question:**

How does the doctor know what is wrong with you?

Activity 1: The Physician's Assistant

1. Introduce the patient and explain that the patient has a real disease. Explain that students will take on the role of healthcare professionals to solve the mystery of what is wrong with their patient. The class will come up with a diagnosis, a name of a specific disease.
2. Explain that the first step in solving this mystery involves asking questions and collecting clues called symptoms. Symptoms are signs that something is wrong with the patient's body. Often physician's assistants help with the questioning.
3. Call on students to be physician's assistants and give those students seeded questions to ask the patient. Ask the students to fill out the patient profile on their worksheets.
4. Remind the students that physician's assistants, or nurse practitioners, also take vital signs such as blood pressure, heart rate, temperature, and weight.

Activity 2: The Doctor

1. Explain that a doctor then reviews the patient profile and meets with the patient, asking more questions and performing an examination. Doctors try to narrow down the diagnosis. Tell the students to turn to the page of their worksheets that shows the symptoms of three possible diagnoses. Ask the students to match symptoms from the patient profile with the diagnoses.
2. Ask the students to come up with their own hypotheses of a diagnosis. Most or all of the students will hypothesize that the patient has diabetes. However, it's okay for them to choose acute pancreatitis or anemia. It's okay to be wrong!
3. Tell the students that people with anemia do not have enough red blood cells, and that people with acute pancreatitis have inflammation of an organ called the pancreas.
4. Explain that diabetes is a disease. Diabetics have high blood sugar. Diabetics have a problem in that their bodies can't make enough of or use an important chemical called

insulin (see Lesson 4). Insulin helps keep our blood sugar level normal.

5. Show chart of blood sugar.
6. Explain that doctors often need more information to confirm a diagnosis. Doctors order tests. Draw on the students' personal experiences visiting doctors' offices to generate a list of tests that they could order. The list should include blood tests and urine tests. Other suggestions could include vision tests, measuring height and weight, and measuring blood pressure.

Activity 3: The Lab Technician: Urine Test

1. Explain that the class will act as lab technicians testing fake urine for sugar levels. This is how they will test their hypotheses. If the patient has diabetes, then the tests will show that his/her urine contains more sugar than the urine of a normal person. People with anemia and acute pancreatitis do not have excess sugar in their urine. The class will test the urine from two people; the patient and a normal person. The urine from the normal person is called the control. The first set of samples were taken after fasting. The second set of samples were taken after drinking a glucose solution.
2. Explain that doctors nowadays usually perform blood tests instead of urine tests, because blood tests are more sensitive. Doctors usually test a person's blood twice to find out if the patient has diabetes: once after fasting, and a second time after drinking sugar water.
3. Demonstrate the urine test. Take one strip of test paper and dip it in a sample of fake urine with high sugar. Show how the paper strip turns from blue to brown.
4. Show the color chart overhead. Match the strip to a color chart showing that brown means high sugar.
5. Divide the class into groups of four. Pass out the urine test strips and the cups of fake urine to each group. Lead the groups as the group members take turns testing the four urine samples and matching the test strips to the overhead color chart.

Cup	Urine Sample	Test strip color
1. Normal person after fasting	Low Sugar	Blue
2. Patient after fasting	Normal Sugar	Green
3. Normal person, 2 hrs. after drinking glucose	Normal Sugar	Green
4. Patient, 2 hrs. after drinking glucose	High Sugar	Brown

Activity 4: The Patient and the Phlebotomist

1. Ask the students if the tests confirm the hypothesis that the patient has diabetes. Ask what the tests show about acute pancreatitis and anemia (nothing; there are different tests for these conditions).

2. Ask the patient if he/she has diabetes. Ask if he/she has anemia or acute pancreatitis. Explain that it would be possible for the patient to have both diabetes and one of the other conditions, but that the patient's symptoms do not match the other conditions, so a doctor would not order the tests for them.
3. Ask the patient to share his/her personal experience living with diabetes and how he/she was diagnosed.
4. Ask the patient to show how to test one's own blood with a glucometer.
5. Explain that when diabetics are diagnosed, healthcare professionals called phlebotomists take their blood. Show the class how to use a glucometer. Insert the black and white end of the glucometer test strip into the glucometer. Wait until a number appears on the screen. Dip the yellow end of the test strip in the fake blood. Show that the number is above 130 indicating that the diabetic has high blood sugar.
6. If time permits, pass out glucometers to each group and lead them as they test the fake blood.

Extension:

Ask the students to find and interview someone in their community who has diabetes or knows someone who has diabetes. The students should ask about symptoms and treatments. The students need not report the name of the person they interview. All personal information should remain confidential.

References:

- Sugar solution test: Program Energy, 3rd grade lesson, Sugar Regulation Part 2: <http://www.programenergy.org>
- American Diabetes Association: <http://www.diabetes.org/youthzone/what-is-diabetes.jsp>
- Information about acute pancreatitis: <http://www.merck.com/mmhe/sec09/ch124/ch124b.html>