**Health in Our Hands: What controls my health?**

**Curriculum storyline**

**Ver. 06/2024**

**Framing the Unit**

This unit guides students through a journey to figure out diabetes. Students meet Monique by video, a girl diagnosed with Type 2 diabetes. Diabetes, like many common diseases, is caused by a combination of both genetic and environmental factors. Students investigate how lifestyle options for healthy foods and exercise help prevent or reduce diabetes.

Throughout the unit, students investigate several sub-driving questions to support them to gradually answer the *big* driving question: “What controls my health?” which encompasses these scientific ideas.

Guided by the sub-driving question, the journey unfolds as students figure out:

* In **LS1** - some of the physical and mental effects of diabetes through the sub-driving question, “What affects Monique’s diabetes”.
* In **LS2** - the basic biological mechanism of diabetes through the sub-driving question, “How does diabetes affect Monique’s body systems?”
* In **LS3** - inheritance as a genetic component of diabetes through the sub-driving question,“How does Monique’s family affect her diabetes?”
* In **LS4** - genetic and environmental factors interact affecting the health and survival of organisms. Students investigate the sub-driving question, “How do Monique’s characteristics and environment affect her diabetes?”
* In **LS5**- that healthy and unhealthy food choices can affect our health and how to collect and use the information about food we eat. Students investigate the sub-driving question, “What can Monique do to make her environment healthier?”
* **In LS6**- what they can do to reduce the risk of diabetes by designing and conducting a community action project focused on making a change in their environment. Students address the sub-driving question, “How can we work together to make our environment healthier?”

**Selected Target Performance Expectations**

[**MS-LS1-3.**](https://www.nextgenscience.org/pe/ms-ls1-3-molecules-organisms-structures-and-processes)Use an argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

[**MS-LS1-5**](http://nextgenscience.org/pe/ms-ls1-5-molecules-organisms-structures-and-processes)**.** Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

[**MS-LS2-1**](https://www.nextgenscience.org/pe/ms-ls2-1-ecosystems-interactions-energy-and-dynamics). Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.

[**MS-LS3-2**](http://www.nextgenscience.org/pe/ms-ls3-2-heredity-inheritance-and-variation-traits)**.** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

[**MS-LS4-4**](http://www.nextgenscience.org/pe/ms-ls4-4-biological-evolution-unity-and-diversity)**.** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals’ probability of surviving and reproducing in a specific environment.

\* The grayed out part of the PE will not be discussed in this lesson

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| **Question(s)** | **Phenomena** | **Scientific Practice(s)** | **(DCI) - (CCC)** | **Learning Goals** |
| **Learning Set 1**  ***What affects Monique’s diabetes?***  ***(3 days)*** | Monique’s Type 2 diabetes  [*Monique’s first video*](https://vimeo.com/8036457) | Asking questions  Developing and using models | DCI: LS1.B. Growth and Development of Organisms  CCC: Cause and effect | * The students generate questions about the causes and effects of Monique’s diabetes. * The students construct models to begin explaining the causes and effects of Monique’s diabetes |
| **Lesson description:**   1. The students watch a video of a young girl, Monique, who has Type 2 diabetes. 2. Students generate their own questions about Monique’s health and are introduced to the driving question of the unit, “What controls my health?”. 3. Students develop an initial model that explains a phenomenon of what affects Monique’s diabetes. | | | | |
| **Question(s)** | **Phenomena** | **Scientific Practice(s)** | **(DCI) - (CCC)** | **Learning Goals** |
| **Learning Set 2**  ***How does diabetes affect Monique’s body systems?***  ***(4 days)*** | The biological mechanism of diabetes.  [*Monique's second video*](https://vimeo.com/8224172)  [*Monique's third video*](https://drive.google.com/file/d/1_jnu_x2tGkQiB80GPYYIR2kLxFc79OPv/view?usp=sharing)  Glucose tolerance and insulin tests | Planning and carrying out an investigation  Constructing explanations  Obtain, communicate, and evaluate information [Developing and Using Models](http://www.nap.edu/openbook.php?record_id=13165&page=56) | DCI: LS1.A: Structure and Function  CCC: Cause and effect  System and system models | * The students carry out blood tests to figure out how glucose levels indicate the condition of Type 1 or Type 2 diabetes. * The students construct a scientific explanation about the mechanisms, causes, and effects of diabetes. * The students obtain, evaluate, and communicate information about the mechanisms, causes, and effects of diabetes. * The students develop models of diabetes. * The students integrate and use their models to construct a scientific explanation to explain how LS1 and LS2 models are connected. |
| **Lesson description:**   1. The students perform a glucose tolerance test by analyzing simulated blood plasma samples to determine if the person has diabetes. 2. The students perform an insulin test on simulated blood plasma samples and analyze and interpret data to determine if the person has Type 1 or Type 2 diabetes. 3. The students read scientific texts to describe patterns in and evidence about mechanisms and cause and effect of diabete. 4. The students write a scientific explanation based on the evidence in the form of a lab report to explain the results of Monique’s blood test. 5. The students develop a visual representation to integrate their findings with scientific information about the mechanism of diabetes and how it affects body systems. 6. The students revisit the *Driving Question Board* *(DQB)* and reflect upon their learning and develop an initial model of Monique’s diabetes and focus on the biological aspect of diabetes. 7. Then they integrate and use their models to explain how environment and biology interactions can affect diabetes and control their health. | | | | |
| **Question(s)** | **Phenomena** | **Scientific Practice(s)** | **(DCI) - (CCC)** | **Learning Goals** |
| **Learning Set 3**  ***How does Monique’s family affect her diabetes?***  ***(4 days)*** | Genetic factors that affect your traits and  patterns of inheritance of traits  (hands-on simulation) | Constructing explanations  Developing models | DCI: LS3.A. Inheritance of Traits Variation of inheritance  CCC: Patterns  Cause and effect | * The students use models to explain/predict how patterns of inheritance can affect variation in the inheritance of diabetes. * The students construct an explanation about how genetic factors affect our traits. * The students develop a model to connect their understanding of the inheritance of traits within families with risk for diabetes. * The students integrate and use their models to construct a scientific explanation to explain how LS2 and LS3 models are connected. |
| **Lesson description:**   1. The students examine pictures of a family to identify some genetic factors of characteristics that might be inherited. 2. The students use beads to simulate the inheritance of risk factors for diabetes. They identify the offspring as having high, medium, or low risk of diabetes based on the number and type of risk factors inherited. 3. The students collect data on tongue rolling and arm span. They use this data to explore what genes are and how they work. 4. The students revisit the *Driving Question Board* *(DQB)* and reflect upon their learning and revise their models and add the effect of genetic factors on Monique’s diabetes. 5. Then they integrate and use their models to explain how genetics and biological interactions can affect diabetes and control their health. | | | | |
| **Question(s)** | **Phenomena** | **Scientific Practice(s)** | **(DCI) - (CCC)** | **Learning Goals** |
| **Learning Set 4**  ***How do Monique’s characteristics and environment affect her diabetes?***  ***(7 days)*** | Link between genes and environment on the health of living things. (online - simulation) | Planning and carrying out investigationsDeveloping and Using Models | DCI: LS1.B. Growth and Development of Organisms Variation of inheritance  CCC: Cause & effect | * The students plan and carry out investigations to identify that both genetic factors and environmental factors affect the growth and health of organisms. * The students revise their models to include the influence of both environmental and genetic factors on organisms’ traits. * The students integrate and use their models to construct a scientific explanation to explain how LS23 and LS5 and LS4 and LS5 models are connected. |
| **Lesson description**:   1. The students investigate the effect of both genetic information and environmental factors on the health of sand-rats using an online simulation. They plan and carry out an experiment using the simulation, collect and analyze data, and draw evidence-based conclusions. Then they share and discuss their results with their peers. 2. The students revisit the *Driving Question Board* *(DQB)* and reflect upon their learning and revise their models and add the interaction of environment and genetic factors on Monique’s diabetes. 3. Then they integrate and use their models to explain how gene-environment interaction can affect diabetes and controls their health. | | | | |
| **Question(s)** | **Phenomena** | **Scientific Practice(s)** | **(DCI) - (CCC)** | **Learning Goals** |
| **Learning Set 5**  ***What can Monique do to make her environment healthier?***  ***(4 days )*** | “Hidden” Sugars in foods  [Tim's video](https://vimeo.com/8870064) | Obtaining, communicating, and evaluating information  Using Mathematics and Computational Thinking  Developing and using model | DCI: LS1.B Growth and Development of Organisms  CCC: Patterns  Cause and effect  Scale, proportion, and quantity | * The students obtain, evaluate and communicate information about their eating habits based on the data of hidden sugars in their food. * The students use their models they have developed for Monique to explain what affects their own health. * The students integrate and use their models to construct a scientific explanation to explain how LS4 and LS6 and LS2 and LS6 models are connected. |
| **Lesson description**:   1. The students interpret the *nutrition fact table* on food labels, and calculate the amount of sugar in their food and usual diet. They discuss the effects of excessive sugar consumption on one’s health, and consider ways to reduce sugar consumption, especially *added* sugar, in their diet. 2. The students revisit the *Driving Question Board* *(DQB)* and reflect upon their learning and revise their models and discuss whether their models apply only to Monique. 3. The students integrate and use their models to explain how gene-environment interaction can affect diabetes and controls their health. 4. Then, they create a consensus model and generalize their models to their own health. The students use the model to explain and predict the effect of genes and environment on their health. | | | | |
| **Question(s)** | **Phenomena** | **Scientific Practice(s)** | **(DCI) - (CCC)** | **Learning Goals** |
| **Learning Set 6**  **Community action projects:**  ***How can we work together to make our environment healthier?***  ***(2 weeks)*** | Obstacles to healthy lifestyle in the neighborhood | Planning and carrying out investigations  Analyzing and interpret data  Developing and using models | DCI: LS1.B Growth and Development of Organisms  CCC: Patterns  Cause and effect | * Students use their model to explain human health issues. * Students use models to explain various phenomena related gene-environment interactions***.*** * Students plan and carry out an investigation about obstacles to a healthy lifestyle in their environment. * Students analyze data and communicate findings with peers to explain environmental factors in their neighborhoods that can be changed to reduce obstacles to making healthy lifestyle choices and make their environment healthier. * Students revise their models by adding the action component to their health. |
| **Lesson description:**   1. The class will transform into a research group whose goal is to answer an inquiry question regarding a public health issue in students’ environment. First, the students develop and choose their inquiry question, design and develop their research tools, and plan and carry out their investigations. 2. After completing their investigations, the students analyze the data and draw conclusions, share their findings with their peers and broader community, draw conclusions regarding their inquiry question while addressing ethical issues, and suggest solutions and potential actions based on their findings. 3. The students revise their models and add both personal and collective action components and their effect on their health. | | | | |