

DIABETES EDUCATION IN TRIBAL SCHOOLS A BALANCING ACT: PREVENTING DIABETES

Department of Health & Human Services USA



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NATIONAL INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES





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A Balancing Act: Preventing Diabetes

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Diabetes Education in Tribal Schools

Dear Teacher,

Thank you for your interest in teaching the Diabetes Education in Tribal Schools (DETS) curriculum in your classroom.

Diabetes was rare among American Indian and Alaska Native peoples until about 50 years ago. Since then, diabetes has become one of the most common and serious illnesses in the Tribal Nations of North America. In 2003, almost 100,000 American Indian and Alaska Native adults, or nearly 13 percent of those receiving care from the Indian Health Service (IHS), were estimated to have diabetes. Prevalence rates vary by Tribal Nations, rising to 26 percent among the Plains Tribes (Centers for Disease Control [CDC], 2005). In a new and alarming turn of events, type 2 diabetes, typically considered an adult disorder, is now emerging in all populations of youth in the United States, including American Indian and Alaska Native populations. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) has determined that effective programs should be initiated to decrease the rising incidence and prevalence and the severe complications of diabetes in the American Indian and Alaska Native communities.

In response to these findings, NIDDK, the Centers for Disease Control and Prevention (CDC), Indian Health Service (IHS), Tribal Colleges and Universities (TCU), and the Tribal Leaders Diabetes Committee collaborated to develop this curriculum. The lessons are designed to enhance the understanding and appreciation of the problems of diabetes in American Indian and Alaska Native communities, to empower students to make healthy lifestyle choices, and to stimulate general student interest in diabetes-based science careers.

The DETS curriculum includes K–12, multidisciplinary units that are sequenced and interrelated to give a continuum of involvement with diabetes-based education. The curriculum is based on national education standards for the respective subject area, along with Native American cultural content. Teachers can assist in this critical prevention education effort while addressing the national content standards of their subject area. Culturally relevant activities are incorporated in the learning to increase the effectiveness of the diabetes prevention effort and to enhance students' cultural awareness.

The initial versions of the curriculum were tested in select K–12 schools to assess teacher acceptance and student reception of the message. Appropriate revisions followed before publication and distribution to schools serving American Indian and Alaska Native students.

The lessons are based on the BSCS 5E Instructional Model and feature multisubject integration. Each lesson includes learning activities that also serve as assessment tools. Activities promote active and collaborative learning, and are inquiry-based to help students develop problem-solving and critical-thinking skills.

The curriculum comes with a complete set of materials for both teachers and students, including printed materials and extensive background and resource information. It is distributed by the Indian Health Services at no cost to teachers. All materials may be copied for classroom use, but may not be sold.

Sincerely, The DETS Team





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Overview of the Diabetes Education in Tribal Schools Project

The Diabetes Education in Tribal Schools (DETS) project is part of a national effort to decrease the incidence of type 2 diabetes among American Indians and Alaska Natives, and also to improve the care of those who have type 2 diabetes. The DETS project is a K–12 curriculum that has a multidisciplinary approach and consists of units that incorporate national education standards, inquiry learning, and American Indian and Alaska Native cultural and community knowledge.

Background

The Tribal Leaders Diabetes Committee formed a partnership with the Indian Health Service (IHS) in 1998 as a result of the Special Diabetes Program for Indians. The Tribal Leaders Diabetes Committee challenged the National Institutes of Health (NIH) to develop a curriculum to teach diabetes science in tribal schools. This challenge brought together multiple funding partners.

In 2001, the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), along with the Native Diabetes Wellness Program of the Centers for Disease Control and Prevention (CDC), and the Division of Diabetes Treatment and Prevention of the Indian Health Services (IHS), initiated a multiyear, national, K–12 curriculum project—Diabetes Education in Tribal Schools. This effort is a direct response to the recognition that type 2 diabetes is an epidemic in American Indian and Alaska Native communities.

Eight Tribal Colleges and Universities (TCU) were involved in this endeavor: Cankdeska Cikana Community College (Fort Totten, North Dakota); Fort Peck Community College (Poplar, Montana); Haskell Indian Nations University (Lawrence, Kansas); Keweenaw Bay Ojibwa Community College (Baraga, Michigan); Leech Lake Tribal College (Cass Lake, Minnesota); Northwest Indian College (Bellingham, Washington); Southwestern Indian Polytechnic Institute (Albuquerque, New Mexico); and Stone Child College (Box Elder, Montana).

Purpose

The purpose of the DETS project is to develop and implement a school-based diabetes curriculum that supports the integration of American Indian and Alaska Native cultural and community knowledge with diabetes-related scientific knowledge.



Goals of the DETS Project

The goals for the DETS project include the following:

- **1.** Increase the understanding of health, diabetes, and maintaining life in balance among American Indian and Alaska Native students.
 - a. Positive health is a continual process of maintaining life in balance.
 - b. Diabetes is an imbalance of health at many levels.
 - c. Some risk factors and imbalances contribute to the likelihood of diabetes.
 - d. Individuals, families, and communities can maintain health and balance and prevent type 2 diabetes risk.
- Increase American Indian and Alaska Native students' understanding and application of scientific and community knowledge about health, diabetes, and maintaining balance, and their understanding of the processes of the development of that knowledge.
 - a. Health, preventing and treating diabetes, and maintaining balance and enhancing health require both scientific and community knowledge.
 - b. Individuals, families, and communities can effectively apply scientific and community knowledge to maintain health and prevent type 2 diabetes.
 - c. Both scientific and community knowledge develop over time.
- **3.** Increase interest in science and health professions among American Indian and Alaska Native youth.
 - a. Science and health professionals can work with people and communities to prevent and care for type 2 diabetes.
 - b. American Indian and Alaska Native students can and do have future careers in science and health.

INTRODUCTORY INFORMATION





An Overview of Diabetes

Almost everyone knows someone who has diabetes. An estimated 20.8 million people in the United States—7.0 percent of the population—have diabetes, a serious, lifelong condition. Of those, 14.6 million have been diagnosed, and 6.2 million have not yet been diagnosed. In 2005, about 1.5 million people aged 20 or older were diagnosed with diabetes.

What Is Diabetes?

Diabetes is a disorder of metabolism—the way our bodies use digested food for growth and energy. Most of the food we eat is broken down into glucose, which is the form of sugar in the blood. Glucose is the main source of fuel for the body.

After digestion, glucose passes into the bloodstream, where it is used by cells for growth and energy. For glucose to get into most cells, insulin must be present. Insulin is a hormone produced by the pancreas, a large gland behind the stomach (figure I1).



For most people, when we eat, the pancreas automatically produces the right amount of insulin to move glucose from the blood into our cells. In people with diabetes, however, the pancreas either produces too little or no insulin, or the cells do not respond appropriately to the insulin that is produced. Glucose builds up in the blood, overflows into the urine, and passes out of the body in the urine. As a result, the body loses its main source of fuel even though the blood contains large amounts of glucose.

Figure I1: Digestive tract and pancreas.

What Are the Types of Diabetes?

The three main types of diabetes are

- type 1 diabetes,
- type 2 diabetes, and
- gestational diabetes.

Type 1 Diabetes

Type 1 diabetes is an autoimmune disease. An autoimmune disease results when the body's system for fighting infection (the immune system) turns against a part of the body. In diabetes, the immune system attacks and destroys the insulin-producing beta cells in the pancreas. The pancreas then produces little or no insulin. A person who has type 1 diabetes must take insulin daily to live.

At present, scientists do not know exactly what causes the body's immune system to attack the beta cells, but they believe that autoimmune, genetic, and environmental factors, possibly viruses, are involved. Type 1 diabetes accounts for about 5–10 percent of diagnosed diabetes cases in the United States. It develops most often in children and young adults but can appear at any age.

Type 2 Diabetes

The most common form of diabetes is type 2 diabetes. About 90–95 percent of people with diabetes have type 2. This form of diabetes most often occurs in adults and in people who are obese, have a family history of diabetes, have a previous history of gestational diabetes, are physically inactive, and are of certain ethnicities. About 80 percent of people with type 2 diabetes are overweight. Type 2 diabetes is increasingly being diagnosed in children and adolescents.

When type 2 diabetes is diagnosed, the pancreas is usually producing some insulin, but for unknown reasons the body cannot use the insulin effectively, a condition called insulin resistance. After several years, insulin production decreases. The result of this condition is the same as for type 1 diabetes—glucose builds up in the blood and the body cannot make efficient use of its main source of fuel.

The symptoms of type 2 diabetes develop gradually. Symptoms may include fatigue, frequent urination, increased thirst and hunger, weight loss, blurred vision, and slow healing of wounds or sores. It is also important to realize that some people have no symptoms.

Gestational Diabetes

Some women develop gestational diabetes late in pregnancy (figure I2). Although this form of diabetes usually disappears after the birth of the baby, women who have had gestational diabetes have a 20–50 percent chance of developing type 2 diabetes within five



Figure 12: Checking for gestational diabetes.

(Source: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health)



to 10 years. Maintaining a reasonable body weight and being physically active may help prevent the development of type 2 diabetes.

How Is Diabetes Diagnosed?

The fasting blood glucose test is the usual test for diagnosing diabetes in children and nonpregnant adults. It is most reliable when performed in the morning. However, a diagnosis of diabetes can be made based on certain test results, which are confirmed by retesting on a different day.

What Is Pre-diabetes?

People with pre-diabetes have blood glucose levels that are higher than normal, but not high enough for a diagnosis of diabetes. This condition raises the risk of developing type 2 diabetes, heart disease, and stroke.

What Are the Scope and Impact of Diabetes?

Diabetes is widely recognized as one of the leading causes of death and disability in the United States. In 2005, it was the sixth-leading cause of death. However, diabetes is likely to be underreported as the underlying cause of death on death certificates. About 65 percent of deaths among those with diabetes are attributed to heart disease and stroke.

The high blood glucose levels of diabetes are associated with long-term complications that affect almost every part of the body. The disease may lead to blindness, heart and blood vessel disease, stroke, kidney failure, amputations, and nerve damage. Uncontrolled

An Overview of Diabetes

diabetes can complicate pregnancy, and birth defects are more common in babies born to women with diabetes. Diabetes also carries emotional, spiritual, and financial burdens for the individual, family, and community.

Who Gets Diabetes?

Diabetes is not contagious. People cannot "catch" it from each other. Certain factors can increase the risk of developing diabetes.

Type 1 diabetes occurs equally among males and females but is more common in whites than in non-whites. Data from the World Health Organization's Multinational Project for

Figure I3: Prevalence data.

Childhood Diabetes indicate that type 1 diabetes is rare in most African, American Indian, and Asian populations.

Type 2 diabetes is more common in adults, especially in people who are overweight. It occurs more often in African Americans, American Indians, some Asian Americans, Native Hawaiians and other Pacific Islander Americans, and Hispanic/ Latino Americans. On average, non-Hispanic African Americans are 1.8 times as likely to have diabetes as non-Hispanic whites of the same age. Mexican Americans are 1.7 times as likely to have diabetes as non-Hispanic whites of similar age. (Data are not available for estimating diabetes rates in other Hispanic/Latino American groups.)



Source: For American Indians/Alaska Natives, the estimate of total prevalence was calculated using the estimate of diagnosed diabetes from the 2003 outpatient database of the Indian Health Service and the estimate of undiagnosed diabetes from the 1999–2002 National Health and Nutrition Examination Survey. For the other groups, 1999–2002 NHANES estimates of total prevalence (both diagnosed and undiagnosed) were projected to year 2005.

American Indians have one of the highest rates of diabetes in the world. On average, American Indians and Alaska Natives are 2.2 times as likely to have diabetes as non-Hispanic whites of similar age (figure I3). Although prevalence data for diabetes among Asian Americans and Pacific Islanders are limited, some groups, such as Native Hawaiians, Asians, and other Pacific Islanders residing in Hawaii (aged 20 or older) are more than twice as likely to have diabetes as white residents of Hawaii of similar age.

How Is Diabetes Managed?

Before the discovery of insulin in 1921, everyone with type 1 diabetes died within a few years after diagnosis. Although insulin is not considered a cure, its discovery was the first major breakthrough in diabetes treatment.



Figure I4:

Keeping track of glucose levels. Source: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.



Today, healthy eating, physical activity, and taking insulin are the basic therapies for type 1 diabetes. The amount of insulin must be balanced with food intake and daily activities. Blood glucose levels must be closely monitored through frequent blood glucose checking (figure I4).

Healthy eating, physical activity, and blood glucose testing are the basic management tools for type 2 diabetes. In addition, many people with type 2 diabetes require oral medication, insulin, or both to control their blood glucose levels.

People with diabetes must take responsibility for their day-to-day care. Much of the daily care involves keeping blood glucose levels from going too low or too high. When blood glucose levels drop too low—a condition known as hypoglycemia—a person can become nervous, shaky, and confused. Judgment can be impaired, and if blood glucose falls too low, fainting can occur. A person can also become ill if blood glucose levels rise too high, a condition known as hyperglycemia. The goal of diabetes management is to keep levels of blood glucose, blood pressure, and cholesterol as close to the normal range as safely possible.

How Can People Lower Their Risk of Diabetes?

People can do a lot to lower their risk. Some ways to do that include the following:

- Reach and maintain a reasonable body weight
- Make wise food choices most of the time
- Be physically active every day (figure I5)

Doing these things can reduce the risk of developing type 2 diabetes.



Figure 15: It's important to exercise every day. Source: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.

Solutions through Research

In 1996, NIDDK launched its Diabetes Prevention Program (DPP). The goal of this research effort was to learn how to prevent or delay type 2 diabetes in people with prediabetes, a strong risk factor for type 2 diabetes. The findings of the DPP, released in August 2001, showed that people at high risk for type 2 diabetes could sharply lower their chances of developing the disorder through diet and exercise. In addition, results of the oral diabetes drug metformin had a smaller reduction of diabetes risk.

In other research before the DPP, with the help and participation of many Akimel O'odham (Pima) Indians over the years, scientists at the National Institutes of Health identified several ways people with diabetes can improve their health. Scientists found that keeping blood glucose, blood pressure, and blood cholesterol under control is very important. Pregnant women with diabetes need to keep their blood glucose under control so that their babies will be healthy and have a lower risk of getting diabetes. Breastfeeding, even for a few weeks, helps protect babies from becoming overweight and developing diabetes.

Many people who might otherwise develop type 2 diabetes can prevent it by exercising regularly, lowering the amount of fat and number of calories they eat, and losing weight if they are overweight. Researchers are also studying the genetic and environmental factors that can lead to pre-diabetes and diabetes. About 100 tribes are evaluating demonstration programs to reduce the risk of developing type 2 diabetes or of developing heart disease, a complication of high blood glucose of diabetes that is not well controlled.

Adapted with permission from the National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.



Life in Balance

Though belief systems vary with every tribe, striving for harmony and balance in life seems central to many American Indians. Harmony and balance is the American Indian belief in interrelatedness and connectedness with all that is natural. The concept not only explains the interdependence of humans with other animates and inanimates in the world, but it also recognizes the need for individual wellness—of the interdependence of physical, emotional, psychological, and spiritual well-being.

Individuals are considered whole when their physical, mental, spiritual, and emotional selves exist in harmony. If there is something negative going on with one part of the self, it affects the other parts and causes an imbalance in the whole self. (Cleary & Peacock, 1998)

Overview

The Diabetes Education in Tribal Schools (DETS) curriculum is part of a national effort to decrease the incidence of type 2 diabetes among American Indians and Alaska Natives and to improve the care of people in these populations who already have the disease. The overarching goal of the multidisciplinary curriculum is to increase the understanding of health, diabetes, and maintaining life in balance. The curriculum recognizes that students bring to the classroom cultural values, and prior knowledge and experience in connection with health and diabetes.

American Indian and Alaska Native cultures embody many generations of oral traditions and stories that encompass values and sense of place. Among many other contributions, American Indians and Alaska Native peopls developed diverse belief systems and social structures; sophisticated and imaginative forms of art; agriculture; architecture; and earth sciences. The challenge of incorporating into teaching American Indian and Alaska Native cultures demands sensitivity to the unique features represented in the diverse array of over 560 federally recognized American Indian and Alaska Native tribes, and many other state and federally nonrecognized tribes. The DETS curriclum incorporates dance, oral history, storytelling, and the circle of balance to reflect American Indian and Alaska Native cultural teaching of prior and new knowledge.

The Round Dance and Powwows

The Round Dance goes by many names for different tribes: *Kahomni*, 2-Step, Owl Dance, or Rabbit Dance. It is a social dance that is often a part of American Indian gatherings, including community social dances, ceremonies, and powwows.

A powwow is a celebration where people gather to sing, dance, see family and friends, conduct honor ceremonies, and compete in singing and dancing. Powwows take place all

over the United States and Canada. During the summer months, there is usually a powwow every weekend in different areas of the United States.

Oral History and Storytelling

American Indian and Alaska Native cultures are filled with tradition. These cultures have sustained their traditions through oral history or storytelling. Oral history is a significant method in Native cultures where wisdom is passed down through tribal elders and leaders and through members of the extended family, such as grandparents and great-grandparents. The practice of storytelling developed over many centuries to teach life lessons and traditional Native values as well as to preserve tribal history.

Families pass their culture on to their children by socializing them to become participating members in that culture through the oral tradition—the spoken word. Within American Indian and Alaska Native communities, knowledge is transmitted through the stories, legends, and prayers. Native people's sense of self is embedded in their languages and the stories that hold the promises for a good life.

The written stories in the DETS curriculum are narratives that are culturally based. They are recitations of an individual's way to a balanced life, and they are written with concern for the well-being of the next generation. These stories are meant to help others understand that they can live a balanced, healthy life, and that living a healthy life is a positive journey.

Circle of Balance

In recognizing and honoring cultural diversity, there are common themes: unity and balance in life, a profound sense of place, and strong values of family and community. The framing and relationship of place and balance interlock and are embedded within a spiritual and ecological-wisdom orientation—they are inseparable for Native peoples. Stewardship and the connectedness of self, community, and all that Mother Earth nurtures portray an integrated approach intrinsic to Native peoples. The premise of the circle of balance is that it is the foundation and the energy for all things.

The Circle of Balance is integrated multiple times within the curriculum. This interconnected approach for *self* is a metaphoric template that allows for the systematic discovery of balance within self and with the surrounding world. For Native people, the Circle of Balance is illustrated by four quadrants: spiritual, physical, emotional, and mental. This conceptual division helps frame the complexity of self in manageable ways, opening the way for reflection on how each quadrant interacts with the others that make up the circle. These four quadrants are always evolving throughout an individual's life span.



The DETS curriculum uses an integrated theme in illustrating the contextual content of Native culture throughout the units. Threading Native cultural themes and concepts throughout the K–12 curriculum provides a meaningful approach for students of all cultural backgrounds to understand their self-identity and expand it in ever-widening circles to include others. As students become engaged with their own cultural backgrounds, beliefs, attitudes, and ways of life, their engagement allows for connectedness and an understanding that *health is life in balance*.

Science as Inquiry

When teachers talk about inquiry in the science classroom, many images come to mind. We like to see students doing science. But inquiry is much more than conducting investigations. We want students to be able to ask scientifically testable questions, design appropriate investigations to answer those questions, and develop explanations based on the evidence they collect. We also want them to be able to consider alternative explanations and use math and technology to help them answer questions when appropriate.

In addition to being able to practice science, we want students to understand the nature of science. We want them to realize that science advances through logical skepticism, that different areas in science lead to different types of questions, and that people from different backgrounds and different ways of life have contributed to the scientific knowledge we have today.

When we think about what inquiry looks like in the science classroom, it is helpful to consider the work of the National Research Council. Following the release of the *National Science Education Standards* (National Research Council [NRC], 1996), the council also developed several addenda to further explore some fundamental ideas inherent in the standards. In one of the addenda, the National Research Council (2000, pp. 24–27) outlines five essential features of inquiry that define inquiry in the classroom across all grade levels. We provide this useful discussion here:

Essential Feature 1: Learners are engaged by scientifically oriented questions.

Scientifically oriented questions center on objects, organisms, and events in the natural world; they connect to the science concepts described in the content standards. They are questions that lend themselves to empirical investigation and lead to gathering and using data to develop explanations for scientific phenomena. Scientists recognize two primary kinds of scientific questions. Existence questions probe origins and include many "why" questions. Why do objects fall toward the earth? Why do some rocks contain crystals? Why do humans have chambered hearts? Many "why" questions cannot be addressed by science. There are also causal/functional questions, which probe mechanisms and include most of the "how" questions. How does sunlight help plants to grow? How are crystals formed?

Students often ask "why" questions. In the context of school science, many of these questions can be changed into "how" questions and thus lend themselves to scientific inquiry. Such change narrows and sharpens the inquiry and contributes to its being scientific.



In the classroom, a question robust and fruitful enough to drive an inquiry generates a "need to know" in students, stimulating additional questions of "how" and "why" a phenomenon occurs. The initial question may originate from the learner, the teacher, the instructional materials, the Web, some other source, or some combination. The teacher plays a critical role in guiding the identification of questions, particularly when they come from students. Fruitful inquiries evolve from questions that are meaningful and relevant to students, but they also must be able to be answered by students' observations and scientific knowledge they obtain from reliable sources. The knowledge and procedures students use to answer the students' developmental level. Skillful teachers help students focus their questions so that they can experience both interesting and productive investigations.

Essential Feature 2: Learners give priority to *evidence*, which allows them to develop and evaluate explanations that address scientifically oriented questions.

As the *Standards* note, science distinguishes itself from other ways of knowing through use of empirical evidence as the basis for explanations about how the natural world works. Scientists concentrate on getting accurate data from observations of phenomena. They obtain evidence from observations and measurements taken in natural settings such as oceans, or in contrived settings such as laboratories. They use their senses, instruments such as telescopes to enhance their senses, or instruments that measure characteristics that humans cannot sense, such as magnetic fields. In some instances, scientists can control conditions to obtain their evidence; in other instances, they cannot control the conditions or control would distort the phenomena, so they gather data over a wide range of naturally occurring conditions and over a long enough period of time so that they can infer what the influence of different factors might be. The accuracy of the evidence gathered is verified by checking measurements, repeating the observations, or gathering different kinds of data related to the same phenomenon. The evidence is subject to questioning and further investigation.

The above paragraph explains what counts as evidence in science. In their classroom inquiries, students use evidence to develop explanations for scientific phenomena. They observe plants, animals, and rocks, and carefully describe their characteristics. They take measurements of temperature, distances, and time, and carefully record them. They observe chemical reactions and moon phases and chart their progress. Or they obtain evidence from their teacher, instructional materials,

the Web, or elsewhere, to "fuel" their inquiries. As the *Standards* note, "explanations of how the natural world changes based on myths, personal beliefs, religious values, mystical inspiration, superstition, or authority may be personally useful and socially relevant, but they are not scientific."

Essential Feature 3: Learners formulate explanations from evidence to address scientifically oriented questions.

Although similar to the previous feature, this aspect of inquiry emphasizes the path from evidence to explanation rather than the criteria for and characteristics of the evidence. Scientific explanations are based on reason. They provide causes for effects and establish relationships based on evidence and logical argument. They must be consistent with experimental and observational evidence about nature. They respect rules of evidence, are open to criticism, and require the use of various cognitive processes generally associated with science—for example, classification, analysis, inference, and prediction, and general processes such as critical reasoning and logic.

Explanations are ways to learn about what is unfamiliar by relating what is observed to what is already known. So, explanations go beyond current knowledge and propose some new understanding. For science, this means building upon the existing knowledge base. For students, this means building new ideas upon their current understandings. In both cases, the result is proposed new knowledge. For example, students may use observational and other evidence to propose an explanation for the phases of the moon; for why plants die under certain conditions and thrive in others; and for the relationship of diet to health.

Essential Feature 4: Learners evaluate their explanations in light of alternative explanations, particularly those reflecting scientific understanding.

Evaluation, and possible elimination or revision of explanations, is one feature that distinguishes scientific from other forms of inquiry and subsequent explanations. One can ask questions such as: Does the evidence support the proposed explanation? Does the explanation adequately answer the questions? Are there any apparent biases or flaws in the reasoning connecting evidence and explanation? Can other reasonable explanations be derived from the evidence?

Alternative explanations may be reviewed as students engage in dialogues, compare results, or check their results with those proposed by the teacher or instructional materials. An essential component of this characteristic is ensuring that students make the connection between their results and scientific knowledge



appropriate in their level of development. That is, student explanations should ultimately be consistent with currently accepted scientific knowledge.

Essential Feature 5: Learners communicate and justify their proposed explanations.

Scientists communicate their explanations in such a way that their results can be reproduced. This requires clear articulation of the question, procedures, evidence, proposed explanation, and review of alternative explanations. It provides for further skeptical review and the opportunity for other scientists to use the explanation in work on new questions.

Having students share their explanations provides others the opportunity to ask questions, examine evidence, identify faulty reasoning, point out statements that go beyond the evidence, and suggest alternative explanations for the same observations. Sharing explanations can bring into question or fortify the connections students have made among the evidence, existing scientific knowledge, and their proposed explanations. As a result, students can resolve contradictions and solidify an empirically based argument.

Essential Features of Classroom Inquiry and Their Variations

	Less More	Learner Sel Direction from Tea	f-Direction acher or Material	More Less
Feature				
1. Learner engages in scientifically oriented questions	A. Learner engages in question provided by teacher, materials, or other source	B. Learner sharpens or clarifies question provided by teacher, materials, or other source	C. Learner selects among questions, poses new questions	D. Learner poses a question
2. Learner gives priority to evidence in responding to questions	A. Learner given evidence (data) and told how to analyze	B. Learner given evidence (data) and guided in how to analyze it	C. Learner directed to collect certain evidence and asked to analyze	D. Learner determines what constitutes evidence, how to collect it, and how to analyze it
3. Learner formulates explanations from evidence	A. Learner provided with evidence and explanation	B. Learner given possible ways to use evidence to formulate an explanation	C. Learner guided in process of formulating explana- tions from evidence	D. Learner formulates explanation after summarizing evidence
4. Learner connects explanations to scientific knowledge	A. Learner given all connections between explanations and existing scientific knowledge	B. Learner given possible connections between explanations and existing scientific knowledge	C. Learner directed toward areas and sources of scientific knowledge in order to make connections to explanations	D. Learner independently examines other resources and forms connections to explanations
5. Learner communi- cates and justifies explanations	A. Learner given steps and procedures to justify and communicate explanations	B. Learner provided guidelines to justify and communicate explanations	C. Learner coached to form reasonable and logical arguments to justify and communicate explanations	D. Learner forms reasonable and logical arguments to justify and communicate explanations

Figure I6:

Essential features of classroom inquiry and their variations. (NRC, 2000)



BSCS 5E Instructional Model

The instruction of major concepts is organized around an instructional model that is based on the constructivist philosophy of learning. This philosophy of learning maintains that learners build or construct new ideas on top of their old ideas.

We call the instructional model the "5Es" because each unit is organized around five phases of learning that can best be described by using five words that begin with *E*: Engage, Explore, Explain, Elaborate, and Evaluate. This instructional model allows students to use and build on prior knowledge and experience, to experience common activities, to construct meaning, and to assess their understanding of a concept continually:

- Engage: This phase of the instructional model initiates the learning. The activity should (1) activate prior knowledge and help students make connections between past and present learning experiences and (2) anticipate activities and focus students' thinking on the learning outcomes of upcoming activities. The learner should become mentally engaged in the concept, process, or skill to be explored.
- Explore: This phase of the instructional model provides students with a common set of experiences within which they identify and develop current concepts, processes, and skills. During this phase, students actively explore their environment or manipulate materials.
- Explain: This phase of the instructional model focuses learners on developing an explanation for the concepts they have been exploring. As a result, they have opportunities to verbalize their conceptual understanding or to demonstrate their skills or behaviors. This phase also provides opportunities for teachers to introduce formal labels, definitions, and explanations for concepts, processes, skills, or behaviors.
- Elaborate: This phase of the instructional model challenges and extends students' conceptual understanding, and it allows further opportunity for students to practice desired skills and behaviors. Through new experiences, the learners develop deeper and broader understanding of major concepts, obtain more information about areas of interest, and refine their scientific skills.
- Evaluate: This phase of the instructional model encourages learners to assess their understanding and abilities and provides opportunities for teachers to evaluate students' understanding of key concepts and development of essential skills.

Stage of the Instructional Model	The BSCS 5E Instructional Model: What the Teacher Does			
Model	That Is Consistent with This Model	That Is Inconsistent with This Model		
Engage	 Creates interest Generates curiosity Raises questions Elicits responses that uncover what the students know or think about the concept or topic 	 Explains concepts Provides definitions and answers States conclusions Provides closure Lectures 		
Explore	 Encourages the students to work together without direct instruction from the teacher Observes and listens to the students as they interact Asks probing questions to redirect the students' investigations when necessary Provides time for the students to puzzle through problems Acts as a consultant for students 	 Provides answers Tells or explains how to work through the problem Provides closure Tells the students that they are wrong Gives information or facts that solve the problem Leads the students step-by-step to a solution 		
Explain	 Encourages the students to explain concepts and definitions in their own words Asks for justification (evidence) and clarification from students Formally provides definitions, explanations, and new labels Uses students' previous experiences as the basis for explaining concepts 	 Accepts explanations that have no justification Neglects to solicit the students' explanations Introduces unrelated concepts or skills 		
Elaborate	 Expects the students to use formal labels, definitions, and explanations provided previously Encourages the students to apply or extend the concepts and skills in new situations Reminds the students of alternative explanations Refers the students to existing data and evidence and asks, "What do you already know?" "Why do you think?" (Strategies from Explore apply here also.) 	 Provides definitive answers Tells the students that they are wrong Lectures Leads students step-by-step to a solution Explains how to work through the problem 		
Evaluate	 Observes the students as they apply new concepts and skills Assesses students' knowledge, skills, or both Looks for evidence that the students have changed their thinking or behaviors Allows students to assess their own learning and group-process skills Asks open-ended questions such as, Why do you think? What evidence do you have? What do you know about <i>x</i>? How would you explain <i>x</i>? 	 Tests vocabulary words, terms, and isolated facts Introduces new ideas or concepts Creates ambiguity Promotes open-ended discussion unrelated to the concept or skill 		

Figure 17: BSCS Instructional Model: What the Teacher Does. © 2008 BSCS. Reprinted with permission.



Stage of the Instructional	The BSCS 5E Instructional Model: What the Student Does			
Model	That Is Consistent with This Model	That Is Inconsistent with This Model		
Engage	 Asks questions such as, Why did this happen? What do I already know about this? What can I find out about this? Shows interest in the topic 	 Asks for the "right" answer Offers the "right" answer Insists on answers or explanations Seeks one solution 		
Explore	 Thinks freely, but within the limits of the activity Tests predictions and hypotheses Forms new predictions and hypotheses Tries alternatives and discusses them with others Records observations and ideas Suspends judgment 	 Lets others do the thinking and exploring (passive involvement) Works quietly with little or no interaction with others (only appropriate when exploring ideas or feelings) "Plays around" indiscriminately with no goal in mind Stops with one solution 		
Explain	 Explains possible solutions or answers to others Listens critically to others' explanations Questions others' explanations Listens to and tries to comprehend explanations that the teacher offers Refers to previous activities Uses recorded observations in explanations 	 Proposes explanations from "thin air" with no relationship to previous experiences Brings up irrelevant experiences and examples Accepts explanations without justification Does not attend to other plausible explanations 		
Elaborate	 Applies new labels, definitions, explanations, and skills in new but similar situations Uses previous information to ask questions, propose solutions, make decisions, and design experiments Draws reasonable conclusions from evidence Records observations and explanations Checks for understanding among peers 	 "Plays around" with no goal in mind Ignores previous information or evidence Draws conclusions from "thin air" In discussion, uses only those labels that the teacher provided 		
Evaluate	 Answers open-ended questions by using observations, evidence, and previously accepted explanations Demonstrates an understanding or knowledge of the concept or skill Evaluates his or her own progress and knowledge Asks related questions that would encourage future investigations 	 Draws conclusions, not using evidence or previously accepted explanations Offers only yes-or-no answers and memorized definitions or explanations as answers Fails to express satisfactory explanations in his or her own words Introduces new, irrelevant topics 		

Figure 18: BSCS Instructional Model: What the Student Does. © 2008 BSCS. Reprinted with permission.

Glossary

A1c: A test that measures a person's average blood glucose concentration over the past two to three months. Glucose sometimes joins with hemoglobin, the protein in red blood cells that carries oxygen. The A1c test shows the amount of glucose joined to hemoglobin, which is proportional to the amount of glucose in the blood. Also called hemoglobin A1c.

adult-onset diabetes: A term formerly used for type 2 diabetes.

balance: In general, being in harmony with the rest of one's world—physically, mentally, emotionally, and spiritually. In medicine and health, a similar concept: actively keeping major functions of the body within a narrow range or maintaining equilibrium. *See* homeostasis.

blood glucose: The main sugar found in the blood and the body's main source of energy. Also called blood sugar.

blood glucose concentration (level): The amount of glucose in a given amount of blood. It is noted in milligrams per deciliter, or mg/dL.

blood glucose meter: A small, handheld device used by people with diabetes to check their blood glucose concentration. The meter displays the blood glucose level as a number on the meter's digital display.

blood sugar: A popular term for glucose in the blood. This term is less accurate than blood glucose.

body mass index (BMI): A measure used to evaluate body weight relative to a person's height. For adults, BMI is used to find out if a person is underweight, normal weight, overweight, or obese. For teens and children, BMI is evaluated differently. For more information, go to the Centers for Disease Control Web site, http://www.cdc.gov/nccdphp/dnpa/bmi/.

borderline diabetes: A term formerly used for early type 2 diabetes or pre-diabetes. *See* pre-diabetes.

calorie: The amount of heat energy required to raise the temperature of 1 gram of water 1 degree Celsius. In this usage, calorie is spelled with a lowercase *c*. The food Calorie (written with a capital *C*) is actually a kilocalorie, or 1,000 calories. The Calorie is an indication of the amount of energy contained in food. The Calorie content written on food labels is actually kilocalories.

carbohydrate: One of the three main nutrients in food. Carbohydrates make up sugar, starch, and cellulose. Foods that provide carbohydrates include starches, vegetables, fruits, dairy products, and sugars.



certified diabetes educator (CDE): A health professional with expertise in diabetes education who has met eligibility requirements and successfully completed a certification exam. *See* diabetes educator.

coma: A sleeplike state in which a person is not conscious. In people who have diabetes, it may be caused by *hyperglycemia* (high blood glucose) or *hypoglycemia* (low blood glucose). **concentration:** The amount of a substance in a specified volume of liquid or air.

deciliter (dL): A volume equal to one-tenth of a liter, or 100 milliliters. In diabetes, blood glucose concentrations are often measured as the number of milligrams of glucose in a deciliter of blood.

diabetes educator: A health professional who teaches people who have diabetes how to manage their diabetes. Diabetes educators work in hospitals, physicians' offices, managed care organizations, home health care, and other settings.

diabetes mellitus: A condition characterized by high blood glucose concentrations. Diabetes mellitus can be classified as either type 1 or type 2. Diabetes may cause serious health problems, such as heart disease, stroke, kidney failure, blindness, or amputations.

Diabetes Prevention Program (DPP): A study by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) conducted from 1998 to 2001 in people at high risk for type 2 diabetes. All study participants had impaired glucose tolerance (also called prediabetes) and were overweight. Basic information about the DPP and its results can be found at the NIDDK Web site, http://diabetes.niddk.nih.gov/dm/pubs/preventionprogram/.

dialysis: The process of cleaning wastes from the blood by a dialysis machine. The kidneys usually perform this function.

dietitian: A health professional who advises people about meal planning, weight control, and diabetes management. A registered dietitian (RD) has met eligibility requirements and successfully completed a certification exam.

digestion: The process of making food absorbable by mechanically and enzymatically breaking it down into simpler chemical compounds. Digestion begins in the mouth and continues in the esophagus, stomach, and intestines.

epidemic: An outbreak of disease affecting a large number of people at the same time. Or a disease that increases suddenly in numbers that exceed what is expected.

fasting blood glucose test: A medical test of the body's ability to metabolize glucose that is used to diagnose diabetes or pre-diabetes. It is also used to monitor people who have diabetes.

fat: 1. One of the three main nutrients in food. Foods that provide fat include butter, margarine, salad dressing, oil, nuts, meat, poultry, fish, and some dairy products. 2. Excess calories are stored as body fat, providing the body with a reserve supply of energy and other functions.

gestational diabetes mellitus: A type of diabetes mellitus that develops only during pregnancy and usually disappears upon delivery. Gestational diabetes increases the risk that the mother will develop diabetes later. It is managed with meal planning, activity, and, in some cases, insulin.

glucagon: A hormone produced in the pancreas. It is released in response to decreases in the blood glucose concentration. Glucagon acts to increase blood glucose by stimulating the breakdown of glycogen and the synthesis of glucose.

glucose: A simple sugar with the chemical formula $C_6H_{12}O_6$. Glucose is the main type of sugar used by cells.

glycogen: The chief carbohydrate used by animals for energy storage.

homeostasis: A fundamental characteristic of living systems; the tendency of an organism to maintain a stable, constant internal environment.

hormone: A regulatory chemical secreted by cells or glands and carried through the blood. Hormones act on specific target cells and organs elsewhere in the body to elicit a response; a chemical messenger.

hyperglycemia: Indicates excessive blood glucose.

hypoglycemia: A condition that occurs when blood glucose levels are lower than normal. Signs include hunger, nervousness, shakiness, perspiration, dizziness or light-headedness, sleepiness, and confusion. If left untreated, hypoglycemia may lead to unconsciousness.

impaired fasting glucose (IFG): A condition in which a blood glucose test, taken after an eight- to 12-hour fast, shows a level of glucose higher than normal but not high enough for a diagnosis of diabetes. IFG is one of two conditions (with impaired glucose tolerance) that are the basis for a diagnosis of pre-diabetes. *See* impaired glucose tolerance (IGT) and pre-diabetes.

impaired glucose tolerance (IGT): A condition in which blood glucose concentrations are higher than normal but not high enough for a diagnosis of diabetes. IGT is one of two conditions (with impaired fasting glucose) that are the basis for a diagnosis of pre-diabetes. Terms for IGT that are no longer used include borderline, subclinical, chemical, or latent diabetes. *See* impaired fasting glucose (IFG) and pre-diabetes.



insulin: A hormone produced by the pancreas and released in response to elevated blood glucose concentrations. Insulin decreases blood glucose by increasing the uptake and use of glucose by cells.

insulin-dependent diabetes mellitus: A term formerly used for type 1 diabetes.

insulin receptors: Specific proteins on the cell membrane that binds to insulin and trigger a series of biochemical events that result in the uptake of glucose into the cell. *See* receptor.

insulin resistance: The body's inability to respond to and use the insulin produced by the pancreas. Insulin resistance is linked to obesity, hypertension, and high levels of fat in the blood.

juvenile diabetes: A term formerly used for type 1 diabetes.

kidney failure: A chronic condition in which the kidneys do not work properly, causing the body to retain fluid and harmful wastes to build up. A person with kidney failure needs dialysis or a kidney transplant.

kidneys: The two organs that regulate water and salt levels, filter water and wastes from the blood, and get rid of the end products as urine.

liver: The body organ that changes food into energy, removes alcohol and poisons from a person's blood, and makes bile, a substance that breaks down fat and helps rid the body of wastes.

metabolism: The sum of all chemical and physical processes within a living organism. Specifically, all of the chemical changes in living cells by which energy is provided for vital processes and activities and new material are assimilated.

noninsulin-dependent diabetes mellitus: A term formerly used for type 2 diabetes.

nutritionist: A person with training in nutrition. A nutritionist may or may not have specialized training or qualifications. *See* dietitian.

obesity: A condition in which the body has a greater than normal amount of fat. Obesity is more a severe condition than being overweight. In adults, obesity is defined as a body mass index (BMI) of 30 or more.

oral glucose tolerance test (OGTT): A test used to diagnose pre-diabetes and diabetes. The oral glucose tolerance test is given by a health professional after an overnight fast. After a blood sample is taken, the patient drinks a high-glucose beverage. Blood samples are taken during the three hours after drinking the glucose beverage. Test results are compared with a standard and show how the body uses glucose over time.

overweight: Having an above-normal body weight. In adults, being overweight means having a body mass index (BMI) of 25–29.9.

pancreas: The body organ that makes the hormones insulin and glucagon, as well as some enzymes used in digestion. The pancreas is located behind the lower part of the stomach and is about the size of a hand.

pre-diabetes: A condition in which blood glucose levels are higher than normal but are not high enough for a diagnosis of diabetes. People with pre-diabetes are at increased risk for type 2 diabetes, heart disease, and stroke. Pre-diabetes is diagnosed by having impaired fasting glucose, impaired glucose tolerance, or both. *See* impaired fasting glucose (IFG) *and* impaired glucose tolerance (IFT).

protein: 1. One of the three main nutrients in food. Foods that provide protein include meat, poultry, fish, cheese, milk, dairy products, eggs, and dried beans. 2. Proteins are produced in the body for cell structure, hormones such as insulin, and other functions.

receptor: A molecule (membrane protein) that recognizes specific chemicals, including hormones, neurotransmitters, or other body chemicals. When the hormone or other body chemical binds to its receptor, a biological response is triggered in the cells. *See* insulin receptors.

sucrose: A double sugar or disaccharide composed of glucose and fructose. Known as table sugar or white sugar, it is found naturally in sugarcane and in beets.

sugar: 1. A class of carbohydrates with a sweet taste; includes glucose, fructose, and sucrose. 2. A term used to refer to blood glucose.

Adapted with permission from the *Diabetes Dictionary* by the National Institute of Diabetes and Digestive and Kidney Diseases; MedlinePlus Medical Dictionary; and *BSCS Biology: An Ecological Approach*, 10th edition (BSCS, 2006).



Resource Directory

In an effort to provide teachers with additional high-quality resources of diabetes, we offer the following list of resources.

General Information on Diabetes

1. National Diabetes Information Clearinghouse (NDIC)

http://diabetes.niddk.nih.gov

The NDIC is a service of the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). NDIC was created to increase knowledge and understanding about diabetes among patients, health professionals, and the general public. The NDIC Web site provides access to

- publications about diabetes, provided free of copyright, in varying reading levels;
- publications for health fairs and community events;
- the Combined Health Information Database;
- the diabetes subfile (which contains fact sheets, brochures, audiovisual materials, and reference materials for patients and health professionals); and
- an "A to Z list" of diabetes topics and titles.

2. U.S. Department of Health and Human Services—National Institutes of Health (NIH)

http://health.nih.gov

The National Institutes of Health (NIH), a part of the U.S. Department of Health and Human Services, is the primary Federal agency for conducting and supporting medical research. The NIH Web site provides access to

- research health topics A–Z,
- search health topics, and
- browse health categories.

3. U.S. Department of Health and Human Services—Indian Health Service

http://www.ihs.gov

The mission of the Indian Health Service (IHS) Division of Diabetes Treatment and Prevention is to develop, document, and sustain a public health effort to prevent and control diabetes in American Indian and Alaska Native peoples.

4. Food Nutrition Information Center

http://fnic.nal.usda.gov

The Food and Nutrition Information Center has been a leader in food and human nutrition information dissemination since 1971. It provides credible, accurate, and practical resources for nutrition and health professionals, educators, government personnel and consumers. The Web site provides access to
- resources for teachers,
- downloadable nutrition education,
- training materials, and
- high-resolution images for educational use.

5. National Diabetes Education Program

http://ndep.nih.gov/

This National Diabetes Education Program is a joint program of the CDC (Centers for

Disease Control and Prevention), NIH (National Institutes of Health), and 200-plus partners.

It provides

- resources for health professionals,
- resources for educators, and
- opportunities and information for business professionals.

6. Children with Diabetes

http://www.childrenwithdiabetes.com

Children with Diabetes is an online community for kids, families and adults with

diabetes, and provides

- the latest news and information for anyone with diabetes,
- an interactive database for children to use in e-mailing pen pals,
- forums,
- a parents' section with parent-specific information on diabetes,
- a home page for parents of kids with diabetes,
- an Ask the Diabetes Team feature, and
- a *Diabetes Basics* section (which offers basic medical information about diabetes, insulin, and research).

7. National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention (CDC)

http://www.cdc.gov/diabetes

- CDC's Diabetes Public Health Resource Web site contains information about
- the National Diabetes Education Program,
- national conferences on diabetes,
- diabetes data and trends,
- national studies, and
- Diabetes & Me (basic information on diabetes and its complications and on ways to be active and eat right).



8. American Diabetes Association

http://www.diabetes.org

The American Diabetes Association is the nation's leading nonprofit health organization providing diabetes research, information, and advocacy. The mission of the association is to prevent and cure diabetes and to improve the lives of all people affected by diabetes.

9. Nutrition.gov

http://www.nutrition.gov

Nutrition.gov provides easy, online access to government information on food and human nutrition for consumers. It is a service of the National Agricultural Library, USDA. The Web site provides access to

- food and nutrition information;
- physical activity requirements;
- food safety for consumers, educators, and health professionals;
- healthy choices to reduce obesity and other food related diseases; and
- specialized nutritional requirements of infants, children, teens, adult women, men, and seniors.

10. Ask the Dietitian—Joanne Larson, MS, RD, LD

http://www.dietitian.com

An interesting feature is the Healthy Body Calculator. Just type in your information, and the results are shown on the third page. A list of commonly asked questions and answers is provided.

11. Nutrition Quest

http://www.nutritionquest.com

This Web site offers an excellent tool for personal nutrition analysis, including

- fat content in your diet,
- fruit content in your diet,
- vegetable content of your diet , and
- fiber intake.

12. Joslin Diabetes Center

http://www.joslin.org

The mission of the Joslin Diabetes Center is to improve the lives of people with diabetes and its complications through innovative care, education, and research that will lead to the prevention and cure of the disease. The Web site provides current diabetes education via

- the latest news and press releases,
- an online diabetes library,
- online classes,

- discussion boards, and
- an interactive learning center (which provides a series of interactive courses on diabetes).

13. U.S. Department of Agriculture—MyPyramid.gov

http://www.mypyramid.gov/

The *MyPyramid Plan* offers you a personal eating plan with the foods and amounts that are right for you. Use the advice at *Inside the Pyramid* to help you

- make smart choices from every food group,
- find your balance between food and physical activity,
- get the most nutrition out of your calories, and
- stay within your daily calorie needs.

Teaching Tools

1. Discovery Kids

http://yucky.discovery.com

This interactive Web site promotes health education activities for kids, including

- games and quizzes,
- information on the endocrine system,
- information on the nervous system,
- information on the skeletal system, and
- information on the digestive system.

2. KidsHealth

http://kidshealth.org

Many topics are available, such as homework help, how the body works, information and news, and featured articles.

3. Mission Nutrition

http://www.missionnutrition.ca/missionnutrition/eng/

The Mission Nutrition Web site offers nutrition information for teachers, parents, or students. The links for educators are in the form of lesson plans and student activities.

4. Kateri Memorial Hospital Centre

http://www.ksdpp.org

This is the Web site of the Kahnawake Schools Diabetes Prevention Project. Their motto is "Healthy eating habits, daily physical activity, and positive attitude can prevent diabetes." This main Web page is oriented toward the educator and focuses on teaching elementary school children about the prevention of diabetes.



5. NIH Office of Science Education

http://science.education.nih.gov/

The Office of Science Education provides educational resources on this Web site. The NIH Curriculum Supplement Series is a package of interactive teaching units that combine cutting-edge science research discoveries from the National Institutes of Health, one of the world's foremost medical research centers, with state-of-the-art instructional materials. The educational resources are listed by topic, grade level, and resource formats.

Books

American Diabetes Association. (2005). *American Diabetes Association complete guide to diabetes.* Alexandria, VA: Author.

Kaufman, F. R. (2005). *Diabesity: The obesity-diabetes epidemic that threatens America and what we must do to stop it.* New York: Bantam Dell.

Grades 7–8 A BALANCING ACT: PREVENTING DIABETES





Unit Overview

The Diabetes Education in Tribal Schools (DETS) 7–8 Science Unit, *A Balancing Act: Preventing Diabetes*, consists of five lessons that can be completed in 10 class periods. The overall goal of this unit on diabetes is to help prevent the onset of type 2 diabetes among the American Indian and Alaska Native populations. Students learn the following big ideas:

- Our knowledge about disease has developed across time and continues to develop as the result of scientific investigation and the accumulation of evidence.
- Diabetes is a disease in which a person's body is not able to use glucose properly.
- A balance between food and physical activity is important to good health.
- Even small changes in a person's lifestyle can significantly reduce his or her risk of developing diabetes.
- While there are controllable and uncontrollable factors that increase an individual's risk of developing diabetes, there are also ways to prevent or reverse the trend of increasing incidence of diabetes among Native Americans.

Enduring Understandings for the Unit

By the end of this unit, students should be able to understand the following:

- Diabetes is a disease in which a person's body is not able to use glucose properly.
- The body's inability to produce and use insulin is the underlying cause of diabetes.
- Diabetes is a treatable disease.
- Diabetes can have serious short- and long-term consequences for health.
- Balance is an important concept for individuals who want to lead a healthy life.
- Even small changes in a person's lifestyle can significantly reduce the risk of developing diabetes.
- There are factors that increase an individual's risk of developing type 2 diabetes.
- Helping people learn about diabetes and healthful lifestyles is essential to reducing the risk of developing diabetes.

Project Goal 1

To increase students' understanding of health and diabetes. To help American Indian and Alaska Native children learn how to maintain balance for themselves, their families, and their communities.

5–8 Specific Goals

- **1.** Describe lifestyle in terms of dietary patterns, physical activity levels, and personal choices.
- **2.** Describe the environment in terms of external factors such as physical surroundings and social organization.
- 3. Describe how lifestyles and the environment change over time.
- 4. Explain how lifestyle choices can lead to balance or imbalance.
- 5. Describe how healthful choices can prevent or delay the onset of type 2 diabetes.

Project Goal 2

To increase American Indian and Alaska Native students' understanding of and appreciation for the process of developing scientific and community knowledge with respect to health, diabetes, and maintaining balance.

5–8 Specific Goals

1. Identify lifestyle changes that would improve or maintain personal health and the health of families and communities.



- **2.** Identify environmental changes that would improve or maintain personal health and the health of families and communities.
- **3.** Identify healthy choices on a personal, family, and community level that can prevent or delay the onset of diabetes.

Project Goal 3

To improve attitudes toward and interest in entering health and science professions by developing a better understanding of how diabetes-related biomedical professionals work with communities and enhance health.

5–8 Specific Goals

- 1. Introduce students to various health and science professions and career opportunities.
- 2. Identify educational paths for becoming health and science professionals.

Correlation with National Standards

The National Science Education Standards

This unit on diabetes supports teachers in their efforts to reform science education in the spirit of the National Research Council's 1996 *National Science Education Standards*. The content of the unit is explicitly standards based. The following chart on the next pages lists the specific content standards that this unit addresses.

This unit also addresses standards in the areas of math, literacy, and health.





Content Standards: Grades 5-8

Content Standard A: As a result of activities in grades 5–8, all students should develop	Correlation with DETS 7–8 Science Unit
Abilities necessary to do scientific inquiry	
Identify questions that can be answered through scientific investigations.	Lessons 1, 2
Use appropriate tools and techniques to gather, analyze, and interpret data.	Lessons 1, 2
Develop descriptions, explanations, predictions, and models using evidence.	Lessons 1, 2
Think critically and logically to make the relationships between evidence and explanations.	Lesson 1
Recognize and analyze alternative explanations and predictions.	Lesson 1
Understandings about scientific inquiry	
Different scientific domains employ different methods, core theories, and standards to advance scientific knowledge and understanding.	Lessons 1, 4
Asking questions and querying other scientists' explanations is part of scientific inquiry.	Lessons 1, 4
Content Standard C: As a result of their activities in grades 5–8, all students should develop understanding of	
Structure and function in living systems	
Specialized cells perform specialized functions in multicellular organisms Each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole.	Lesson 1
Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system.	Lesson 1

Content Standard F: As a result of their activities in grades 5–8, all students should develop understanding of	Correlation with the DETS 7–8 Science Unit
Personal health	
Regular exercise is important to the maintenance and improvement of health.	Lessons 3, 4, 5
Food provides energy and nutrients for growth and development. Nutrition requirements vary with body weight, age, sex, activity, and body functioning.	Lessons 3, 4, 5
Risks and benefits	
Individuals can use a systematic approach to thinking critically about risks and benefits.	Lessons 3, 4
Important personal and social decisions are made based on perceptions of benefits and risks.	Lessons 3, 4
Science and technology in society	
Science influences society through its knowledge and world view.	Lessons 1, 2, 3
Content Standard G: As a result of activities in grades 5–8, all students should develop understanding of	
Science as a human endeavor	
Women and men of various social and ethnic backgrounds—and with diverse interests, talents, qualities, and motivations—engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams and some work alone, but all communicate extensively with others.	Lesson 4
Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity.	Lessons 1, 4
Nature of science	
Scientists formulate and test their explanations of nature using observation, experiments, and theoretical and mathematical models.	Lesson 1
It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists. Evaluation includes reviewing the experimental procedures, examining the evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations.	Lesson 1
History of science	
Many individuals have contributed to the traditions in science.	Lesson 4
Tracing the history of science can show how difficult it was for scientific innovators to break through the accepted ideas of their time to reach conclusions that we currently take for granted.	Lessons 1, 4

Source: National Resource Council. (1996). National science education standards. Washington, DC: National Academy Press.



Teacher Strategies

Timeline for the Lessons

The timeline provides a guideline for completing the five lessons in this unit. The lessons will require 10 45-minute class periods. The amount of class time needed for the unit will reflect the practice of individual teachers. Some classes will spend more time on activities and discussions than others. If your class periods are either shorter or longer than 45 minutes, you will need to adjust your schedule accordingly.

Lesson 1, History in the Making: 2 class periods

Lesson 2, Focus on Diabetes: 2 class periods

Lesson 3, Health Is Life in Balance: 2 class periods

Lesson 4, The Diabetes Health Care Clinic: 2 class periods

Lesson 5, Taking the Message Home: 2 class periods

The timeline assumes that you will teach the lessons on consecutive days. If several days separate the lessons, you may need additional time to review the previous lessons. This review will help students make stronger connections between the lessons.

Advance Preparation

2–3 Weeks Ahead

Begin reviewing lessons.

1 Week Ahead

Make photocopies and transparencies. Gather necessary materials.

Teacher Materials for the Unit

overhead projector

transparency pens or markers

transparency copies of each of the following:

- Copymaster 1.1, Medical Discovery Proves Epoch-Making
- Copymaster 1.3, Condition Unknown
- Copymaster 1.6, Looking for Clues
- Copymaster 1.9, Leonard and Testing New Ideas

1 copy of Copymaster 1.4, Condition Unknown—Possible Answers

1 copy of Copymaster 1.7, Looking for Clues—Possible Answers

1 copy of Copymaster 1.10, Leonard and Testing New Ideas—Possible Answers

1 copy of Copymaster 1.12, Lesson 1 Quiz—Answer Key (optional)

transparency copies of each of the following:

- Copymaster 2.1, Incidence of Diabetes in the United States
- Copymaster 2.2, *Generating Questions about Type 2 Diabetes*

1 copy of Copymaster 2.5, Scoring Rubric for Focus on Diabetes Poster

1 copy of Copymaster 2.7, Lesson 2 Quiz—Answer Key (optional)

transparency copies of each of the following:

- Copymaster 3.1, Risk Factors for Type 2 Diabetes
- Copymaster 3.2, *MyPyramid*
- Copymaster 3.4, Brian's Diary
- Copymaster 3.5, Sample MyPyramid Worksheet
- Copymaster 3.14, Guidelines for Student Letters
- Copymaster 3.15, Sample Letter

1 copy of Copymaster 3.13, Details about the MyPyramid Guidelines for Middle School Students

1 copy of Copymaster 3.17, Lesson 3 Quiz—Answer Key (optional)

1 copy of Copymaster 4.9, Lesson 4 Quiz—Answer Key (optional)

1 transparency copy of Copymaster 5.1, Commendation Letter

1 copy of Copymaster 5.3, Scoring Rubric for Presentation to Tribal Leaders

1 copy of Copymaster 5.5, Lesson 5 Quiz—Answer Key (optional)

Student Materials for the Unit

For each student

3 x 5-inch index card
manila folder (optional)
copy of Copymaster 1.2, On the Trail of Discovery
copy of Copymaster 1.6, Looking for Clues
copy of Copymaster 1.8, The First Test of a New Idea
copy of Copymaster 1.9, Leonard and Testing New Ideas

1 copy of Copymaster 1.11, Lesson 1 Quiz (optional)

1 copy of Copymaster 2.4, Facts about Diabetes

1 copy of Copymaster 2.5, Scoring Rubric for Focus on Diabetes Poster

1 copy of Copymaster 2.6, Lesson 2 Quiz (optional)

1 copy of Copymaster 3.3, MyPyramid Food Guidance System

1 copy of Copymaster 3.4, Brian's Diary

1 copy of Copymaster 3.11, MyPyramid Worksheet

1 copy of Copymaster 3.12, MyPyramid Equivalents

1 copy of Copymaster 3.14, Guidelines for Student Letters

1 copy of Copymaster 3.16, Lesson 3 Quiz (optional)



- 1 copy of Copymaster 4.1, Diabetes Health Care Team Members
- 1 copy of Copymaster 4.7, Case Analysis Form
- 1 copy of Copymaster 4.8, Lesson 4 Quiz (optional)
- 1 copy of Copymaster 5.3, Scoring Rubric for Presentation to Tribal Leaders
- 1 copy of Copymaster 5.4, Lesson 5 Quiz (optional)

For each team of 3-4 students

assorted brochures, articles, books, and other references about diabetes

1 poster board

1 set of markers

highlighting markers, 2 different colors

blank transparencies

transparency pens

computers with presentation software (optional)

1 copy of Copymaster 1.5, Clue Cards

1 copy of Copymaster 2.3, Team Questions about Type 2 Diabetes

1 copy of 1 diary from Copymasters 3.6–3.10, Student Diaries:

- Copymaster 3.6, Valerie's Diary
- Copymaster 3.7, Lenore's Diary
- Copymaster 3.8, Jeremy's Diary
- Copymaster 3.9, Jody's Diary
- Copymaster 3.10, Jessica's Diary

1 copy of Copymaster 3.13, Details about the MyPyramid Guidelines for Middle School Students

1 copy of 1 case summary from Copymasters 4.2–4.6, Case Summaries:

- Copymaster 4.2, Case Summary—Josie
- Copymaster 4.3, Case Summary—Richard
- Copymaster 4.4, Case Summary—Sarah
- Copymaster 4.5, Case Summary—Chad
- Copymaster 4.6, Case Summary—Art

1 copy of Copymaster 5.2, Guidelines for Diabetes Presentation

Monitoring Students' Progress

Assessing what students have learned during an activity, lesson, or unit is an important part of your role as a teacher. Because assessment can play a different role at different times, this unit has a variety of assessment strategies built in to the procedures.

The Engage lessons often include a mechanism for learning more about the preconceptions that students have before new content material is presented. From research on learning, we know that it is important for students to recall and think about their current knowledge and ideas. Some of this information is likely to be accurate and correct, but often this opportunity enables students to consider what they know, what questions they have, and even what discrepancies they have in their knowledge. Only after considering their prior knowledge will they be ready to add new information or revise incorrect ideas.

Assessment is also important as students progress through the lessons in the unit. In this unit, an icon in the margin denotes an opportunity for assessment. The icon indicates stages at which you can assess students' understanding of the enduring understandings or major concepts the lesson is designed to convey. Specific strategies for evaluating students' understanding are provided with the icon. Some of the strategies are informal and quick, while others may be more in depth. On the basis of students' understanding at these points, you can modify your teaching practices accordingly.

The Evaluate lesson in the unit provides an opportunity for students to synthesize what they have learned during the previous lessons. By completing the Evaluate lesson, students demonstrate what they have learned and apply their understanding to new situations.

This unit includes short, optional quizzes that can be given at the end of each lesson. These quizzes focus on the major points that students should know when they complete the lesson. The quizzes are found on copymasters. For each quiz, there is one copymaster for the quiz that can be photocopied for students and one copymaster that serves as an answer key. These quizzes are another way to monitor students' understanding at different points in the unit.

Finally, some teachers may wish to use an end-of-unit quiz to assess students' understanding of the ideas and concepts. The accompanying Teacher Resource CD-ROM (TRCD) includes a short test bank of questions that can be used for this purpose. The questions are in a variety of formats—multiple choice, true-false, short answer, and problem solving. As you design your end-of-unit quiz, select the questions from the test bank that represent the concepts you focused on and that align with the way you taught the unit.





A Balancing Act: Preventing Diabetes

Student Lessons









A Balancing Act: Preventing Diabetes

At a Glance

Overview

Lesson 1, *History in the Making*, consists of one activity and takes two class periods to complete. Students read a true story about a teenager who had diabetes in the early 1920s. They then use the clues that were available to his doctors to develop an initial answer to the question of what was wrong in the boy's body that led to his disease. Students predict how the boy's doctors might have tried to treat his diabetes. Finally, they learn how the boy was actually treated and discuss how and why the treatment worked.

Enduring Understandings

- Our understanding of diseases develops across time as the result of scientific investigation and the accumulation of evidence.
- In diabetes, the body cannot use glucose properly and lacks the source of energy it needs to function.
- The body's inability to produce and use insulin is the underlying cause of diabetes.

Teacher Background

Please consult the Overview of Diabetes section of Introductory Information.

Outcomes and Indicators of Success

By the end of this lesson, students should be able to

- 1. explain the importance of scientific investigation in our understanding of disease.
 - They will demonstrate their understanding by
 - using medical clues to determine what was wrong in Leonard's body and
 - analyzing how doctors experimented with possible cures.
- 2. describe what happens in the body of a person with diabetes.
 - They will demonstrate their ability by
 - explaining how the body uses glucose and
 - explaining the importance of insulin.

In Advance

Teacher Materials

overhead projector

transparency pens or markers

transparency copies of each of the following:

- Copymaster 1.1, Medical Discovery Proves Epoch-Making
- Copymaster 1.3, Condition Unknown

Lesson 1: History in the Making Engage Explore



- Copymaster 1.6, Looking for Clues
- Copymaster 1.9, Leonard and Testing New Ideas

1 copy of Copymaster 1.4, Condition Unknown—Possible Answers

- 1 copy of Copymaster 1.7, Looking for Clues—Possible Answers
- 1 copy of Copymaster 1.10, Leonard and Testing New Ideas—Possible Answers
- 1 copy of Copymaster 1.12, Lesson 1 Quiz—Answer Key (optional)

Student Materials

For each student

1 copy of Copymaster 1.2, On the Trail of Discovery

1 copy of Copymaster 1.6, Looking for Clues

1 copy of Copymaster 1.8, The First Test of a New Idea

- 1 copy of Copymaster 1.9, Leonard and Testing New Ideas
- 1 copy of Copymaster 1.11, Lesson 1 Quiz (optional)

For each team of 3–4 students

1 copy of Copymaster 1.5, Clue Cards

Preparation

Cut the copies of Copymaster 1.5, *Clue Cards*, on the dotted lines to produce a set of six clue cards for each team. To make them last longer, you may want to laminate the cards.

Process and Procedure

 Open the lesson by asking, "What major discoveries have changed our tribe's way of life?"

Students may suggest events that occurred long ago, such as the discoveries that perfected hunting and gathering techniques and weapons, the discovery of edible foods in nature, the discovery of things in nature that have medicinal value, or the discovery of materials that could be used to make pottery. They might also list such recent events as the invention of cars, television, computers, and cell phones; the discovery of electricity; and various medical advances such as antibiotics, immunizations, and organ transplants. Accept all reasonable answers.

Explain to students that major discoveries that have a big effect in a given time period are often referred to as "epoch-making."

Asking this type of question invites students to call on their prior knowledge and engages their thinking. At this point, do not critique students' responses; instead, respond with short, positive phrases such as, "Good" and "What else?" To encourage students to think more deeply, you may need to ask questions such as, "How do you know that?"

and "Why do you believe that?" When students' interest has been piqued and their thinking engaged, move on to the next step.

2. Tell students that they are about to begin a study of an epoch-making event that made world headlines in the early 1920s. Display a transparency of Copymaster 1.1, *Medical Discovery Proves Epoch-Making*. Explain that this headline appeared in the *Toronto Star Weekly* on March 26, 1922. Ask, "What do you think the headline is saying?"

Students may not be familiar with the word "benefaction," but should still be able to see that the headline is announcing good news about a disease called diabetes. If necessary, explain that benefaction is an act that shows kindness and goodwill.

Note to Teacher: We have not included the full article because the vocabulary is not grade appropriate. The purpose of the headline on Copymaster 1.1 is just to engage students' interest in understanding that the discovery of insulin and its relationship to managing and controlling diabetes was very significant to the public health of all nations.

- 3. Ask, "How many of you have heard of diabetes?" A simple count of raised hands is sufficient here. Then ask, "What do you know about diabetes?" Answers will vary. Accept all reasonable student responses. This will give you an idea of students' preconceptions about diabetes.
- Distribute a copy of Copymaster 1.2, On the Trail of Discovery, to each student. Explain that they are going to begin their study of diabetes by reading about a teenage boy in the early 1920s.

Because the excerpt is short, you may wish to have a volunteer read aloud as other students follow along. To create more individual accountability, you may wish to have students read silently.

5. Display a transparency of Copymaster 1.3, *Condition Unknown*, and lead a short discussion of the questions listed.

See Copymaster 1.4, *Condition Unknown—Possible Answers*, for sample student answers. Keep this discussion short. The purpose of the discussion is not to teach students about diabetes, but simply to ensure that all students have the same general knowledge from reading about Leonard and his medical condition.

Note to Teacher: Ensure that students know that glucose is a sugar (a type of carbohydrate) that the body uses to produce the energy it needs to function. If necessary, ask your students, "What does the body do that requires energy?" Students may think only of muscular actions requiring energy, so you may need to ask leading



questions to make sure they also list essential functions such as breathing, circulation, digestion, and brain activity.

- 6. Explain that in the 1920s doctors did not know what was happening in the body of a patient with diabetes. Doctors did not know how to treat the disease. Before the mid-1920s, patients usually died of diabetes. Most children died within a year of being diagnosed with the disease.
- 7. Explain that, before diabetes could be understood and treated, scientists needed to know why glucose from food could not get into a patient's cells. Ask students to move into their teams. Give one set of Copymaster 1.5, *Clue Cards*, to each team.
- Have teams lay their cards face up on a desk. Explain that these cards describe some of the clues doctors had about diabetes in the 1920s, when Leonard was hospitalized.
- **9.** Tell students that they need to think like scientists. This means they need to think critically and use logic and evidence. They should first read and discuss the information on all of the cards. Then have them arrange the cards in a logical sequence that might tell the story of how scientists discovered what might be wrong in the bodies of people with diabetes.

Give students 10 minutes to discuss and arrange their cards. Rotate among the teams. As necessary, help students understand the clues as they are written and ask students to explain and justify their sequences as they create them. Several different sequences will make sense and help explain how doctors knew what might be wrong in Leonard's body. The goal of this exercise is not for students to find the *only* correct sequence, but to find a sequence that helps them begin to understand the relationship between insulin and diabetes.



10. Distribute Copymaster 1.6, Looking for Clues, to each student. Have students answer the questions as a team, based on the clues they have pieced together. Allow 15 minutes for this task. Students should work with their team members and

share their understanding of the information on the clue cards.

11. Display a transparency of Copymaster 1.6, *Looking for Clues*. Call on different teams to provide answers to each question. After a team responds, ask if other teams agree or disagree.

See Copymaster 1.7, *Looking for Clues—Possible Answers*, for sample student answers.

12. Explain that scientists did many, many experiments in which they injected pancreatic extracts from different animals into diabetic dogs. The scientists

wanted to see if the extracts would eliminate the symptoms of diabetes. The results of these experiments were variable—sometimes the dog's condition improved and sometimes it did not. Nevertheless, in 1922, Leonard's father gave his permission for the doctors to inject Leonard with an extract made from a healthy beef pancreas.

13. Have students read Copymaster 1.8, *The First Test of a New Idea*, to learn how the experiment turned out.

Because the excerpt is short, you may wish to ask a volunteer to read aloud as other students follow along. To create more individual accountability, you may wish to have students read silently.

14. Distribute Copymaster 1.9, Leonard and Testing New Ideas, to each student. Have students answer the questions as a team.

Give students 10 minutes to complete this task.

15. Display a transparency of Copymaster 1.9, *Leonard and Testing New Ideas*. Call on different teams to provide answers to each question.

See Copymaster 1.10, *Leonard and Testing New Ideas—Possible Answers*, for sample student answers.

16. To close the lesson, display the transparency of Copymaster 1.1 again. Explain that in the 1920s, almost everyone diagnosed with diabetes died. Children and teenagers usually died from the disease within a year. Today, if people with diabetes take care of their health properly, they can live long and happy lives. Ask students if they agree with the headline, that the discovery of insulin was both "epoch-making" and a "benefaction." Accept all reasonable answers.

Assessment Opportunities

Collect students' completed copies of Copymaster 1.6, *Looking for Clues*, and Copymaster 1.9, *Leonard and Testing New Ideas*. Administer the optional quiz for Lesson 1 (Copymaster 1.11, *Lesson 1 Quiz*).











A Balancing Act: Preventing Diabetes

At a Glance

Overview

Lesson 2, *Focus on Diabetes*, consists of one activity and will take approximately two class periods to complete. Students identify questions they have about diabetes and use a variety of resources to find the answers. Students create posters that communicate their new understanding about diabetes and then develop individual lists of questions they still have about the disease. Students will review these questions again in Lesson 5, *Taking the Message Home*.

Enduring Understandings

- There is more than one form of diabetes.
- Diabetes is a treatable disease, and the treatment varies with the type of diabetes.
- Diabetes can have serious short- and long-term consequences for one's health.

Teacher Background

Please consult the Overview of Diabetes section of Introductory Information.

Outcomes and Indicators of Success

By the end of this lesson, students should be able to

1. recognize why diabetes is of concern to Native Americans today.

They will demonstrate their understanding by

- analyzing a graph of the prevalence of diabetes and
- realizing that the incidence of diabetes is increasing.
- 2. describe the types of diabetes and the health consequences.

They will demonstrate their understanding by

- generating a list of questions about diabetes,
- researching answers to their questions, and
- developing a poster to explain type 2 diabetes to the school and community.

In Advance

Teacher Materials

overhead projector

transparency pens or markers

transparency copies of each of the following:

- Copymaster 2.1, Incidence of Diabetes in the United States
- Copymaster 2.2, Generating Questions about Type 2 Diabetes

1 copy of Copymaster 2.5, Scoring Rubric for Focus on Diabetes Poster

1 copy of Copymaster 2.7, Lesson 2 Quiz—Answer Key (optional)

Lesson 2: Focus on Diabetes Explore Explain



Student Materials

For each student

1 3 x 5-inch index card

- 1 manila folder (optional)
- 1 copy of Copymaster 2.4, Facts about Diabetes
- 1 copy of Copymaster 2.5, Scoring Rubric for Focus on Diabetes Poster
- 1 copy of Copymaster 2.6, Lesson 2 Quiz (optional)

For each team of 3–4 students

assorted brochures, articles, books, and other references about diabetes

- 1 poster board
- 1 set of markers
- 1 copy of Copymaster 2.3, Team Questions about Type 2 Diabetes

Preparation

Gather as many magazine articles and books about diabetes as possible. You also can provide students with access to computers and the Web so that they can do their own research.

The following sites are recommended:

- National Diabetes Information Clearinghouse (NDIC),
 - http://diabetes.niddk.nih.gov/dm/a-z.asp
- National Center for Chronic Disease Prevention and Health Promotion, http://www.cdc.gov/diabetes/index.htm

Process and Procedure

Part I

- Organize students into teams of two or three. Ask, "How many of you think there is only one type of diabetes? More than one?" A quick show of hands is appropriate here.
- Tell students that Leonard Thompson—the boy they read about in Lesson 1,
- *History in the Making*—had what is called "type 1 diabetes." Explain that there is also another type of diabetes called "type 2 diabetes."
- Ask, "Describe something that you know about these two types of diabetes. How are they similar? How are they different?"

Students may know people with diabetes and may mention insulin injections and dietary restrictions as aspects of life for people with diabetes. Accept all reasonable answers. Do not comment on students' responses if students offer ideas that do not

seem to be correct. Instead, respond with short, positive phrases such as, "That's interesting." Ask probing questions such as, "Why do you believe that?" and "What else have you heard?" When students' interest has been piqued and their thinking engaged, move on to the next step.

4. Display a transparency of page 1 of Copymaster 2.1, *Incidence of Diabetes in the United States*. Ask, "What does this graph tell us about diabetes?"

The graph indicates that the incidence of diabetes (the number of people with the disease) is increasing.

5. Display a transparency of page 2 of Copymaster 2.1. Ask, "What does this second graph tell us about diabetes?"

This graph indicates the high incidence of type 2 diabetes in the American Indian and Alaska Native populations. Help students understand that diabetes is a growing health threat in the United States—one that affects children as well as adults.

Note to Teacher: According to the Centers for Disease Control, about 176,500 people aged 20 years or younger have diabetes. This group represents 0.22 percent of all people in this age group. About 1 in every 400 to 600 children and adolescents has type 1 diabetes. Clinically based reports and regional studies suggest that type 2 diabetes is being diagnosed more frequently in children and adolescents, particularly in American Indians, African Americans, and Hispanic/Latino Americans.

6. Explain to students that 90–95 percent of people with diabetes in the United States have type 2 diabetes. Ask, "Imagine that you are going to meet a person with type 2 diabetes. What might you want to know about the disease? What questions would you ask this person in order to learn more?" Have students write their questions on a sheet of paper.

Accept several students' responses. They may ask, "How is type 1 diabetes different from type 2 diabetes?" "What causes type 2 diabetes?" "Who is most likely to develop type 2 diabetes (i.e., what are the risk factors for developing type 2 diabetes)?" They may ask, "What are the symptoms of type 2 diabetes?" "How is type 2 diabetes treated?" "What are the short- and long-term health consequences of type 2 diabetes?"

7. Display a transparency of Copymaster 2.2, *Generating Questions about Type 2 Diabetes*. Have students use the categories on the copymaster to help them clarify some of their questions and add more questions to their lists.

Write students' questions in the appropriate rows on the transparency. Ask leading questions to help students focus and refine their questions. Help students formulate appropriate questions in each of the categories listed on the transparency.



Note to Teacher: Leave the completed transparency on the overhead so that students can refer to it as they complete Steps 8–10.

8. Ask, "Where else could you get the answers to your questions?"

Students should recognize that one way to find answers to their questions would be to conduct research using various print or electronic resources about diabetes. They could also ask a health professional.

- **9.** Explain that each team will develop a poster that explains type 2 diabetes to the school.
- **10.** Distribute one copy of Copymaster 2.3, *Team Questions about Type 2 Diabetes*, to each team. Have each team choose three questions from the class's list that they think are most important to answer.

Direct students to write these questions in the three rows provided on the handout. Give teams 10 minutes to discuss the questions, think about which questions they would like to focus on for their poster, and write their choices on the handout. Circulate around the room, listening to teams' discussions, inviting students to explain their choice of questions, and providing guidance as appropriate. Help students understand that they should choose questions that would be important for many people. Help guide the design and content of their posters by answering questions or asking students to provide more information in their explanations.

11. Distribute Copymaster 2.4, Facts about Diabetes, to each student. Have students use the fact sheet to answer their questions on Copymaster 2.3, Team Questions about Type 2 Diabetes. Point out the location of other resources on diabetes that are available in the room for research. Distribute Copymaster 2.5, Scoring Rubric for Focus on Diabetes Poster, to each student.

You may wish to emphasize to students that although the resource material includes information about both type 1 and type 2 diabetes, their research and their posters will focus on type 2 diabetes.

Note to Teacher: Giving each student a copy of the fact sheet will encourage all students to be actively involved in discovering answers to their team's questions and in generating new questions. This fact sheet will also be an important resource for students as they complete Lesson 4, The Diabetes Health Care Clinic, and Lesson 5, Taking the Message Home. You may want to give each student a manila folder in which to keep his or her diabetes information. This strategy will help students remain organized and have the information available for future lessons.

12. Give teams the rest of the class period to conduct their research.

Circulate around the room, inviting discussion and helping students locate the answers to their questions.

Part II

- Have students sit with their teams. Begin class by reminding students that they started researching their questions for their posters. Ask, "Did any new questions about diabetes occur to you as you started your research?" Invite a response from each team and write any new questions on the board.
- 2. Tell students that research often raises as many questions as it answers. Challenge students to think about what else they would like to know about type 2 diabetes as they work on their posters. Explain that they will have a chance to share their new questions at the end of the lesson.
- **3.** Have students complete their research from the previous day. Distribute poster boards and markers and direct teams to begin making their posters.

Give students 30 minutes to finish their posters. To keep all students productively engaged during this time, you may want to suggest that one or two members of the team begin to make the poster while other members complete any remaining research.

- Have students display their completed posters around the classroom. Or you may want to arrange to display the students' posters in strategic locations in your school.
- 5. Distribute one 3 x 5-inch note card to each student. Direct students to think about the poster they helped create. Have students put their names on the front of the card and write the three most important new facts they learned about diabetes in this lesson.

This step of the lesson is designed to encourage each student to individually identify specific information that he or she has learned about diabetes from the lesson, and it allows each student to decide what aspects of diabetes are most important to him or her. Insist that students work independently during this phase of the lesson.

- 6. Tell students to walk around the room and study all of the other teams' posters. Ask them to look for new information about diabetes as well as information that is different from what is on their own posters.
- 7. Have students turn their cards over and write up to three questions that they still have about diabetes. Explain that these may be new questions that came up during their research or questions they still have from the class's list of questions. Tell students that the new questions, however, may not be questions that are answered by any of the posters.







This step of the lesson is designed to encourage students to study the posters carefully and also to continue to ask questions about diabetes.

8. Collect the cards. Tell students that you will give the cards back to them in Lesson 5.



Assessment Opportunities

Use the scoring rubric (Copymaster 2.5) to assess each team's poster. Scan the cards from Step 8 to assess what students have learned about diabetes from this lesson and to discover what students still do not know or understand. Administer the optional quiz for Lesson 2 (Copymaster 2.6, *Lesson 2 Quiz*).

Note to Teacher: As indicated in Step 8, students will use the cards they wrote during this lesson again in Lesson 5. Ask students to save their copies of Copymaster 2.4. These handouts will be useful in Lessons 4 and 5.




At a Glance

Overview

Lesson 3, *Health Is Life in Balance*, consists of one activity and takes two class periods to complete. Students will use the MyPyramid food guidance system from the U.S. Department of Agriculture to evaluate the food and activity choices of fictional middle school students for one school day. Students then write a letter describing the result of this evaluation and offering recommendations to other students on how to achieve a healthier balance in eating and physical activity. The letter will also explain why—with emphasis on the risk of developing diabetes—students should consider making such changes.

Enduring Understandings

- Balance is an important concept for all individuals to lead a healthy life.
- The MyPyramid food guidance system helps people learn about healthy patterns of eating and exercising.
- Even small changes in a person's lifestyle can significantly reduce the risk of developing diabetes.

Teacher Background

Please consult the Life in Balance section of Introductory Information.

Outcomes and Indicators of Success

By the end of this lesson, students should be able to

- 1. relate the idea of balance to delaying or preventing the development of type 2 diabetes.
 - They will demonstrate their ability by
 - participating in a class discussion about controllable and uncontrollable risks and
 - realizing that balance in food choices and activity level can reduce the risk of diabetes.
- **2.** describe how the MyPyramid food guidance system can help a person eat healthfully and exercise right.
 - They will demonstrate their understanding by
 - using the MyPyramid guidance system to analyze a fictional student's food and exercise diary and
 - applying the results of that analysis to provide recommendations of healthy changes to make.

In Advance

Teacher Materials

overhead projector transparency pens or markers Lesson 3: Health Is Life in Balance Explore Explain



transparency copies of each of the following:

- Copymaster 3.1, Risk Factors for Type 2 Diabetes
- Copymaster 3.2, *MyPyramid*
- Copymaster 3.4, Brian's Diary
- Copymaster 3.5, Sample MyPyramid Worksheet
- Copymaster 3.14, Guidelines for Student Letters
- Copymaster 3.15, Sample Letter

1 copy of Copymaster 3.13, *Details about the MyPyramid Guidelines for Middle School Students* 1 copy of Copymaster 3.17, *Lesson 3 Quiz—Answer Key* (optional)

Student Materials

For each student

1 copy of Copymaster 3.3, MyPyramid Food Guidance System

1 copy of Copymaster 3.4, Brian's Diary

1 copy of Copymaster 3.11, MyPyramid Worksheet

1 copy of Copymaster 3.12, *MyPyramid Equivalents*

1 copy of Copymaster 3.14, Guidelines for Student Letters

1 copy of Copymaster 3.16, Lesson 3 Quiz (optional)

For each team of 3–4 students

highlighting markers, 2 different colors

1 copy of 1 diary from Copymasters 3.6–3.10, Student Diaries:

- Copymaster 3.6, Valerie's Diary
- Copymaster 3.7, Lenore's Diary
- Copymaster 3.8, *Jeremy's Diary*
- Copymaster 3.9, *Jody's Diary*
- Copymaster 3.10, Jessica's Diary

1 copy of Copymaster 3.13, Details about the MyPyramid Guidelines for Middle School Students

Process and Procedure

Part I

1. Have students sit in their teams. Open the lesson by writing on the board, "Health is life in balance." Ask, "What do you think this sentence means?"

Students may explain that being healthy involves having different things (activities, foods, or feelings) be equal to one another, or having a variety of things in one's life. If students have difficulty applying the idea of balance to health, ask them what types of behaviors would be "balanced" in a healthful lifestyle. Accept all responses, but ask

probing questions to stimulate broad thinking. When you see that students' thinking is engaged, move on to the next step.

Display a transparency of Copymaster 3.1, *Risk Factors for Type 2 Diabetes*.
 Explain that this list shows the risk factors for developing type 2 diabetes.
 Ask, "What type of balance might be most important for you to reduce your risk of developing type 2 diabetes?"

Students should recognize that achieving a healthy balance between what they eat and how much they exercise is an important step they can take to reduce their risk. If students are not able to answer this question, you may need to remind them of what they learned in previous lessons—that a person's risk of developing type 2 diabetes depends not only on uncontrollable risk factors such as age, family background, and ethnic background, but also on controllable risk factors such as diet, weight, and exercise. These are things that we often refer to as lifestyle.

3. Explain that research has shown that people can significantly reduce their risk of developing type 2 diabetes by making good choices about what they eat and how much they exercise. Display a transparency of Copymaster 3.2, *MyPyramid*. Ask, "Does anyone know what this is?"

If students do not recognize MyPyramid, explain briefly that the pyramid can help people keep a good balance between how much they eat and how much exercise they get. Tell students that the U.S. Department of Agriculture developed this tool, and it is based on the *2005 Dietary Guidelines for Americans* (a document the government has released to help educate the public about healthful eating and exercise habits).

4. Distribute a copy of Copymaster 3.3, *MyPyramid Food Guidance System*, to each student. Use the bulleted information on the copymaster to review the major features of MyPyramid with students.

Point out the five major food groups, plus oils, and note how the graphic uses differences in the width of the bands of color to indicate the recommended proportions of each group. Also point out that the pyramid illustrates that physical exercise is an important part of each day.

Note to Teacher: Do not attempt to teach students all of the specific guidelines related to the MyPyramid food guidance system. Instead, keep the focus of the discussion on how the system can help a person eat a diet that is balanced across the different food groups, as well as achieve a good balance between how much the person eats and how much exercise he or she gets.

5. Ask, "Why might MyPyramid be a useful tool for people who want to reduce their risk of developing type 2 diabetes?"



Students should recognize that MyPyramid communicates the need for balance in both diet and activity. Maintaining healthy eating habits and activity patterns are important for reducing the risk of developing type 2 diabetes.

- 6. Tell students that each team will act as a MyPyramid mentor for a fictional middle school student. This student wants to determine if his or her diet and exercise habits are balanced.
- 7. Explain that as a mentor, each team will evaluate one student's eating and activity patterns for one day by using the guidelines provided by MyPyramid. Ask, "Why might it be helpful for the students to have someone evaluate their eating and activity patterns?"

Students may recognize that some people may not be able to evaluate their lifestyle choices accurately. Sometimes seeing one's own choices through another person's eyes will help a person understand his or her areas of strength and weakness and understand the level of balance in their lifestyles.

8. Distribute Copymaster 3.4, *Brian's Diary*, to each student and display a copy as a transparency. Explain that the handout shows Brian's food and activity diary for one school day.

You may want to have a student read Brian's diary aloud to the class.

9. As a class, have students point out what Brian ate during the day and what exercise he did.

Underline students' responses on the transparency.

10. Display a transparency of Copymaster 3.5, Sample MyPyramid Worksheet. Explain that each team will use this worksheet to evaluate their student's diet and exercise for the day. Explain that a sample worksheet has been completed for Brian. Distribute Copymaster 3.12, MyPyramid Equivalents, to each student.

Use the transparency to explain what students will look for in their student's diary. Note that when you look up "bread sticks" on Copymaster 3.12, it shows that bread sticks count as 2 grain equivalents. This information should prompt teams to put two tally marks in the "tally MyPyramid equivalents" column on Copymaster 3.11, *MyPyramid Worksheet*, in Part II.

Likewise, looking up "meat lover's pizza" reveals that this food item is valued at 3 grain, 3 meat and beans, and 1 dairy MyPyramid equivalents. Students would enter the appropriate number of tally marks in the proper boxes. Students would then look up their student's activities for the day and follow the same procedure to evaluate their student's physical activity.

Once they determine the totals for each category, students can discover whether their student met the MyPyramid goals for that category. For instance, Brian consumed 3 grain equivalents from his pizza and 2 grain equivalents from bread sticks, for a total of 5 grain equivalents. Comparing Brian's total with the total number of grain equivalents recommended for a person of his age revealed that Brian met his goal for this food group for the day, and so "met goal" in the first row of the "evaluate the total" column is checked.

Finally, explain that two statements on the worksheet ask the team to make an overall evaluation of their student's eating and exercise patterns for the day. Ask students why they think "poor" has been entered in the blank in the first statement. The discussion should reveal that "poor" was entered because Brian did not meet his goal for four out of the five food groups. Ask students why they think "fair" was entered into the blank in the second statement. The discussion should reveal that although Brian did get some moderate to vigorous physical exercise that day, he only got 20 minutes of such exercise as compared with the MyPyramid recommendations of 30 minutes.

Note to Teacher: Teams will discover that some items have no MyPyramid value. For instance, the soda that Brian drank is labeled "none" on copymaster 3.12, MyPyramid Equivalents. This is because soda does not fit into any of the MyPyramid food groups. Instead, the calories contained in this beverage count as "discretionary calories" (see Copymaster 3.13, Details about the MyPyramid Guidelines for Middle School Students). Likewise, some activities (for example, riding in a car and even skateboarding) do not have an assigned MyPyramid value. This is because these activities do not elevate the heart rate enough to qualify as moderate to vigorous physical activity.

Part II

 Give each team one student's diary from Copymasters 3.6–3.10, Student Diaries, and two different colored highlighters. Distribute one copy of Copymaster 3.11, *MyPyramid Worksheet*, to each student. Tell teams that their first task will be to read the diary and highlight all of the food the student ate and all of the physical activity the student reported. Explain that teams should use one color to mark the food and a different color for physical activity.

Give teams 10 minutes to complete this task. Having each team evaluate only one fictional student allows the activity to be completed in one class period. Having a variety of cases will also broaden the discussion later in the lesson. Circulate around the room, helping students understand how to complete the worksheet. Help students find the different types of food and activity in Copymaster 3.12, as necessary.



Students might use a yellow highlighter to highlight all of the food and drink their student consumed (such as doughnuts, soda, or candy). They might then use a green highlighter to mark all of the physical activity for the day (such as walking to school, sitting in class, or walking home again). Be sure students mark all of the food and activity, even though some of it will not count toward meeting the MyPyramid requirements. Also, help students think through any questions they have about whether the MyPyramid equivalents are appropriate values.



2. Distribute Copymaster 3.13, *Details about the MyPyramid Guidelines for Middle School Students*, to each team. Instruct teams to use the handouts and their diaries to complete Copymaster 3.11, *MyPyramid Worksheet*, for their student.

Copymaster 3.13 allows students to see the actual recommendations for ages 9–18 and to learn more about what an equivalent is. Giving students copies provides them with a valuable resource and a constant reminder to think about what they eat. If they are interested, students can also find more information about MyPyramid at http://mypyramid.gov.

You may want to remind students that although Brian had spent an hour skateboarding with friends, it did not qualify as a MyPyramid equivalent because this activity does not elevate the heart rate unless done very vigorously.

Note to Teacher: If students comment that it does not seem fair to evaluate the student's eating and exercise habits based on only one day's choices, acknowledge that this is true. It would be a good idea to do this evaluation for each day of one week. But looking at one day is a good place to start. See Step 8.



3. After teams have completed their evaluations, have students summarize the outcome. Ask, "How well did your students do in terms of balancing their food intake across the different food groups with their activity levels?"

Invite students to comment on the areas of strength and weakness that they see in the overall pattern revealed by the summary. Be sure that each team discusses their student so that the class hears a variety of outcomes.

4. Ask, "Did the students eat any foods that had no MyPyramid equivalent—foods that did not fit into any of the categories listed?"

Most students will have at least one or two items that do not fit into the food categories on the worksheet. Most of these items will be soda, candy, or other sweets.

Note to Teacher: *MyPyramid does not contain a category for fats and sweets. Instead, it has only a category for oils—fats that are liquid at room temperature such as vegetable oils used for cooking. Thus, your students will not be able to* classify many of the foods their assigned students ate (other fats, soda, candy, and most desserts) into a specific category on MyPyramid.

5. Ask, "Why do you think that MyPyramid does not have a category for these items?"

Students should be able to recognize that this omission makes it clear that such substances do not contribute to a healthful eating pattern. Ask the students to identify some healthier choices.

Note to Teacher: As noted on Copymaster 3.13, these substances make up what the developers of the pyramid call discretionary calories—calories that can be consumed if a person has not already consumed his or her total number of recommended calories for the day. The simple analysis conducted here does not require students to calculate the number of calories their assigned student has consumed. Thus, students do not have a way to evaluate whether these additional calories indicate that their student has consumed too many calories for his or her activity level. However, students should be able to see that eating too many sweets each day would not be a good lifestyle choice.

6. Ask, "Do you have any activities left unclassified on your food and activity diary—activities that did not have a MyPyramid equivalent?"

Most students will have at least one or two activities (watching television, doing homework, or going shopping) that do not fit into the physical activity category on the worksheet.

Ask, "Why do you think that MyPyramid does not have a category for these activities?"

By now, students should understand that these activities do not increase a person's heart rate; therefore, MyPyramid does not include them in the recommended 30 minutes per day of *moderate to vigorous* activity. Students should be able to recognize that other activities can be healthier choices.

8. Point out that this one-day evaluation represents a quick snapshot of the assigned student's eating and activity patterns. Ask, "How could you gain a better sense of this person's regular eating and activity patterns?"

Students should suggest that they could obtain a better estimate by tracking the student's eating and activity patterns across a longer period. Everyone will have days where they are either over or under the recommended servings of one or more food categories. People can make adjustments over time. If people eat more on one day than they need to or should, they can make sure to follow the guidelines more closely on





- subsequent days. If people eat more high-fat or high-sugar foods during one day, they can be careful to limit those foods on following days. If people eat fewer servings than the guidelines recommend during one day, on subsequent days they should make sure to eat a balanced diet that includes all food groups.
- **9.** Ask, "How can making healthy, balanced choices now help improve the quality of your lives now and in the future?"

Students may be able to list several immediate advantages of making better choices, such as increased energy and even a reduction in the number of cavities they get. They also should be able to recognize that better choices now will reduce their risk of developing chronic, long-term health problems such as type 2 diabetes.

Note to Teacher: Making better choices now will help reduce a student's risk of developing several age-related diseases, including type 2 diabetes, heart disease, and cancer. Accept all reasonable answers to this question. If students do not mention decreased risk of type 2 diabetes as a benefit of making better choices now, ask them to extend their thinking to include all that they have learned about diabetes in the previous lessons.



10. Distribute Copymaster 3.14, *Guidelines for Student Letters*, to each student and display a transparency of it. Have teams fill in the guidelines for their student.

Circulate around the room. Make sure that the students' outlines offer a clear and specific evaluation of their assigned student's eating and activity patterns and that students offer specific recommendations about how to improve those patterns. For example, simply saying that a person should "get more exercise" is not a specific recommendation. A specific recommendation would be suggesting that the person add a 30-minute walk to his or her schedule for each day.

 Display a transparency of Copymaster 3.15, Sample Letter. Explain that students will use their draft notes to write a letter to their fictional student. You may also wish to assign this letter as a homework assignment.

12. Ask students to save their copies of Copymaster 3.13 for use in Lesson 4, *The Diabetes Health Care Clinic*, and Lesson 5, *Taking the Message Home*.

The information on Copymaster 3.13 will be helpful as students work on upcoming lessons. Other handouts may also be helpful, but this copymaster especially will help them complete their tasks.

A Balancing Act: Preventing Diabetes

Assessment Opportunities

After the students complete their *MyPyramid Worksheets* (Copymaster 3.11) in Part II, Step 3, you might want to collect the worksheets and review them to assess students' level of understanding before continuing the lesson. Collect the students' letters and read them as a way to determine the level of understanding individual students have about the relationship among diet, activity level, and diabetes. Briefly address misconceptions that you find in the letters before beginning Lesson 4. You may also choose to administer the optional quiz for Lesson 3 (Copymaster 3.16, *Lesson 3 Quiz*).









At a Glance

Overview

Lesson 4, *The Diabetes Health Care Clinic*, consists of one activity and takes approximately two class periods to complete. Students role-play as health professionals in a local clinic and work in teams to review the case histories of patients referred to the clinic by local doctors. Students discuss what information and suggestions the clinic could offer these patients to help them better understand their medical situations and make future choices that are more healthful.

Enduring Understandings

- Although the cause of type 2 diabetes is unknown, certain factors increase an individual's risk of developing the disease.
- Some risk factors, such as age and family history, cannot be controlled. Other factors, such as weight and activity patterns, can be controlled.
- Controlling risk factors can reduce the likelihood that people will develop type 2 diabetes and improve the overall health and longevity of people who already have the disease.

Teacher Background

Please consult the Overview of Diabetes section of Introductory Information.

Outcomes and Indicators of Success

By the end of this lesson, students should be able to

1. describe the health professionals who work with patients to prevent or treat diabetes.

They will demonstrate their understanding by role-playing a health professional who reviews a patient's case summary.

2. explain the controllable and uncontrollable risk factors for type 2 diabetes.

They will demonstrate their understanding by analyzing a patient's case summary to find areas that can be changed to prevent type 2 diabetes.

3. describe changes people can make to reduce the risk of developing type 2 diabetes.

They will demonstrate their ability by developing a presentation that provides recommendations for healthy choices.

In Advance

Teacher Materials

1 copy of Copymaster 4.9, Lesson 4 Quiz—Answer Key (optional)

Lesson 4: The Diabetes Health Care Clinic Elaborate



Student Materials

For each student

- 1 copy of Copymaster 4.1, Diabetes Health Care Team Members
- 1 copy of Copymaster 4.7, Case Analysis Form
- 1 copy of Copymaster 4.8, Lesson 4 Quiz (optional)

For each team of 3–4 students

assorted brochures, articles, books, and other references about diabetes from Lesson 2 (optional)

1 copy of Copymaster 2.4, Facts about Diabetes, from Lesson 2

1 copy of Copymaster 3.13, *Details about the MyPyramid Guidelines for Middle School Students*, from Lesson 3 (optional; see *Preparation*)

1 copy of 1 case summary from Copymasters 4.2–4.6, *Case Summaries* (teams will analyze different case summaries):

- Copymaster 4.2, Case Summary—Josie
- Copymaster 4.3, Case Summary—Richard
- Copymaster 4.4, Case Summary—Sarah
- Copymaster 4.5, Case Summary—Chad
- Copymaster 4.6, Case Summary—Art

Preparation

You may wish to provide students with the print resources that were available in the classroom for Lesson 2, *Focus on Diabetes*, and with printed resources that describe in detail the dietary guidelines that formed the basis for the MyPyramid food guidance system. You can use Copymaster 3.13, *Details about the MyPyramid Guidelines for Middle School Students*, or find a summary of these guidelines at the MyPyramid Web site, http://www.mypyramid.gov.

Process and Procedure

Part I

- Have students sit in their teams. Tell students that today they will assume the role of a diabetes health care team member from the Diabetes Health Care Clinic. Explain that the clinic provides weekly counseling and support to
 - people who are at risk for developing diabetes and
 - people who have already developed diabetes.
- 2. Ask, "Why might it be important for health professionals to meet with people who are at risk of developing diabetes?"

Students should recognize that it is very important for people who are at risk for developing diabetes to understand the medical risk and to develop behaviors and attitudes that can help them prevent its onset. Patients may also come to the clinic for help in changing their lifestyles to reduce their risk.

3. Ask, "Why might it be important for health professionals to meet with people who currently have diabetes?"

Students should recognize that it is very important for people who currently have diabetes to understand their medical condition and to have the skills and attitudes necessary to help them manage their health wisely. Patients will also need counseling and support as they learn to manage their medical situations.

- 4. Tell students that local physicians have become concerned about how many of their patients do not seem to understand what diabetes is or what the lifestyle implications of having this disease are. These doctors have referred their patients to the Diabetes Health Care Clinic and have asked the health care team to meet with each patient.
- 5. Ask, "Why is a *team* of health professionals involved with patient care at the Diabetes Health Care Clinic? What types of professionals would be members of the team?"

Different health professionals have expertise in different health care areas, such as medicine, nutrition, exercise, and diabetes education. They often work in teams to help patients prevent diabetes or better manage and control their blood glucose levels to prevent complications from diabetes from occurring. Students may not be able to name specific health experts, which is OK. The question is to engage their thinking about the idea that diabetes prevention and care requires different types of professionals. In the next step, you will provide students with a list of health professionals.

6. Distribute Copymaster 4.1, *Diabetes Health Care Team Members*, to each student. Have each student select a health professional he or she would like to be as part of the diabetes health care team.

Give students a few minutes to scan the description of what each health professional does. The description also explains how that health professional can help patients better understand what they can do to prevent diabetes or how they can better manage their disease if they already have diabetes. Help students understand that as members of the diabetes health care team, they will recommend what information to share with each patient and help develop treatment plans for these patients. Make sure that each health professional is represented on each team.



7. Distribute one patient summary from Copymasters 4.2–4.6, *Case Summaries*, to each team. (Different teams will analyze different case summaries.) Give one copy of Copymaster 4.7, *Case Analysis Form*, to each student. Students will help the patient understand his or her medical situation and suggest how the person can develop more healthful ways of living.

Having each team evaluate only one fictional case summary allows the activity to be completed in one class period. Having a variety of cases will also broaden the discussion later in the lesson. Make sure that each team still has Copymaster 2.4, *Facts about Diabetes*. If necessary, review the information in Copymaster 2.4. Point out the topics discussed and stress that the handout contains valuable information that students will need to complete the analysis. If students do not consult this resource, they will have difficulty completing the assigned task.

8. Direct teams to read their assigned case summary. Tell students they will develop a brief presentation that the team can make to the whole class about this patient. Students should complete Copymaster 4.7, *Case Analysis Form*, to organize the information required for their presentation.

Student presentations should include the following:

- Basic information about the patient
- The patient's current medical status, including symptoms and a likely explanation for these symptoms
- Controllable and uncontrollable risk factors relevant to the patient
- Special challenges relevant to the patient's situation
- An evaluation of whether the patient seems to understand his or her medical situation
- The likely consequences if controllable risk factors are not controlled, if the patient's medical situation is left untreated, or both
- The team's recommendations about what should be discussed when a health professional meets with this person

Note to Teacher: Remind students what controllable and uncontrollable risk factors are by referring to Copymaster 2.4. Briefly, uncontrollable risk factors are factors that a person can't do anything about. Examples of uncontrollable risk factors include age, ethnicity, and family background. Controllable risk factors are factors that a person can change. Examples of controllable risk factors include eating a high-calorie diet, being obese, and being physically inactive.



9. Give teams approximately 30 minutes to complete their case analysis forms and work on their presentations.

Rotate among the teams. As necessary, help students understand the information in their assigned case summary and point students to resources that will help them answer their questions and formulate specific recommendations.

Part II

- 1. Give teams approximately 10 minutes to finish their presentations.
- 2. After teams have finished their work, reconvene the class. Explain that to help prepare for their meeting with patients, the entire diabetes health care team will meet and discuss each patient's specific situation.

Inform students that as the diabetes health care team leader, you will assess their work based on their presentations and their participation in discussing other presentations.

- **3.** Allow each team about 10 minutes to make their presentation. Encourage students to ask questions and discuss each case after it is presented.
- 4. After the last presentation, thank the teams for their participation in the meeting. Have students comment on the usefulness of the different case presentations as a way to understand the specific challenges that people face as they think about improving their lifestyles with respect to diet and exercise.

Answers will vary. Encourage students to be realistic about challenges but also to see that it is possible to accomplish important changes in one's life, especially if those changes will improve the quality and length of life. Help students understand that the close connection between diet, exercise, and diabetes offers a compelling reason for most people to do so.

Assessment Opportunities

Collect students' completed copies of Copymaster 4.7, *Case Analysis Form*, to assess their understanding of the material covered. You may also choose to administer the optional quiz for Lesson 4 (Copymaster 4.8, *Lesson 4 Quiz*).











A Balancing Act: Preventing Diabetes

Lesson 5: Taking the Message Home Evaluate

At a Glance

Overview

Lesson 5, *Taking the Message Home*, consists of one activity and will take two class periods to complete. Students, in their role as health professionals with the Diabetes Health Care Clinic, receive a letter of commendation for their work with the patients. Students are then asked to develop a presentation that one of the men they counseled can use. He needs the presentation to explain to tribal leaders how the tribe can better educate the members of the community about diabetes and how they can promote and support healthful lifestyles for people on the reservation.

Enduring Understandings

- There are ways to reverse the trend of the increasing incidence of diabetes.
- Helping people learn about diabetes and healthful lifestyles and providing better support to people as they attempt to change how they live are essential to reducing their risk of developing diabetes.

Teacher Background

Because this is the Evaluate activity, no new information is introduced.

Outcomes and Indicators of Success

By the end of this lesson, students should be able to

1. explain that individuals and communities can work together to help people achieve their health goals.

They will demonstrate their understanding by participating in a class discussion about things tribal leaders could do to promote healthful lifestyles.

2. describe several strategies that individuals can use to help reduce their risk of developing diabetes.

They will demonstrate their ability by developing a presentation that explains ways people can make healthy choices and reduce the risk of developing type 2 diabetes.

In Advance

Teacher Materials

overhead projector transparency pens or markers index cards that students wrote in Lesson 2 1 transparency copy of Copymaster 5.1, *Commendation Letter* 1 copy of Copymaster 5.3, *Scoring Rubric for Presentation to Tribal Leaders* 1 copy of Copymaster 5.5, *Lesson 5 Quiz—Answer Key* (optional)



Student Materials

For each student

copy of Copymaster 5.3, Scoring Rubric for Presentation to Tribal Leaders
 copy of Copymaster 5.4, Lesson 5 Quiz (optional)

For each team of 3–4 students

assorted brochures, articles, books, and other references about diabetes from Lesson 2 (optional)
blank transparencies
transparency pens
computers with presentation software (optional)
1 copy of Copymaster 2.4, *Facts about Diabetes*, from Lesson 2 (optional)
1 copy of Copymaster 3.13, *Details about the MyPyramid Guidelines for Middle School Students*, from Lesson 3 (optional; see *Preparation*)
1 copy of Copymaster 5.2, *Guidelines for Diabetes Presentation*

Preparation

Decide on your approach to having students complete this activity. Gather transparencies and markers for students to make transparency-based presentations. Alternatively, ensure that sufficient computers with a presentation software such as PowerPoint are available.

You may wish to provide students with Copymaster 2.4, *Facts about Diabetes*, Copymaster 3.13, *Details about the MyPyramid Guidelines for Middle School Students*, and the print resources that were available in the classroom for Lesson 2.

Process and Procedure

1. Have students sit in their teams. Display a transparency of Copymaster 5.1, *Commendation Letter.*

You may want to have a student read the letter out loud.

- 2. Ask, "Why do you think Art wants to talk to the tribal leaders about diabetes?" Students may remember from Lesson 4, *The Diabetes Health Care Clinic*, that Art has had type 2 diabetes for most of his adult life. He was very distressed to learn that his grandson might have developed the disease as well. Students should recognize that Art's concern for his grandson and his improved understanding of the serious threat that type 2 diabetes poses for Native Americans have triggered his desire to help others avoid developing diabetes.
- **3.** Ask, "What changes do you think tribal leaders can make to help reduce the incidence of diabetes in the tribe?"

Write key ideas on the board. Students may suggest that the tribe could improve the exercise facilities available to community members or organize intramural sports leagues to encourage people of all ages to participate in regular vigorous activity. The tribe might also organize a diabetes awareness fair and invite the Diabetes Health Care Clinic team to talk about the risk of developing diabetes and how to delay or prevent it. If students are unable to offer answers, suggest that they think about the kinds of lifestyle information they provided to the patients they counseled in Lesson 4.

4. Ask, "What would Art need to tell the tribal leaders so they would understand what he is concerned about?"

On the board, write key ideas from the students.

- **5.** Explain that each team's challenge is to produce an interesting, informative, and effective presentation that Art can show to the tribal leaders.
- **6.** Distribute Copymaster 5.2, *Guidelines for Diabetes Presentation*. Have students generate a list of questions that their presentation would need to answer.

Some possible questions include the following:

- "What is diabetes?"
- "What causes diabetes?"
- "Who can develop type 2 diabetes?"
- "How is the incidence of type 2 diabetes in the United States changing?"
- "What can happen to people who develop type 2 diabetes?"
- "What are some ways that type 2 diabetes can be prevented?"
- "What specific things could the tribal leaders do to encourage their community to make choices that are more healthful for themselves and their families in the future?"
- 7. Distribute Copymaster 5.3, *Scoring Rubric for Presentation to Tribal Leaders*, to each student. Give students approximately 30 minutes to complete their presentations. Tell students that they may use any of the resources in the classroom to help them.

Adjust the time as necessary depending on the specifics of the task that you have assigned the teams.

- **8.** Allow each team 10 minutes to make their presentation. Encourage students to ask questions and offer suggestions.
- **9.** Return the index cards that students submitted at the end of Lesson 2, *Focus on Diabetes*. Ask, "How has your understanding of diabetes changed across the past few days as you have studied the disease?"





Figure 1: Art giving his presentation to tribal leaders. Encourage students to discuss whether they now would list other facts about diabetes as more interesting or important than those that they listed at the end of Lesson 2. They should also discuss whether they now have answers to the questions. Allow students to share what they have



learned with the class and to point out what they still do not understand and would like to know. Ask students how they could find the answers to any questions that remain.



Assessment Opportunities

Collect the teams' completed presentations and evaluate them as a way to determine the depth and breadth of student learning during this unit. Use Copymaster 5.3, *Scoring Rubric for Presentation to Tribal Leaders*, to assess each team's presentation. You may also choose to administer the optional quiz for Lesson 5 (Copymaster 5.4, *Lesson 5 Quiz*).

A Balancing Act: Preventing Diabetes

COPYMASTERS

- Copymaster 1.1, Medical Discovery Proves Epoch-Making
- Copymaster 1.2, On the Trail of Discovery
- Copymaster 1.3, Condition Unknown
- Copymaster 1.4, Condition Unknown– Possible Answers
- Copymaster 1.5, Clue Cards
- Copymaster 1.6, Looking for Clues
- Copymaster 1.7, Looking for Clues Possible Answers
- Copymaster 1.8, The First Test of a New Idea
- Copymaster 1.9, Leonard and Testing New Ideas
- Copymaster 1.10, Leonard and Testing New Ideas-Possible Answers
- Copymaster 1.11, Lesson 1 Quiz
- Copymaster 1.12, Lesson 1 Quiz—Answer Key
- Copymaster 2.1, Incidence of Diabetes in the United States
- Copymaster 2.2, Generating Questions about Type 2 Diabetes
- Copymaster 2.3, Team Questions about Type 2 Diabetes
- Copymaster 2.4, Facts about Diabetes
- Copymaster 2.5, Scoring Rubric for Focus on Diabetes Poster
- Copymaster 2.6, Lesson 2 Quiz
- Copymaster 2.7, Lesson 2 Quiz—Answer Key
- Copymaster 3.1, Risk Factors for Type 2 Diabetes
- Copymaster 3.2, MyPyramid
- Copymaster 3.3, MyPyramid Food Guidance System
- Copymaster 3.4, Brian's Diary

Copymaster 3.5, Sample MyPyramid Worksheet Copymaster 3.6, Valerie's Diary Copymaster 3.7, Lenore's Diary Copymaster 3.8, Jeremy's Diary Copymaster 3.9, Jody's Diary Copymaster 3.10, Jessica's Diary Copymaster 3.11, MyPyramid Worksheet Copymaster 3.12, MyPyramid Equivalents Copymaster 3.13, Details about the MyPyramid Guidelines for Middle School Students Copymaster 3.14, Guidelines for Student Letters Copymaster 3.15, Sample Letter Copymaster 3.16, Lesson 3 Quiz Copymaster 3.17, Lesson 3 Quiz—Answer Key Copymaster 4.1, Diabetes Health Care Team Members Copymaster 4.2, Case Summary—Josie Copymaster 4.3, Case Summary—Richard Copymaster 4.4, Case Summary—Sarah Copymaster 4.5, Case Summary—Chad Copymaster 4.6, Case Summary—Art Copymaster 4.7, Case Analysis Form Copymaster 4.8, Lesson 4 Quiz Copymaster 4.9, Lesson 4 Quiz—Answer Key Copymaster 5.1, Commendation Letter Copymaster 5.2, Guidelines for Diabetes Presentation Copymaster 5.3, Scoring Rubric for Presentation to Tribal Leaders Copymaster 5.4, Lesson 5 Quiz

Copymaster 5.5, Lesson 5 Quiz—Answer Key





1.1

Medical Discovery Proves Epoch-Making



Source: Toronto Star Weekly, March 26, 1922.





1.2

On the Trail of Discovery

Fourteen-year-old Leonard Thompson weighed only 65 pounds when he was admitted to Toronto General Hospital. He was pale and listless. His hair was falling out, and his abdomen was swollen. He complained bitterly about always being hungry. He was too weak to do anything for himself. In fact, all he did, day after day, was lie still in his bed.

Many years later, a former secretary at the hospital remembered seeing Leonard for the first time. "I've never seen a living creature as thin as he was," she said, "except pictures of victims of famine or concentration camps." Leonard had diabetes. When he entered the hospital, he did not have long to live. "All of us knew he was doomed," said a former medical student at the hospital.

Diabetes is a disease that affects a person's ability to use the glucose (sugar) in the food that he or she eats. In a person without diabetes, the glucose that enters the bloodstream is taken into cells, where it is used to produce energy. In a person with diabetes, however, the glucose does not enter cells. Instead, it stays in the bloodstream. The result is that the person is always terribly hungry. He or she is also very tired and weak and may lose weight quickly.





Condition Unknown

Date

- 1. How would you describe Leonard's condition when he entered the hospital?
- 2. What disease did Leonard have?
- 3. What was wrong in Leonard's body?
- 4. How can you explain his terrible hunger?
- 5. How can you explain how tired and weak he was?
- 6. How can you explain how thin he was?



101



1.4

Condition Unknown—Possible Answers

1. How would you describe Leonard's condition when he entered the hospital?

Leonard appeared to be very sick. He was thin, his abdomen was swollen, his hair was falling out, and he had no energy. He complained about being hungry and was too weak to do anything but lie in bed.

2. What disease did Leonard have?

Leonard had diabetes.

3. What was wrong in Leonard's body?

The glucose in the food that Leonard ate could not enter his cells. Instead, it stayed in his bloodstream.

4. How can you explain his terrible hunger?

Despite high levels of glucose in his blood, Leonard's cells did not receive the glucose and could not use it as fuel to release energy. The result was constant hunger.

Leonard was also hungry because he was on a strict, 450 calorie per day diet. Before the discovery of insulin, most doctors tried to treat diabetes by putting patients on extremely strict diets, restricting their calorie intake to just under the level at which glucose would begin to appear in the urine. This strategy helped keep the blood glucose level under control, but it worsened many of the symptoms that the patients already were experiencing (for example, extreme hunger, tiredness, weakness, and weight loss).

5. How can you explain how tired and weak he was?

Leonard's cells were not receiving enough of the glucose they needed to provide energy for his body to function.

6. How can you explain how thin he was?

Students may have difficulty with this question. This is an opportunity to reinforce the importance of glucose as a source of energy for the body. Without glucose in the cells to provide energy, the body begins to use other molecules, such as protein and fat, to provide the energy it needs. Leonard's body was using protein from his muscles and fat to provide the energy that it should have been receiving from glucose. Leonard was not getting enough protein from food to rebuild his muscles, and so he became very thin.





1.5

Clue Cards

Autopsies on people who died of diabetes often showed a damaged pancreas.	If the pancreas is taken completely out of a dog's body, the dog develops diabetes.
The pancreas makes many different types of chemicals. Some of these chemicals travel from the pancreas through a small tube into the digestive tract.	Some chemicals made by the pancreas move straight from the pancreas into the bloodstream.
If the tube that carries chemicals from a dog's pancreas into its digestive tract is cut, then these chemicals can no longer move into the digestive tract. The dog cannot digest its food properly. However, the dog <i>does not</i> develop diabetes.	If the pancreas is cut completely out of a dog's abdomen but then grafted back under its skin, the dog cannot digest its food. However, the dog <i>does not</i> develop diabetes.



105


Looking for Clues

Name

1.6

Date

- 1. Which organ of the body seems to be involved in diabetes?
- 2. What were the two most important pieces of evidence that show this organ is involved?
- 3. What does this organ normally do in the body?
- **4.** Two experiments showed that the chemicals that move through a tube into the digestive tract are not important in diabetes. Which experiments are they?
- 5. Which type of chemical does seem to be important in diabetes? Why do you say this?
- **6.** Remember from the story about Leonard that diabetes is a disease in which glucose does not move into a person's cells. What does this clue suggest about the importance of one or both of these chemicals?
- 7. What possible treatment for diabetes did these clues suggest?
- 8. How could this idea for a treatment be tested?



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Looking for Clues—Possible Answers

1. Which organ of the body seems to be involved in diabetes?

The pancreas is involved in diabetes.

2. What were the two most important pieces of evidence that show this organ is involved?

Autopsies on the bodies of people who died from diabetes almost always showed some kind of damage to the pancreas.

When the pancreas was completely removed from a dog, the dog developed diabetes.

3. What does this organ normally do in the body?

The pancreas makes several different types of chemicals. Some of these chemicals travel from the pancreas through a small tube into the digestive tract, and others move from the pancreas directly into the bloodstream.

4. Two experiments showed that the chemicals that move through a tube into the digestive tract are not important in diabetes. Which experiments are they?

They are the experiment in which the tube leading from the pancreas to the digestive tract was cut and the experiment in which the pancreas was removed from the dog's abdomen and grafted under the skin. If the tube that carries chemicals from a dog's pancreas into its digestive tract was cut so that chemicals could no longer move into the digestive tract, the dog could not digest its food properly. However, the dog does not develop diabetes. This evidence indicates that these chemicals are not important in diabetes.

Likewise, if the pancreas is removed and then grafted under a dog's skin, the dog again has trouble digesting its food. It cannot digest its food properly because the grafted pancreas has no connection to the digestive system and the chemicals required for digestion cannot reach it. However, the dog does not develop diabetes. This suggests that the chemicals that move from the pancreas into the digestive tract are not involved in diabetes, because even though they are not getting into the dog's digestive tract, the dog does not develop diabetes.

The grafted pancreas does not reconnect itself to the digestive tract, but it does develop connections to the bloodstream. Thus, the chemicals that are normally produced by the pancreas and secreted

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directly into the blood are still present in the dog's body, even after the pancreas has been removed from its normal location in the abdomen. These chemicals include the one chemical (insulin) that is important in diabetes. This is why even when the pancreas is moved as described, the dog remains diabetes free. You may wish to explain to students that further experiments showed that if the grafted pancreas was subsequently removed from under the skin (that is, if the grafted pancreas was later removed completely), the dog would then develop diabetes, just like when the pancreas is completely removed in the first place.

5. Which type of chemical does seem to be important in diabetes? Why do you say this?

The chemicals that are secreted from the pancreas directly into the bloodstream seem to be important in diabetes.

Students should be able to see that this is the only remaining answer, if the chemicals that move into the digestive tract are not involved. To help students see the full picture, you may want to explain to them that when either the tube is cut or the pancreas is moved from its normal location, the chemicals that the pancreas normally secretes into the bloodstream are still present in the dog's body. This is why the dog does not develop diabetes. The dog only developed diabetes if the pancreas was removed completely.

- 6. Remember from the story about Leonard that diabetes is a disease in which glucose does not move into a person's cells. What does this clue suggest about the importance of one or both of these chemicals? It suggests that either all of these chemicals together, or perhaps only one of these chemicals, may help glucose get into a person's cells.
- 7. What possible treatment for diabetes did these clues suggest?

The clues suggested that if scientists could restore the missing substance to the bloodstream of a person with diabetes, perhaps glucose would be able to enter his or her cells.

8. How could this idea for a treatment be tested?

Scientists could try transplanting a healthy pancreas into a person with diabetes.

A different approach would be to make an "extract" of the substances produced by the pancreas and inject that extract into a patient's body. If the extract contained the unknown chemical that helps glucose get into a person's cells, the symptoms of diabetes might be eliminated by the injection.

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The First Test of a New Idea

In January 1922, Leonard Thompson became the first human known to be treated for diabetes by receiving regular injections of an extract made from the pancreas of a healthy cow.

Within 24 hours after the first injection, the level of glucose in Leonard's blood dropped. According to one of Leonard's doctors, Leonard quickly "became brighter, more active, looked better, and said he felt stronger."

Leonard lived for 13 more years, receiving daily injections of "pancreatic extract." He gained weight and his health got much better. The picture shows Leonard as a young man, after his release from the hospital. As long as he received regular injections of the extract, Leonard remained free from the most serious symptoms of diabetes. He died at age 27 from pneumonia.



LEONARD THOMPSON First patient to receive insulin in Toronto.

Source: Thomas Fisher Rare Books Library.





Leonard and Testing New Ideas

Date

Name			

 What hypothesis were the scientists testing when they injected the pancreas extract into Leonard Thompson?

2. What were the effects of the first injection on Leonard? What do you think was happening inside his body that brought about these changes?

3. Did injecting Leonard with the extract cure his diabetes? What evidence does the story offer for your answer?

4. The chemical in the extract that helped control Leonard's diabetes is called insulin. Does insulin cure diabetes? Can you offer any evidence for your answer?





Leonard and Testing New Ideas— Possible Answers

1. What hypothesis were the scientists testing when they injected the pancreas extract into

Leonard Thompson?

They were testing the hypothesis that the extract would help glucose get into Leonard's cells (that is, that it would help "control" the symptoms of diabetes).

2. What were the effects of the first injection on Leonard? What do you think was happening inside

his body that brought about these changes?

Leonard became "brighter" (more alert) and more active. He also looked better and said that he felt stronger. These changes happened because the glucose in Leonard's bloodstream began moving into his cells.

3. Did injecting Leonard with the extract cure his diabetes? What evidence does the story offer for

your answer?

No, injection with the extract did not cure Leonard's diabetes. The evidence for this is that he continued to receive daily injections of pancreatic extract for the rest of his life. He would not have had to receive these injections if the extract had cured his diabetes.

4. The chemical in the extract that helped control Leonard's diabetes is called insulin. Does insulin cure

diabetes? Can you offer any evidence for your answer?

No, insulin injections do not cure diabetes, even though they do help control the symptoms. This is why Leonard remained healthy only if he received regular injections. Students may also know that people with certain types of diabetes must still receive daily injections of insulin.

Today, bacteria that contain a cloned copy of the human gene for insulin make virtually all of the insulin used in the treatment of diabetes.





Lesson 1 Quiz

Name

1.11

Date

Directions: Please indicate which response you believe is the correct one.

- 1. What disease did Leonard have?
- _____a. liver failure
- _____b. heart disease
- _____c. diabetes
- _____d. ulcers

2. Which organ of the body is directly involved in this disease?

- _____a. liver
- _____b. heart
- _____c. pancreas
- _____d. stomach
- 3. Diabetes is a disease that affects how the body uses glucose.
- _____true _____false
- 4. People with diabetes that has not been treated
- _____a. are often tired and weak.
- _____b. are usually filled with energy and strength.
- _____c. cannot digest their food properly.
- _____d. have too much insulin in their bodies.
- 5. Insulin is
- _____a. a sugar made by the liver.
- _____b. a chemical made by the pancreas.
 - _____c. important for digestion of the sugar in food.
 - _____d. a protein that increases blood sugar levels.

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Lesson 1 Quiz—Answer Key

- 1. What disease did Leonard have?
- _____a. liver failure
- _____b. heart disease
- **X**_c. diabetes
- _____d. ulcers
- 2. Which organ of the body is directly involved in this disease?
- _____a. liver
- _____b. heart
- **X**_c. pancreas
- _____d. stomach
- 3. Diabetes is a disease that affects how the body uses glucose.
- X_true _____false
- 4. People with diabetes that has not been treated
- **X**____a. are often tired and weak.
- _____b. are usually filled with energy and strength.
- _____c. cannot digest their food properly.
- _____d. have too much insulin in their bodies.
- 5. Insulin is
- _____a. a sugar made by the liver.
- **____X**___b. a chemical made by the pancreas.
- ______c. important for digestion of the sugar in food.
- _____d. a protein that increases blood sugar levels.





Incidence of Diabetes in the United States



Source: Centers for Disease Control and Prevention, National Center for Health Statistics, Division of Health Interview Statistics, data from the National Health Interview Survey.

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Estimated age-adjusted total prevalence of diabetes in people aged 20 years or older, by race and ethnicity, United States, 2005



Sources: For American Indians/Alaska Natives, the estimate of total prevalence was calculated using the estimate of diagnosed diabetes from the 2003 outpatient database of the Indian Health Service and the estimate of undiagnosed diabetes from the 1999–2002 National Health and Nutrition Examination Survey (NHANES). For the other groups, 1999–2002 NHANES estimates of total prevalence (both diagnosed and undiagnosed) were projected to year 2005.

Reprinted with permission (http://diabetes.niddk.nih.gov/dm/pubs/overview/index.htm).

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Generating Questions about Type 2 Diabetes

Cause of Type 2 Diabetes

Who Develops Type 2 Diabetes

Symptoms of Type 2 Diabetes

Consequences of Type 2 Diabetes

Treatment of Type 2 Diabetes

Other Questions





Team Questions about Type 2 Diabetes

Question 1
Answer
Question 2
Answer
Question 3
Answer





Facts about Diabetes

Almost everyone knows someone who has diabetes. An estimated 20.8 million people in the United States—7 percent of the population—have diabetes, a serious, lifelong condition. Of those, 14.6 million have been diagnosed, and 6.2 million have not yet been diagnosed. In 2005, about 1.5 million people aged 20 or older were diagnosed with diabetes.

What Is Diabetes?

Diabetes is a disorder of metabolism—the way our bodies use digested food for growth and energy. Most of the food we eat is broken down into glucose, which is the form of sugar in the blood. Glucose is the main source of fuel for the body.

After digestion, glucose passes into the bloodstream, where it is used by cells for growth and energy. For glucose to get into cells, insulin must be present. Insulin is a hormone produced by the pancreas, a large gland behind the stomach (figure 1).

For most people, when we eat, the pancreas automatically produces the right amount of insulin to move glucose from the blood into our cells. In people with diabetes, however, the pancreas either produces too little or no insulin, or the cells do not respond appropriately to the insulin that is produced. Glucose builds up in the blood, overflows into the urine, and passes out of the body in the urine. As a result, the body loses its main source of fuel even though the blood contains large amounts of glucose.

What Are the Types of Diabetes?

The three main types of diabetes are

- type 1 diabetes,
- type 2 diabetes, and
- gestational diabetes.

Figure 1: Insulin is produced in the pancreas.



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Type 1 Diabetes

Type 1 diabetes is an autoimmune disease. An autoimmune disease results when the body's system for fighting infection (the immune system) turns against a part of the body. In diabetes, the immune system attacks and destroys the insulinproducing cells in the pancreas. The pancreas then produces little or no insulin. A person who has type 1 diabetes must take insulin daily to live.

At present, scientists do not know exactly what causes the body's immune system to attack the beta cells, but they believe that autoimmune, genetic, and environmental factors, possibly viruses, are involved. Type 1 diabetes accounts for about 5–10 percent of diagnosed diabetes in the United States. It develops most often in children and young adults but can appear at any age.

Type 2 Diabetes

The most common form of diabetes is type 2 diabetes. About 90–95 percent of people with diabetes have type 2. This form of diabetes most often occurs in adults and in people who are obese, have a family history of diabetes, have a previous history of gestational diabetes, are physically inactive, and are of certain ethnicities. About 80 percent of people with type 2 diabetes are overweight. Type 2 diabetes is increasingly being diagnosed in children and adolescents. When type 2 diabetes is diagnosed, the pancreas is usually producing enough insulin, but for unknown reasons the body cannot use the insulin effectively, a condition called insulin resistance. After several years, insulin production decreases. The result of this condition is the same as for type 1 diabetes—glucose builds up in the blood and the body cannot make efficient use of its main source of fuel.

The symptoms of type 2 diabetes develop gradually. Symptoms may include fatigue, frequent urination, increased thirst and hunger, weight loss, blurred vision, and slow healing of wounds or sores. It is also important to realize that some people have no symptoms.

Gestational Diabetes

Some women develop gestational diabetes late in pregnancy. Although this form of diabetes usually disappears after the birth of the baby, women who have had gestational diabetes have a 20–50 percent chance of developing type 2 diabetes within 5 to 10 years. Maintaining a reasonable body weight and being physically active may help prevent development of type 2 diabetes.

How Is Diabetes Diagnosed?

The fasting blood glucose test is the preferred test for diagnosing diabetes in children and adults,

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except for pregnant women. It is most reliable when performed in the morning. However, a diagnosis of diabetes can be made based on certain test results, which are confirmed by retesting on a different day.

What Is Pre-diabetes?

People with pre-diabetes have blood glucose levels that are higher than normal, but not high enough for a diagnosis of diabetes. This condition raises the risk of developing type 2 diabetes, heart disease, and stroke.

What Are the Scope and Impact of Diabetes?

Diabetes is widely recognized as one of the leading causes of death and disability in the United States. In 2002, it was the sixth-leading cause of death. However, diabetes is likely to be underreported as the underlying cause of death on death certificates. About 65 percent of deaths among those with diabetes are attributed to heart disease and stroke.

Diabetes is associated with long-term complications that affect almost every part of the body. The disease often leads to blindness, heart and blood vessel disease, stroke, kidney failure, amputations, and nerve damage. Uncontrolled diabetes can complicate pregnancy, and birth defects are more common in babies born to women with diabetes. In 2002, diabetes cost the United States \$132 billion. Indirect costs, including disability payments, time lost from work, and premature death, totaled \$40 billion; direct medical costs for diabetes care, including hospitalizations, medical care, and treatment supplies, totaled \$92 billion.

Who Gets Diabetes?

Diabetes is not contagious. People cannot "catch" it from each other. However, certain factors can increase the risk of developing diabetes.

Type 1 diabetes occurs equally among males and females but is more common in whites than in non-whites. Data from the World Health Organization's Multinational Project for Childhood Diabetes indicate that type 1 diabetes is rare in most African, American Indian, and Asian populations.

Type 2 diabetes is more common in adults, especially in people who are overweight. It occurs more often in African Americans, American Indians, some Asian Americans, Native Hawaiians and other Pacific Islander Americans, and Hispanics/ Latinos. On average, non-Hispanic African Americans are 1.8 times as likely to have diabetes as non-Hispanic whites of the same age. Mexican Americans are 1.7 times as likely to have diabetes as non-Hispanic whites of similar age.

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(Data are not available for estimating diabetes rates in other Hispanic/Latino groups.)

American Indians have one of the highest rates of diabetes in the world. On average, American Indians and Alaska Natives are 2.2 times as likely to have diabetes as non-Hispanic whites of similar age (figure 2). Although prevalence data for diabetes among Asian Americans and Pacific Islanders are limited, some groups, such as Native Hawaiians, Asians, and other Pacific Islanders residing in Hawaii (aged 20 or older) are more than twice as likely to have diabetes as white residents of Hawaii of similar age.

How Is Diabetes Managed?

Before the discovery of insulin in 1921, everyone with type 1 diabetes died within a few years after diagnosis. Although insulin is not considered a cure, its discovery was the first major breakthrough in diabetes treatment.

Today, healthy eating, physical activity, and taking insulin are the basic therapies for type 1 diabetes. The amount of insulin must be balanced with food intake and daily activities. Blood glucose levels must be closely monitored through frequent blood glucose checking (figure 3).

Figure 2: Prevalence data. Estimated age-adjusted total prevalence of diabetes in people aged 20 years or older.



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Healthy eating, physical activity, and blood glucose testing are the basic management tools for type 2 diabetes. In addition, many people with type 2 diabetes require oral medication, insulin, or both to control their blood glucose levels.



Figure 3: Keeping track of glucose levels. Source: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.

People with diabetes must take responsibility for their day-to-day care. Much of the daily care involves keeping blood glucose levels from going too low or too high. When blood glucose levels drop too low—a condition known as hypoglycemia—a person can become nervous, shaky, and confused. Judgment can be impaired, and if blood glucose falls too low, fainting can occur. The goal of diabetes management is to keep levels of blood glucose, blood pressure, and cholesterol as close to the normal range as safely possible.

How Can People Lower Their Risk of Diabetes?

People can do a lot to lower their risk. Some ways to do that include the following:

- Reach and maintain a reasonable body weight.
- Make wise food choices most of the time.
- Be physically active every day.
- Take prescribed medicines.

Doing these things can reduce the risk of developing type 2 diabetes. Keeping blood pressure and cholesterol on target also helps people stay healthy.

Adapted with permission from National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.

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Scoring Rubric for Focus on Diabetes Poster

Task	Excellent (3)	Satisfactory (2)	Needs Improvement (1)
Answer to the team question	The poster provides a clear and accurate answer to the team's question about type 2 diabetes.	The poster provides a satisfactory answer to the team's question about type 2 diabetes, but leaves out some important information that should be included.	The poster does not provide a satisfactory or accurate answer to the team's question. It does not indicate why the team was not able to find an accurate answer.
Additional information about type 2 diabetes	The poster accurately includes other related and important information about type 2 diabetes that students have learned so far.	The poster includes other information about diabetes that is mostly accurate.	The poster does not include any additional and related information about type 2 diabetes, or it includes information that is not accurate.
Appearance of poster	The poster's appearance is neat and inviting to the reader. The poster presents the information in a manner that is easy for the reader to understand.	The poster's appearance is fairly neat and presents the information in a manner that is satisfactory.	The poster's appearance is not neat and is difficult for the reader to follow and understand.
Evidence of teamwork	It is clear that the team members worked together to create the poster. The poster displays the work of each member of the team.	It is clear that more than one team member contributed to the poster, but there is no evidence of each team member's work.	There is little evidence to indicate that more than one person worked on the poster.




Lesson 2 Quiz

Name

2.6

Date

Directions: Please indicate which response you believe is the correct one.

1. There is only one type of diabetes.

_____true _____false

- 2. What do we know about the number of people in the United States who have been diagnosed with diabetes?
- _____a. It is increasing.
- _____b. It is decreasing.
- _____c. It is not changing.
- _____d. No one knows whether this number is changing or not.
- 3. Treatment for diabetes might include which of the following?
- _____a. receiving regular injections of insulin
- _____b. eating a healthy diet
- _____c. getting regular physical exercise
- _____d. all of these
- 4. Which of the following is true about insulin?
- _____a. A person's liver produces it.
- _____b. It causes the amount of glucose in a person's blood to rise.
- _____c. It helps glucose move into a person's cells.
- _____d. It is found in the food that we eat.
- 5. Scientists have not yet discovered a cure for diabetes.

_____true _____false





Lesson 2 Quiz—Answer Key

1. There is only one type of diabetes.

_____true _____false

- 2. What do we know about the number of people in the United States who have been diagnosed with diabetes?
- **X**_a. It is increasing.
- _____b. It is decreasing.
- _____c. It is not changing.
- _____d. No one knows whether this number is changing or not.
- 3. Treatment for diabetes might include which of the following?
- _____a. receiving regular injections of insulin
- _____b. eating a healthy diet
- _____c. getting regular physical exercise
- <u>X</u> d. all of these
- 4. Which of the following is true about insulin?
- _____a. A person's liver produces it.
- _____b. It causes the amount of glucose in a person's blood to rise.
- **____**c. It helps glucose move into a person's cells.
- _____d. It is found in the food that we eat.
- 5. Scientists have not yet discovered a cure for diabetes.
- X true _____false





Risk Factors for Type 2 Diabetes

- Family background
- Ethnic background
- Age





- Diet
- Weight
- Exercise habits



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MyPyramid





3.2

Community, Prevention, Lifestyle, Education Diabetes Education in Tribal Schools Health Is Life in Balance



MyPyramid Food Guidance System



- MyPyramid has six colored bands representing the five food groups and oils (the narrow yellow band). Eat foods from all six groups every day for good health.
- The different widths of the bands show the relative amounts of each food group you should eat every day. For instance, eat more vegetables than meat and beans.
- The wider base for each band represents foods with little or no fats or sugars added, and the narrower tip represents foods with more fats or sugars added. Eat more foods that belong at the

base of each band (for example, plain broccoli). Eat fewer foods that belong at its tip (for example, broccoli that is fried and has cheese sauce added).

- You are the person climbing the steps of the pyramid. Get at least 30 minutes of moderate to vigorous exercise on most days of the week for good health.
- Remember the following slogans to help you eat more healthfully: "Make half your grains whole.
 Vary your veggies. Focus on fruits. Get your calcium-rich foods. Go lean with protein."





Brian's Diary

Name of student: Brian Age: 16

It is only a 10-minute walk from my house to the school, but it was cold this morning, so it felt longer. I did not have breakfast before I left the house, so I bought two 50-cent doughnuts from the swim team's fund-raiser table in the school cafeteria. I was hungry again between third and fourth periods, so I bought a soda and a candy bar from a vending machine. That held me over through lunch, so I had only a bottle of lemonade and a bag of chips while my friends ate their bag lunches.

After sitting in class all afternoon, I was ready to get outside again, so I walked the 10-minute route back home from school instead of taking the afternoon shuttle bus. Later, I spent an hour skateboarding in the neighborhood with my friends before catching a ride with my older brother to a local pizza parlor, where we each ate half of a meat lover's pizza and three or four bread sticks. Of course, I had another soda before we headed back home in my brother's car.





Sample MyPyramid Worksheet

Team Evaluation: Food

Lifestyle Elements	Goal	Tally the MyPyramid Equivalents	Evaluate the Total (Check the Line That Applies)
Grains	5–9 equivalents	 	Did not meet goal Met goal Exceeded goal
Vegetables	2–3 ¹ /₂ equivalents		X Did not meet goal Met goal Exceeded goal
Fruits	1 ¹ / ₂ –2 equivalents		X Did not meet goal Met goal Exceeded goal
Dairy	3 equivalents	/	X Did not meet goal Met goal Exceeded goal
Meat and beans	5–6 ¹ /2 equivalents	///	X Did not meet goal Met goal Exceeded goal

On this day, <u>Brian</u> (student's name) ate a <u>poor</u> (good, fair, poor) balance of foods from the different food groups.

Team Evaluation: Physical Activity

Physical activity	30 minutes of moderate to vigorous activity	_ <i>20</i> minutes	X Did not meet goal Met goal Exceeded goal
-------------------	---	---------------------	--

On this day, \underline{Brian} (student's name) achieved a \underline{fair} (good, fair, poor) balance between eating and exercise.





Valerie's Diary

Name of student: Valerie Age: 13

This morning, I had my usual cup of oatmeal with 1 cup of milk before getting dressed. I had an orange while I made the 20-minute trek to school. I walked quickly with my heavy backpack. I was already hungry an hour before lunch, so I munched on some walnuts (1 ounce) that I had in a bag in my backpack while I sat in class.



For lunch, the cafeteria was serving chili (meatless). I mixed in four to five crumbled saltine crackers into my bowl to give it some texture.

I have PE at the end of the day. Today, we warmed up with 10 minutes of laps and then played volleyball. On the way back from school I walked slowly, chatting with my friends along the way. My backpack seemed even heavier than it was in the morning; that could be because I now had it filled with textbooks for next week's exams. It must weigh 10 pounds.

I did some homework before dinner. My mom cooked my favorite meal, which included 3 ounces of grilled chicken breast and a cup of steamed cabbage. I also had a baked sweet potato with butter. In the evening, I watched some television with my little sister. Before bed, I snacked on a cup of blueberries.





Lenore's Diary

Name of student: Lenore Age: 11

Today, when I went down to the kitchen, my dad had set out 2 ¹/₂ cups of cereal for my breakfast. He wanted to finish off the box because none of us kids really like it and do not eat it. We are always asking for cereals with more sugar! I added a cup of milk. Since our toaster is not working, I dipped my piece of whole wheat bread in the leftover milk at the bottom of the bowl until it got nice and soggy.

Dad packed my lunch because I was running late to catch the bus for my ride to school. I discovered he had made me a sandwich on whole wheat with tuna and mayonnaise. He also included one sliced apple with 1 tablespoon of peanut butter to spread on it. There was also a container of six or seven carrot sticks with light ranch dressing for dipping.

After a few more hours of sitting in class, I took the bus home again. No one was home, so I made myself a snack of 4 cups of popcorn. I watched some afternoon TV shows and talked on the phone with some of my friends. We like to watch the same show while we are on the phone so we can talk about it! When my parents got home, they had me do some homework. My mom then took me to my soccer coach's house. We were having a big team dinner to get ready for our game tomorrow. I had $1 \frac{1}{2}$ cups of spaghetti with meat sauce as well as two slices of garlic bread and a garden salad with French dressing.







Jeremy's Diary

Name of student: Jeremy Age: 12

I was running late for school this morning because I took the dog for a quick, 10-minute walk before school. I was only able to chug down a glass of orange juice before I had to leave for the 10-minute walk to school.

Since I had not had time for a real breakfast, I bought an egg sandwich from the cafeteria before my first period. I had forgotten to pack lunch, so I called my mom to see if she could bring me something. I have PE just before lunch, where we did 20 minutes of exercise before watching a movie. I was very hungry by the time my mom arrived. She brought me a turkey sandwich and lots of veggies. I also grabbed a carton of milk, some baked chips, and an apple from the cafeteria to round out the meal.

After school, I made the 10-minute walk home. I grabbed a low-fat yogurt with blueberries as a snack. I then made the 5-minute bike ride to my friend's house.



His mom had set out a garden salad and a plate with cucumbers, radishes, and bell peppers for us to munch on while she finished making dinner. The meal was tacos on whole-wheat tortillas with lettuce, tomato, salsa, and light cheese. I only ate one taco, but it was great.





Jody's Diary

Name of student: Jody Age: 13

I grabbed a cup of milk this morning before I got in the car with my mom and my little brother for the ride to school. It is a long drive, so I usually grab something to eat in the car. This morning I had a banana and a



granola bar. Mom gave me money before I got out of the car, so I ate in the cafeteria for lunch. They were serving turkey with gravy and mashed potatoes. I also had a garden salad and 1/2 cup of slushy canned fruit.

I was hungry again before PE, so I snacked on a string cheese between classes. In PE, we did 30 minutes of exercise.

After school, my brother and I took the bus home. We each had a 20-ounce soda and a bag of chips. Later, we snacked on some licorice. Mom called and said she would be late getting home from work, so I made a hamburger and pasta dinner. We ate that with a piece of whole wheat bread with butter for our dinner. We spent the evening watching TV and playing video games because neither of us had any homework.





Jessica's Diary

Name of student: Jessica

Age: 12

Mom stayed home from work today, so she made everyone a big breakfast. I had two scrambled eggs, four small sausage links, and three big pancakes with syrup.



She drove me to school, and I spent the morning sitting in classes. I do not have PE this semester, so I never seem to get much exercise.

For lunch, my dad stopped in for a surprise visit. He brought me my favorite—a double hamburger with cheese, large French fries, and a soda.

After my last class, Mom drove me home. I got ready to meet my friends for a movie. It was an early showing, so I skipped dinner and grabbed a bag of popcorn (about 4 cups) and a soda (20 ounces) after riding the bus to the theater. After the show, my dad picked us up, dropped my friends off at their houses, and drove me home.





MyPyramid Worksheet

Team Evaluation: Food

Lifestyle Elements	Goal	Tally the MyPyramid Equivalents	Evaluate the Total (Check the Line That Applies)
Grains	5–9 equivalents		Did not meet goal Met goal Exceeded goal
Vegetables	2–3 ¹ / ₂ equivalents		Did not meet goal Met goal Exceeded goal
Fruits	1 ¹ / ₂ –2 equivalents		Did not meet goal Met goal Exceeded goal
Dairy	3 equivalents		Did not meet goal Met goal Exceeded goal
Meat and beans	5–6 ¹ / ₂ equivalents		Did not meet goal Met goal Exceeded goal

On this day, ______ (student's name) ate a ______ (good, fair, poor) balance of foods from the different food groups.

Team Evaluation: Physical Activity

Physical activity	30 minutes of moderate to vigorous activity	minutes	Did not meet goal Met goal Exceeded goal
On this day,	(studer	nt's name) achieved a	(good, fair, poor)

balance between eating and exercise.





MyPyramid Equivalents Food

Type of Food	MyPyramid Equivalent
Apple (sliced or whole)	1 fruit
Baked sweet potato	1 vegetable
Banana	1 fruit
Blueberries (1 cup)	1 fruit
Bread sticks (3–4)	2 grain
Butter	None
Candy bar	None
Canned fruit (½ cup)	¹ / ₂ fruit
Carrot sticks (6–7 sticks)	¹ / ₂ vegetable
Cereal (2 ¹ / ₂ cups)	2 ¹ / ₂ grain
Chili (meatless,1 bowl)	2 ¹ / ₂ meat and beans
Chips	None
Cucumbers, radishes, bell peppers	1 vegetable
Double hamburger with cheese	2 grain, 1 dairy, 4 meat and beans
Doughnut	None
Egg sandwich	2 grain, 1 meat and beans
French dressing	None
French fries (large)	None
Garden salad	1 vegetable
Garlic bread (2 slices)	2 grain
Granola bar	1 grain
Grilled chicken breast (3 ounces)	3 meat and beans
Hamburger and pasta dish	1 grain, 2 meat and beans, $1/_2$ vegetable
Lemonade	None
Licorice	None



Copymaster 3.12 Grades 7–8, Science, Lesson 3 MyPyramid Equivalents



Food (continued)

None
1 dairy, ½ fruit
None
3 grain, 3 meat and beans, 1 dairy
1 dairy
2 grain
1 fruit
1 fruit
3 grain
None
None
1 grain
2 grain, 2 meat and beans
4 grain, 1 meat and beans, 1/2 vegetables
2 meat and beans
2 meat and beans
None
3 grain, 1 meat and beans, 1 vegetable
1 vegetable
1 dairy
None
2 grain, $\frac{1}{2}$ vegetable, 1 dairy
2 meat and beans
1 meat and beans
1 grain



Copymaster 3.12 Grades 7-8, Science, Lesson 3 MyPyramid Equivalents



Activity

MyPyramid Equivalent
None
20 minutes
30 minutes
30 minutes
None
5 minutes
None
10 minutes
10 minutes
30 minutes
35 minutes
10 minutes
None
None



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Details about the MyPyramid Guidelines for Middle School Students

The amount of grains, vegetables, fruits, and meats and beans you need to eat depends on age, sex, and level of physical activity.

Grains: In general, 1 slice of bread; 1 cup of ready-to-eat cereal; or ¹/₂ cup of cooked rice, cooked pasta, or cooked cereal can be considered as a 1-ounce equivalent from the grains group.

Vegetables: In general, 1 cup of raw or cooked vegetables or vegetable juice, or 2 cups of raw leafy greens can be considered as 1 cup from the vegetable group.

Fruits: In general, 1 cup of fruit or 100 percent fruit juice, or ¹/₂ cup of dried fruit can be considered as 1 cup from the fruit group.

Meat and beans: In general, 1 ounce of meat, poultry, or fish; ¹/₄ cup cooked dry beans; 1 egg; 1 tablespoon of peanut butter; or ¹/₂ ounce of nuts or seeds can be considered as a 1-ounce equivalent from the meat and beans group.

	Ages	Daily Equivalents
Girls	9–13 years old	5-ounce equivalents
Giris	14–18 years old	6-ounce equivalents
Boys	9–13 years old	6-ounce equivalents
воуѕ	14–18 years old	7-ounce equivalents

	Ages	Daily Equivalents
Girls	9–13 years old	2 cups
Giris	14–18 years old	2 ¹ / ₂ cups
Boys	9–13 years old	2 ¹ / ₂ cups
boys	14–18 years old	3 cups

	Ages	Daily Equivalents
Girls	9–13 years old	1 ¹ / ₂ cups
GIIIS	14–18 years old	1 ¹ / ₂ cups
Boys	9–13 years old	1 ¹ / ₂ cups
DOys	14–18 years old	2 cups

	Ages	Daily Equivalents
Girls	9–13 years old	5-ounce equivalents
Giris	14–18 years old	5-ounce equivalents
Boys	9–13 years old	5-ounce equivalents
воуз	14–18 years old	6-ounce equivalents

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Dairy: In general, 1 cup of milk or yogurt, 1¹/₂ ounces of natural cheese, or 2 ounces of processed cheese can be considered as 1 cup from the milk group.

	Ages	Daily Equivalents
Girls	9–13 years old	3 cups
GIIIS	14–18 years old	3 cups
Boys	9–13 years old	3 cups
DOys	14–18 years old	3 cups

Daily Equivalents

5 teaspoons

5 teaspoons

6 teaspoons

6 teaspoons

Ages

9-13 years old

14-18 years old

9-13 years old

14-18 years old

Girls

Boys

Oils: Most Americans consume enough oil in the foods they eat, such as nuts, fish, cooking oil, and salad dressings. A person's allowance for oils depends on age, sex, and level of physical activity. Daily allowances for teens are shown in the chart.

Discretionary calories: The discretionary calories allowance is based on estimated calorie needs by age and sex. Physical activity increases calorie needs, so those who are more physically active need more total calories and have a larger discretionary calorie allowance. The discretionary calorie allowance is part of the total estimated calorie needs, not in addition to the total calorie needs. The chart gives a general guide for teens.

These calories are the "extras" that can be used on luxuries like solid fats and added sugars or on more food from any food group. They are your "discretionary calories." You can use your discretionary calorie allowance to

 Eat more foods from any food group than the food guide recommends.

		Not Physically Active		Physically Active	
	Age Group	Calorie Budget	Discretionary Calories	Calorie Budget	Discretionary Calories
Girls	9–13 years old	1,600	130	1,600–2,200	130–290
	14–18 years old	1,800	195	2,000–2,400	265–360
Boys	9–13 years old	1,800	195	1,800–2,600	195–410
	14–18 years old	2,200	290	2,400–3,200	360–650






- Eat higher-calorie forms of foods—those that contain solid fats or added sugars. Examples are whole milk, cheese, sausage, biscuits, sweetened cereal, and sweetened yogurt.
- Add fats or sweeteners to foods. Examples are sauces, salad dressings, sugar, syrup, and butter.
- Eat or drink items that are mostly fats or caloric sweeteners, such as candy and soda.

Physical activity: "Physical activity" simply means moving the body in ways that use energy. Walking, gardening, briskly pushing a baby stroller, climbing the stairs, playing soccer, or dancing are all good examples of being active. For health benefits, physical activity should be moderate or vigorous and add up to at least 30 minutes a day.

Moderate physical activities include the following:

- Walking briskly (about 3¹/₂ miles per hour)
- Hiking
- Gardening and yard work
- Dancing
- Golf (walking and carrying clubs)



- Bicycling (less than 10 miles per hour)
- Weight training (general light workout)

Vigorous physical activities include the following:

Running or jogging (5 miles per hour)



- Bicycling (more than 10 miles per hour)
- Swimming (freestyle laps)
- Aerobics
- Walking very fast (4¹/₂ miles per hour)
- Heavy yard work, such as chopping wood
- Weight lifting (vigorous effort)
- Basketball (competitive)

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At a minimum, do *moderately* intense activity for 30 minutes most days, or preferably every day. This is in addition to your usual daily activities. Increasing the intensity or the amount of time you engage in an activity can have additional health benefits and may be needed to control body weight.



About 60 minutes a day of moderate physical activity can help prevent weight gain. To lose weight, exercise for at least 60–90 minutes a day. At the same time, calorie needs should not be exceeded. Children and teenagers should be physically active for at least 60 minutes every day, or most days.

While 30 minutes a day of moderately intense activities provides health benefits, being active for longer or doing more vigorous activities can provide even greater health benefits. They also use up more calories per hour. No matter what activity you choose, even exercising for just 10–15 minutes two to three times a day can be a very healthful choice. Even 10-minute bouts of activity count toward your total.

Adapted from MyPyramid.gov.

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Guidelines for Student Letters

Directions: Write a polite, informative letter to your assigned student. Be sure to do each of the following.

1. Briefly evaluate the strengths and weaknesses of his or her food and activity choices.

2. Offer at least three specific recommendations for how he or she could improve his or her lifestyle choices to bring about a better balance in diet and activity patterns.

3. Provide at least two reasons for doing so.





Sample Letter

Dear Brian,

We enjoyed analyzing the diet and exercise diary that you sent us. We hope our comments are helpful to you.

You did a great job meeting the MyPyramid recommendations for the grains food group. However, you might want to consider making some changes to meet the recommended amounts for the other four food groups. Also, be sure not to exceed the recommended amounts.

It is terrific that you spent 20 minutes walking to school and back. However, MyPyramid recommends that you get at least 30 minutes of moderate to vigorous exercise on most days.

To bring your eating and activity habits into better balance, we recommend that you continue to eat 5 ounces of grains every day. In addition, you should

- eat more vegetables, fruits, milk, and meat and beans every day;
- reduce the amount of fat- and sugar-containing foods (for instance, doughuts, soda, and candy bars) that you eat; and
- get a little more exercise every day (for instance, you might want to ride your bike for a half hour every day or join a sports team at your school).

Keeping a better balance in the foods you eat and how much exercise you get each day will help you control your weight. It will also help you lower your risk for developing dangerous diseases like type 2 diabetes.

Sincerely,

Team members' names





Lesson 3 Quiz

Name

3.16

Date

Directions: Please indicate which response you believe is the correct one.

If your mother or father has type 2 diabetes, then you can be sure that you will develop it, too.
 ______true _____false

- 2. The MyPyramid food guide system emphasizes the importance of balancing what we eat with
- _____a. how much soda we drink.
- _____b. how much exercise we get.
- _____c. our age.
- _____d. our risk of developing type 2 diabetes.

3. Most teenagers probably do which of the following?

- _____a. eat too many foods that have a lot of sugar and fat
- _____b. eat more than the recommended amounts of fruits and vegetables each day
- _____c. get more than the recommended amount of daily exercise
- _____d. all of the above
- 4. How does the expression, "Health is life in balance" best relate to type 2 diabetes?
- _____a. It doesn't relate.
- _____b. The number of people with type 1 diabetes is balanced with the number of people with type 2 diabetes.
- _____c. People with diabetes need to balance the different kinds of exercise they get.
- ______d. A person may be able to avoid developing type 2 diabetes by keeping his or her diet and exercise in good balance.
- Making good eating and exercise choices today can help improve a person's health in the future.
 ______true _____false





Lesson 3 Quiz—Answer Key

- If your mother or father has type 2 diabetes, then you can be sure that you will develop it, too.
 _____true ___X__false
- The MyPyramid food guide system emphasizes the importance of balancing what we eat with ______a. how much soda we drink.
- **X**____b. how much exercise we get.
- _____c. our age.
- _____d. our risk of developing type 2 diabetes.
- 3. Most teenagers probably do which of the following?
- **____**a. eat too many foods that have a lot of sugar and fat
- _____b. eat more than the recommended amounts of fruits and vegetables each day
- ______c. get more than the recommended amount of daily exercise
- _____d. all of the above
- 4. How does the expression, "Health is life in balance" best relate to type 2 diabetes?
- _____a. It doesn't relate.
 - _____b. The number of people with type 1 diabetes is balanced with the number of people with type 2 diabetes.
 - _____c. People with diabetes need to balance the different kinds of exercise they get.
- **X** d. A person may be able to avoid developing type 2 diabetes by keeping his or her diet and exercise in good balance.





Diabetes Health Care Team Members

A diabetes educator may also be a nurse, dietitian, pharmacist, doctor, exercise physiologist, podiatrist, or a social worker. Diabetes educators specialize in the care and education of people with diabetes. A diabetes educator can help patients understand what diabetes is, understand the benefits of managing their diabetes properly, give themselves shots, and measure their blood glucose levels. The diabetes educator may also help teach patients' families about diabetes and about how to help patients manage their disease. These health professionals obtain additional training in the diagnosis, treatment, and management of diabetes. This allows them to take a test to become a certified diabetes educator.

An **exercise physiologist** is a person who helps patients develop and stick with an exercise plan. This person also works with the patients' medical doctor to help the patients exercise safely. Developing and sticking with an exercise plan is important because regular exercise can help lower a person's blood glucose level, help a person's body better use insulin, and reduce stress. An **ophthalmologist** is a medical doctor who specializes in detecting and treating eye diseases, including those caused by diabetes. It is important that patients with diabetes see this doctor at least once a year because diabetes can affect the blood vessels in the eyes, causing vision loss and even blindness. Fortunately, many of these problems can be safely treated when they are detected early enough. Ophthalmologists make sure that people with diabetes understand how important it is that they get their eyes checked regularly.

A **pharmacist** is a person with extensive education and experience in the preparation and dispensing of medications. This person can help patients understand how to take their medications. The pharmacist can also work with the patients' physician to solve any problems with the patients' medications. Pharmacists can answer questions that the patients may have about diabetes products like glucose measuring devices and about procedures such as blood glucose testing.

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A **physician** is a medical doctor who is responsible for the overall medical management of patients. This includes helping patients make lifestyle choices that may prevent diabetes and diagnosing the type of diabetes patients have. This also includes ordering blood work to check glucose levels, prescribing the medication patients need, and making referrals to other health providers.

A **podiatrist** is a specialist trained to treat foot problems, such as those that sometimes develop in patients with diabetes. This person helps patients understand how to care for their feet and advises patients about appropriate shoes to wear. This person also examines patients' feet regularly to detect any problems and provides treatment for calluses, sores, or ulcers that the patients may develop. The information and treatment that a podiatrist gives is important because amputations related to diabetes are preventable if patients receive proper care.

A **registered dietitian** is a person trained to help patients develop a healthy diet or alter their current diet to lose weight or maintain a healthy weight. A dietitian can help patients learn what foods affect their blood glucose levels, how to read food labels, and how to plan healthful meals.

A **registered nurse** is a person with a nursing degree who can help patients in a variety of ways. A registered nurse can help people with diabetes learn to take care of themselves (diabetes self-care). Specifically, a nurse may help patients learn how to follow a diet, take medicines, and manage days when they do not feel well.

A **social worker** is a person trained to help patients get the care they need, such as home health care, food, and medical assistance. The social worker can also help patients deal with the emotional stress of having diabetes. Social workers provide family support, and they can help patients deal with any issues that may arise related to their job.

A **traditional healer** is a person who specializes in traditional Native American medicine who can complement the diabetes team in the management of diabetes.

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Case Summary—Josie

Josie is a 12-year-old Native American girl whose mother took her to the doctor because she has continued to gain weight even though she is not getting any taller. Josie attends the local middle school and lives at home with her mother, father, and two younger brothers. Her father works for the tribal roads department, and her mother works as a secretary at the local Indian Health Service clinic. Her father has type 2 diabetes. Her parents get home by about 6:00 p.m. every weekday evening. From the time she gets home from school until the time her parents get home, Josie usually watches TV with her brothers. Josie does not play any sports.

Josie did not want to see the doctor, but her mother insisted. Josie agreed to let the nurse measure her weight and height, but she refused to let the nurse draw blood for a blood test. The nurse noted on Josie's chart that her weight is approximately 35 percent above normal for her height. Josie explained that she feels like she gains weight no matter what she eats and that she does not think the doctor can do anything about it. When the nurse asked Josie about her eating habits, she explained that she never eats breakfast, she rarely eats meat, and she eats only a few fruits and vegetables each week.

The doctor explained to Josie that he would like to do some tests to determine if Josie has diabetes. He suggested that Josie talk with a health professional at the Diabetes Health Care Clinic about her weight and about diabetes. Her physician hopes that after she talks with the health professional, Josie will make another appointment and will agree to undergo a thorough examination and appropriate testing to determine her actual medical condition.





Case Summary—Richard

Richard is a 45-year-old Native American male construction worker who went to the doctor because of recent back pain. He admitted to the doctor that he has not had a physical or seen a doctor for several years. He has not been feeling well for the past six months. He complained of being tired, having increased thirst at times, and having blurry vision.

Richard is 100 pounds overweight. His mother and brother have type 2 diabetes. His mother and brother both take oral medications to treat their diabetes. Richard does not want to take any medication if he does not have to. He also does not like to exercise. When he gets home from work, he likes to watch TV. His favorite foods include pizza, nachos, hot dogs, potato chips, and soda. His wife mostly prepares fried foods, and they like to eat out whenever they can. He admitted that he loves food and loves to eat.

The doctor received the results of Richard's blood work. It showed that his blood sugar was elevated. The doctor told Richard that he has type 2 diabetes. He will need to take oral medication and test his blood sugar regularly. The doctor explained that he will need to make some lifestyle changes and requested that he see a health professional at the Diabetes Health Care Clinic to help manage his disease.





Case Summary—Sarah

Sarah is a 55-year-old Native American female with type 2 diabetes who works as a secretary. She has had diabetes for 15 years and complained of her feet burning all the time. Her vision is poor and she has noticed a change in the last year. Her kidney function is declining, and she was told that if she does not get her blood sugar under control she may lose her eyesight and kidney function.

Sarah lives alone most of the time. She takes care of her grandchildren, and they will stay with her over the weekend. She admitted that she does not check her blood sugar and in fact does not know where her machine is. She also admitted that she eats whatever she wants, and she likes to eat what her grandchildren are eating—foods such as potato chips, soda, cookies, and other junk food. Sarah likes to walk but because her feet hurt all the time, she seldom walks anymore.

Sarah wants to make changes to improve her blood sugar level but she does not know where to start. She knows she needs to take her medication regularly. Her doctor referred her to a health professional at the Diabetes Health Care Clinic to help her manage her diabetes.





Case Summary—Chad

Chad is a quiet, overweight, 11-year-old Native American boy who has been diagnosed with type 2 diabetes. Chad is supposed to check his blood sugar before each meal and bedtime and write the results in a logbook. He should start on medication and work on improving his diet and increasing his physical activity. He should return to his physician in one month for a follow-up visit. His physician is also concerned about his blood pressure.

Chad has a strong family history of diabetes. Both of his parents have type 2 diabetes. He does not want to test his blood sugar because he hates needles and is afraid of blood. At this time, both parents' diabetes is not well controlled.

Chad likes to eat sugary cereals for breakfast. He eats lunch at school and snacks on popcorn, chips, sandwiches, and ice cream after school. He only drinks diet soda because that is all that his parents buy. He likes sports but is afraid to participate because kids tease him about his weight. Chad's teachers report that he is doing poorly in school and has trouble staying awake in class.

Chad has been referred to a health professional to help him manage his diabetes.





Case Summary—Art

Art is a 68-year-old Native American male with type 2 diabetes. He has had diabetes for over 30 years and knows how the disease can affect a person's life. His diabetes is well controlled, and he suffers from no complications. Art takes his health very seriously. He checks his blood sugar daily, eats a healthy diet, and walks five miles every day.

Art is worried about his 12-year-old grandson John, who recently has gained some weight and complains of being tired all the time. John loves to play video games and eat junk food. He doesn't enjoy playing basketball with his cousins. He also loves to read and play on the computer. When John gets home from school, he plays video games and snacks on chips and soda. He skips breakfast and eats lunch at school. At school, John was weighed and had his height measured. He is overweight for his height and age. He participates in gym class five days a week. John has two brothers who are overweight, but who are very active physically. John's mother tries to prepare healthful dinners, but she does not get home from work until 6:00 pm, and they eat dinner late. John has expressed some interest in cooking.

Art thinks that John's weight gain, family history of diabetes, and complaint that he is tired all the time means that John might have type 2 diabetes.





Case Analysis Form

Part I: Patient Profile

Directions: Use the information available in the case summary to complete the patient profile. If certain information is not available, write "unknown" in the space provided.

Name of patient	Age	Occupation
Reason for seeing doctor		
Current medical status (including symptoms)		
Uncontrollable risk factors for diabetes		
Controllable risk factors for diabetes		
Special challenges for the patient		

Part II: Team Evaluation of Patient's Medical Situation

Directions: Think about the information provided in the case summary and then answer the following questions. If a specific question does not apply to the case you are analyzing, write "does not apply" in the space provided.

1. Does this person already have diabetes or is he or she at risk of developing it? Explain.



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- 4.7
- 2. Does the patient seem to understand what diabetes is and what type of diabetes he or she has or might be at risk of developing? Explain.

3. Does the patient seem to understand how the treatment doctors have recommended relates to his or her diabetes? Explain.

4. What is this person doing that might help improve his or her medical situation? Explain.

5. What is this person doing that can harm his or her medical situation? Explain.

6. What is likely to happen to this person's medical condition if he or she begins to make better lifestyle choices? Explain.

A

Community, Prevention, Lifestyle, Education Diabetes Education in Tribal Schools Health Is Life in Balance

Copymaster 4.7 Grades 7–8, Science, Lesson 4 Case Analysis Form

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- 4.7
- **7.** What is likely to happen to this person's medical condition if he or she continues to make or begins to make bad lifestyle choices? Explain.

Part III: Team Recommendations

1. What do you recommend that the diabetes health care team explain to the patient about his or her specific medical condition (for example, about diabetes, about his or her symptoms, or about his or her treatment)?

2. What do you recommend that the diabetes health care team explain to the patient about his or her lifestyle in relation to diabetes, now and in the future?

3. What specific suggestions do you recommend that the diabetes health care team offer the patient about how to manage his or her medical condition, how to avoid developing diabetes, or both?

6

Community, Prevention, Lifestyle, Education Diabetes Education in Tribal Schools Health Is Life in Balance **Copymaster 4.7** Grades 7–8, Science, Lesson 4 Case Analysis Form

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Lesson 4 Quiz

4.8

Name

Date

Directions: Please indicate which response you believe is the correct one.

- 1. What is a risk factor for a disease?
- _____a. something that affects how likely you are to get the disease
- _____b. something that prevents you from getting the disease
- _____c. something that doctors use to treat you for a disease
- _____d. something you cannot ever control
- 2. An example of a controllable risk factor for type 2 diabetes is
- _____a. a person's family background.
- _____b. a person's weight.
- _____c. a person's sex.
- _____d. a person's age.
- 3. An example of an uncontrollable risk factor for type 2 diabetes is
- _____a. how much soda a person drinks.
- _____b. how much exercise a person gets.
- _____c. a person's family background.
- _____d. whether or not he or she has diabetes.
- 4. A symptom of diabetes might be which of the following?
- _____a. feeling very energetic and well rested
- _____b. pain in a person's chest
- _____c. often being very thirsty
- _____d. all of these
- 5. Which of the following health professionals might be part of a diabetes care team?
- _____a. physician
- _____b. diabetes educator
- _____c. pharmacist
- _____d. all of these





Lesson 4 Quiz—Answer Key

- **1.** What is a risk factor for a disease?
- **____**a. something that affects how likely you are to get the disease
- _____b. something that prevents you from getting the disease
- _____c. something that doctors use to treat you for a disease
- _____d. something you cannot ever control
- 2. An example of a controllable risk factor for type 2 diabetes is
 - _____a. a person's family background.
- **X**____b. a person's weight.
- _____c. a person's sex.
- _____d. a person's age.
- 3. An example of an uncontrollable risk factor for type 2 diabetes is
- _____a. how much soda a person drinks.
- _____b. how much exercise a person gets.
- _____c. a person's family background.
 - _____d. whether or not he or she has diabetes.
- 4. A symptom of diabetes might be which of the following?
 - _____a. feeling very energetic and well rested
- _____b. pain in a person's chest
- **X**_____c. often being very thirsty
- _____d. all of these
- 5. Which of the following health professionals might be part of a diabetes care team?
- _____a. physician
- _____b. diabetes educator
- _____c. pharmacist
- **X**____d. all of these




Commendation Letter

Dear Diabetes Health Professionals,

I want to thank and commend you for the excellent work you did with the patients I referred to the Diabetes Health Care Clinic. They all learned a great deal about diabetes. They also appreciated the many useful suggestions you made about what they can do every day to improve their health. The information and suggestions that you provided will help them make choices that are more healthful for themselves and their families in the future.

I have one more favor to ask of you. One of the patients, Art, is very concerned about the increasing number of people on the reservation who are overweight and who have diabetes. He has scheduled a meeting with tribal leaders to discuss what the community can do to help people live lives that are more healthful. Art is not sure that he will be able to present the problem clearly. He is also not sure what the community can do to encourage people to adopt healthful patterns of eating and exercising. Because you are the experts, Art would like your help.

I would like to request that you put together a presentation that Art could show at his meeting with tribal leaders. Please develop an outline of the contents for Art's talk and provide the basic information and ideas that will form the body of the talk.

Thank you for your help with Art's talk and for all that you do to promote healthful living in our community.

Sincerely,

Deana Rides at the Wind, MD



Community, Prevention, Lifestyle, Education Diabetes Education in Tribal Schools Health Is Life in Balance **Copymaster 5.1** Grades 7–8, Science, Lesson 5 Commendation Letter



Guidelines for Diabetes Presentation

Directions: Develop questions that your presentation should answer.





Scoring Rubric for Presentation to Tribal Leaders

Task	Excellent (3)	Satisfactory (2)	Needs Improvement (1)
Relevance of the presentation	The presentation is relevant and addresses the concern Art has for his grandson and the tribe.	The presentation is somewhat relevant and satisfactorily addresses the concern Art has for his grandson and other members of the tribe.	The presentation is not very relevant and does not satisfactorily address Art's concern for his grandson and the tribe.
Accuracy of the presentation	The presentation accurately describes the risks and challenges for the tribe with respect to type 2 diabetes.	The presentation fairly accurately describes the risk and challenges for the tribe with respect to type 2 diabetes.	The presentation does not describe the risk and challenges for the tribe with respect to type 2 diabetes.
Effectiveness of the presentation	The presentation is effective in suggesting ways the tribe can help reduce the risk for type 2 diabetes within the tribe. The presentation keeps the sustained interest of the audience.	The presentation is somewhat effective in suggesting a few ways the tribe can reduce the risk of developing type 2 diabetes within the tribe. The presentation is satisfactory in keeping the interest of the audience.	The presentation does not effectively suggest ways the tribe might help reduce the risk of tribe members developing type 2 diabetes. The presentation does not keep the interest of the audience.
Evidence of teamwork	It is clear that the team members worked together to develop the presentation. The presentation includes the work of each member of the team.	It is clear that more that one team member contributed to the presentation, but there is no evidence of each team member's work.	There is little evidence to indicate that more than one person worked on the presentation.





Lesson 5 Quiz

Date

Name

Directions: Please indicate which response you believe is the correct one.

- Diabetes is diagnosed in all families and in people of all ethnic backgrounds at about the same rate.
 ______true _____false
- 2. It is important to help people learn about diabetes because
- ______a. the incidence of diabetes is increasing in the United States.
- _____b. diabetes can lead to serious consequences like blindness and amputations.
- _____c. knowledge about diabetes can help people make healthy choices about how they live.
- _____d. all of these.
- **3.** Imagine that you want to help a person reduce his or her risk of developing diabetes. Which of the following would you suggest he or she do?
- _____a. eat as many sweets as he or she wants
- _____b. never exercise
- _____c. balance how much and what they eat with how much exercise they get
- _____d. become obese
- **4.** Communities can help people reduce their risk of developing type 2 diabetes by helping educate people about the disease.

_____true _____false

- 5. If you want to avoid developing type 2 diabetes, what can you do?
- _____a. get regular exercise
- _____b. maintain a healthy weight
- _____c. eat a well-balanced diet
- _____d. all of these





Lesson 5 Quiz—Answer Key

- Diabetes is diagnosed in all families and in people of all ethnic backgrounds at about the same rate.
 _____true ___X__false
- 2. It is important to help people learn about diabetes because
- ______a. the incidence of diabetes is increasing in the United States.
- _____b. diabetes can lead to serious consequences like blindness and amputations.
- ______c. knowledge about diabetes can help people make healthy choices about how they live.
- <u>X</u> d. all of these.
- **3.** Imagine that you want to help a person reduce his or her risk of developing diabetes. Which of the following would you suggest he or she do?
- _____a. eat as many sweets as he or she wants
- _____b. never exercise
- **X**____c. balance how much and what they eat with how much exercise they get
- _____d. become obese
- **4.** Communities can help people reduce their risk of developing type 2 diabetes by helping educate people about the disease.

X_true _____false

- 5. If you want to avoid developing type 2 diabetes, what can you do?
- _____a. get regular exercise
- _____b. maintain a healthy weight
- _____c. eat a well-balanced diet
- **X**____d. all of these



References

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