Overview

The increase in type 2 diabetes nationally and globally gives meaningful context for learning about nutrition, health, and the environmental and genetic contributions to this challenging disease.

In this unit, students are exposed to the complex, real-world problem of the rapid increase in diagnosed cases of type 2 diabetes across the United States in the past 20 years. Students begin by considering the genetic and environmental contributions to several complex health conditions and expand the term "environment" to include factors such as access to resources, pressures impacting personal choice, the emotional/social environment, as well as the physical environment. Students learn where glucose is found in the foods and drinks we consume, how blood glucose levels are maintained, and how the failure of these mechanisms can result in type 2 diabetes. Students then analyze labels for carbohydrates and other nutrients and determine the durations of physical activity required for balancing calories consumed and calories burned. Throughout the unit, prevention and treatment are emphasized as students learn how good nutrition, exercise, personal choice, public health policies and community engagement can contribute to positive health outcomes.

Enduring Understandings

- Most traits are determined by a combination of genetic and environmental factors, including complex diseases like type 2 diabetes.
- Type 2 diabetes is a growing concern and occurs frequently.
- Type 2 diabetes is a complex condition that is heavily influenced by environmental factors such as access to resources, personal choice, product marketing, public policy, socio-economic status, and stress.
- Blood glucose levels are regulated to stay within a healthy range. Type 2 diabetes is the result of chronic high blood glucose levels over time as regulation of blood glucose levels fail.
- Glucose, the major energy source for all cells, is released primarily through digestion of carbohydrates. Food choices impact blood glucose levels.
- Type 2 diabetes is a serious condition with negative health consequences if left untreated.
- Type 2 diabetes can be prevented: factors contributing to a person's risk include good nutrition and exercise.
- Students can make a meaningful contribution to the prevention of type 2 diabetes.

Companion Unit

The Enduring Understandings for this curriculum also guide a 5-lesson unit developed for high school biology courses ***Biology, Homeostasis, and Type 2 Diabetes*** which can be found at https://gsoutreach.gs.washington.edu/

Overview

Target Level	High school health courses, Family and Consumer Science classes
Health Standards	This curriculum is tied to the National Health Standards and the Washington State Health Standards. In using the complete 5 lesson curriculum and assessment piece, teachers will be connecting to every general National Health Standard and every Nutrition and Wellness standard for Washington State, as shown on the following tables.
Slide Set	The unit is built with an accompanying slide set. The Essential Question is posed on the first slide for each lesson. These slides could be used as entrance activities, in which students would respond to the question(s) posed on the slide in a variety of ways, as directed by the teacher. Suggested strategies include a think-pair-share, a brief class discussion, or an individual writing exercise.
Timing	This 5-lesson unit plus assessment will take between 7 and 15 classroom days.
The 5 E Model	The unit is designed around the 5E Learning Cycle Model developed by the Biological Sciences Curriculum Study. The 5E model provides a scaffold for guiding and assessing student inquiry and learning through the following stages: Engage; Explore; Explain; Elaborate; and Evaluate.
Assessment	Each lesson provides opportunities to assess student learning through opening and closing activities and questions. In addition, students reflect on their own health goals throughout the curriculum. As a summative assessment, students create nutritional eating plans for themselves and/or people with type 2 diabetes. Students are also introduced to projects that set the stage for leadership opportunities, in which students could implement direct, meaningful, and relevant contributions towards combating diabetes within their community. A test that can be used as a pre/post test or a summative assessment is also available as a Google Form.

Connections to Health Education Core Idea and Standards
This table provides an overview of the standard topics incorporated into each lesson. Detailed information about the specific outcomes and codes addressed in each lesson can be found on the first page of that lesson.

Washington State Health Core Ideas and Topics	L1	L2	L3	L4	L5	L6
Nutrition						
1. Food Groups and Nutrients		●	●	●	●	
2. Beverages	●			●	●	
3. Label Literacy				●	●	
4. Caloric Intake and Expenditure				●	●	●
5. Disease Prevention	●	●	●		●	
6. Nutritional Planning				●		●
Wellness						
1. Dimensions of Health	●	●			●	●
2. Disease Prevention	●	●	●	●	●	●
3. Analyzing Influences	●	●	●			●
4. Access Valid Information		●		●	●	
5. Communication	●		●			●
6. Decision-Making			●	●	●	●
7. Goal-Setting	●	●			●	●

National Health Standards	L1	L2	L3	L4	L5	L6
Standard 1: Students will comprehend concepts related to health promotion and disease prevention to enhance health.	●	●	●	●	●	●
Standard 2: Students will analyze the influence of family, peers, culture, media, technology, and other factors on health behaviors.	●	●		●	●	●
Standard 3: Students will demonstrate the ability to access valid information and products and services to enhance health.				●	●	
Standard 4: Students will demonstrate the ability to use interpersonal communication skills to enhance health and avoid or reduce health risks.	●		●			●
Standard 5: Students will demonstrate the ability to use decision-making skills to enhance health.	●	●		●	●	●
Standard 6: Students will demonstrate the ability to use goal-setting skills to enhance health.	●	●				●
Standard 7: Students will demonstrate the ability to practice health-enhancing behaviors and avoid or reduce health risks.	●		●	●	●	●
Standard 8: Students will demonstrate the ability to advocate for personal, family, and community health.		●				●

Lesson	Description	Activities
Lesson 1 Genes and Environment	Students explore unit themes through a Silent Chalk Talk conversation. Students then see how diabetes and obesity have increased dramatically in the United States over the last two decades by watching a slide set from the Center for Disease Control. Students consider how the environment has changed during this time.	● Silent Chalk Talk ● CDC slide set illustrating the dramatic increase in t2d ● *The Bigger Picture* video ● SMART goal creation
Lesson 2 Our Environment: Access and Choice	Students learn how type 2 diabetes is influenced by our environments and assess their own environmental risk factors for type 2 diabetes. Students learn how the change in environment for one population has impacted their health over time.	● Pencil/paper risk tally to determine environmental risks ● *Diabetes Among Native Americans* video clip
Lesson 3 Glucose: From Fuel to Toxin	Students model glucose as the building block of most carbohydrates and learn how blood glucose balance is maintained (or not) when type 2 diabetes develops. Students then create analogies to explain the roles of glucose, insulin, and the pancreas.	● Paper cut-out model of carbohydrates, fiber, glucose ● Blood glucose traffic analogy ● Student-made analogies
Lesson 4 What Are We Eating?	Students examine food and drink labels and calculate the percentage of proteins, fats, and carbohydrates contained in different foods and drinks, and visually illustrate liquid sugars in a beverage. Students consider changes in diet over time and figure out how different types of food impact blood glucose levels.	● Food label calculations to determine calories from fat, carbohydrates, and protein ● Visual demonstration of sugar in drinks
Lesson 5 An Ounce of Prevention	Students learn ways in which exercise can aid in treating and preventing type 2 diabetes and determine durations of physical activity required for balancing calories consumed and calories burned.	● Fun size candy bar demonstration ● Use of Activity Calculator
Assessment	Students make final contributions to the Chalk Talk posters, identify themes for the unit, and assess the SMART goals they set for themselves. Lastly, students consider how they might make a meaningful contribution to the prevention of type 2 diabetes.	● Silent Chalk Talk final visit and debrief ● SMART goal assessment

What is diabetes? Diabetes is a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action, or both. Diabetes can lead to serious complications and premature death, but people with diabetes, working together with their support network and their health care providers, can take steps to control the disease and lower the risk of complications.

Type 1 diabetes Type 1 diabetes was previously called insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes. Type 1 diabetes develops when the body's immune system destroys pancreatic beta cells, the only cells in the body that make the hormone insulin that regulates blood glucose. To survive, people with type 1 diabetes must have insulin delivered by injection or a pump. This form of diabetes usually strikes children and young adults, although disease onset can occur at any age. In adults, type 1 diabetes accounts for approximately 5% of all diagnosed cases of diabetes. Risk factors for type 1 diabetes may be autoimmune, genetic, or environmental. There is no known way to prevent type 1 diabetes.

Type 2 diabetes Type 2 diabetes was previously called non–insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. In adults, type 2 diabetes accounts for about 90% to 95% of all diagnosed cases of diabetes. It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly. As the need for insulin rises, the pancreas gradually loses its ability to produce it. Type 2 diabetes is associated with older age, obesity, family history of diabetes, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and race/ethnicity. African Americans, Hispanic/Latino Americans, American Indians, and some Asian Americans and Native Hawaiians or Other Pacific Islanders are at particularly high risk for type 2 diabetes and its complications. Type 2 diabetes in children and adolescents, although still rare, is being diagnosed more frequently among American Indians, African Americans, Hispanic/Latino Americans, and Asians/Pacific Islanders.

Gestational Diabetes This is a form of glucose intolerance diagnosed during pregnancy. Gestational diabetes occurs more frequently among African Americans, Hispanic/Latino Americans, and American Indians. It is also more common among obese women and women with a family history of diabetes. During pregnancy, gestational diabetes requires treatment to optimize maternal blood glucose levels to lessen the risk of complications in the infant.

Other types Other types of diabetes result from specific genetic conditions (such as maturity-onset diabetes of youth), surgery, medications, infections, pancreatic disease, and other illnesses. Such types of diabetes account for 1% to 5% of all diagnosed cases.