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Summary:
Big Idea: *Life Science/Health - Cardiovascular diseases, connection to lifestyle choices, and disease prevention*

Type of Activity:
Section 1: Case study with class discussion
Section 2: Develop and implement personal health plan as a scientific investigation

Length of Activity:
Section 1: 1-2 class periods
Section 2: 2 class periods with extended at-home investigation

Group Size: *Some individual work, some group work (2-4 students)*

Space Needed: *Classroom equipped with PowerPoint or overhead projector*

Special Considerations: *Weight can be a sensitive issue with youth, particularly as they are changing physically. Be aware of your students' individual situations (e.g. an overweight student, or one with an eating disorder). Focus on positive steps to improve health and emphasize an optimum level of caloric intake.*

Grades: *Grades 5-8. There are extension activities for fast paced learners.*

Core Concepts:

- To develop a personal understanding of one's own heart health, including blood pressure, body weight, caloric intake, and activity level.
- Identify and assess risk factors that could lead to cardiovascular disease and risk factors for those diseases.
- Apply new knowledge to make personal health changes, using the scientific method.

Preparation:

- *Set-Up*: Prior to presenting the activity, review and familiarize yourself with the PowerPoint presentation, worksheets, calorie chart, and activity chart.
- *Materials*:
  - A computer with PowerPoint in conjunction with a projector. If powerpoint isn't available in the classroom, make overheads of the slides.
  - Photocopies of: PowerPoint presentation (for student reference), Food Calorie Chart, Physical Activity Chart, and Personal Choice Investigation.

Performing the Activity:

Engage:

Using a *think, pair, share* format, students discuss three generative questions designed to elicit prior experiences dealing with cardiovascular disease, its causes, and its relevance to their own lives. Ask students to prepare notepaper based on guidelines in Slide 2.

- (Slide 3) Question #1: Who do you know who has had a heart attack or stroke? What happened? How do they cope?
    - If you do not know someone who has had a heart attack or stroke, what do you know about heart attacks or strokes?
    - (Slide 4) Question #2: What risk factors (behaviors or choices) could lead to a heart attack or a stroke?
    - (Slide 5) Question #3: Should a middle school student be concerned about his or her risk factors for heart attacks or stroke? What is your reasoning?

Explore:

- (Slides 6-7) Students are provided with a scenario about Karl, a person their age.
- Students are asked to discuss possible evidence that could be gathered in order to make a further evaluation of Karl's risk factors in his life situation.
- (Slides 8-11) Students learn about cardiovascular disease.
- (Slide 12) Students re-visit the question and determine facts they need to know about Karl.
- (Slide 13-14) Students are then provided with some specific information about Karl such as blood pressure, caloric intake, and physical activity levels.
- (Slide 15) Before making a determination, students are then directed to come up with a list of questions they would need answered in order to determine Karl's level of risk for cardiovascular disease (for example, What is healthy blood pressure? What is a normal caloric intake? and What are physical activity levels?).
- (Slide 16-17) Information about healthy behaviors is provided, which should answer most of the students' questions. Students are asked to assess the character's risk for cardiovascular disease.

Explain:

- (Slides 18-21) Using the Food Calorie Chart and Physical Activity Chart, students make an informal evaluation of Karl's health, highlighting both positive and negative aspects.

Elaborate:

- (Slides 22-24) Using the Food Calorie Chart and Physical Activity Chart, students examine their own eating, exercise, stress, and lifestyle habits to identify and evaluate their own risk factors for cardiovascular disease.

Evaluate:

- (Slides 25-28) Using the Personal Choice Investigation worksheet, they develop a one month plan, following the scientific method, with the goal of reducing risk of heart disease. At the end of the month, they make a conclusion based on gathered evidence. Note: Students can measure blood pressure at a local fire station, some grocery stores, or the school nurse.

Differentiation:
Embedded in the activity are provisions for younger, ELL or learning impaired students, such as copying packets of the PowerPoint slides for all students' reference, and both individual work and group collaboration.
For older or more advanced students, diet choices could be made on the internet at a calorie counter on the internet. They may also want to continue their diet or exercise changes for a longer period of time, or repeat or revise the original experiment.

Learning Links:

- *Youth Take Heart Online Lessons*
  This is a collection of lessons that have been created to educate students about the structure and function of the heart, heart disease, and how lifestyle choices can affect heart health. These lessons outline activities that can be done using minimal materials. The "Lifestyle choices" and "Heart anatomy and function" lessons also include PowerPoint presentations.
  - Lifestyle choices
  - Heart anatomy and function
  - Fat and sugar in fast food
  - Sheep heart dissection
  - Nutrient exchange
  - Meditation
  - Blood pressure
  - Salt
  - Case of the Ailing Heart **http://depts.washington.edu/simplant/**
  - *"Case of the Ailing Heart" allows students to problem solve and help Guy, a secret agent, recover from his ailing heart. Students help him exercise, eat well, and install a stent in his blood vessel!*
- *"Super Size Me" (Movie)*
  - Watch the movie and discuss the elements of a scientific experiment performed by Morgan Spurlock. What variables did he change? What were the responding variables?
- *Health Central Heart Attack Video*

    - http://www.healthcentral.com/cholesterol/understanding-cholesterol-13-115.html
    - Google search terms: health central heart attack video
- *Calorie Checkbook BMR (Basal Metabolic Rate) Calculator*
    - http://www.caloriecheckbook.com/BMR_calc.php
    - Google search terms: calorie checkbook BMR calculator
- *Fast food Facts*
    - www.helpguide.org/life/fast_food_nutrition.htm
    - Google search terms: helpguide healthy fast food
- *Heart disease symptoms & info*
    - http://www.heartdiseasesympton.com/
    - http://www.healthline.com/channel/heart-disease.html

Background Informaton:

- Instructor should have some knowledge of the cardiovascular system. The "We Got the Beat" lesson provides background in this. The student reading "Kids Health" in the Explain section of the lesson is especially helpful. Also see: National Heart Lung and Blood Institute: http://www.nhlbi.nih.gov/
- Instructor should be prepared to answer questions about the types and causes of cardiovascular diseases. (National Heart Lung and Blood Institute: http://www.nhlbi.nih.gov/)
- Instructor and students may want to be aware of trends in obesity in the United States (Center for Disease Control Obesity Trends:http://www.cdc.gov/nccdphp/dnpa/obesity/trend/maps/index.htm)
- Instructor should have some basic knowledge of fitness concepts such as basal metabolic rate, how calories are burned, how diet and exercise can affect ones health, body mass index. (Free Fitness Tools: http://www.freefitnesstools.com/)

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Misconceptions:

- Students may not see the link between their diet and the cardiovascular system. More specifically, they may not understand how food is metabolized and how the body processes excess calories.
- Students may know the name of dietary components, but not their functions.
- Students associate consuming food with growing, but not with energy requirements of body systems.

National Standards:

The following National Science Education Standards are covered in this lesson. The Science Content Standards of the National Science Education Standards can be accessed at the following website: http://books.nap.edu/readingroom/books/nses/.

Personal Health

- Regular exercise is important to the maintenance and improvement of health. The benefits of physical fitness include maintaining healthy weight, having energy and strength for routine activities, good muscle tone, bone strength, strong heart/lung systems, and improved mental health. Personal exercise, especially developing cardiovascular endurance, is the foundation of physical fitness.
- Food provides energy and nutrients for growth and development. Nutrition requirements vary with body weight, age, sex, activity, and body functioning.

Risks and Benefits

- Individuals can use a systematic approach to thinking critically about risks and benefits. Examples include applying probability estimates to risks and comparing them to estimated personal and social benefits.
- Important personal and social decisions are made based on perceptions of benefits and risks.

Understandings About Scientific Inquiry

- Different kinds of questions suggest different kinds of scientific investigations. Some investigations involve observing and describing objects, organisms, or events; some involve collecting specimens; some involve experiments; some involve seeking more information; some involve discovery of new objects and phenomena; and some involve making models.
- Current scientific knowledge and understanding guide scientific investigations. Different scientific domains employ different methods, core theories, and standards to advance scientific knowledge and understanding.
- Mathematics is important in all aspects of scientific inquiry.
- Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results of investigations.
- Scientific explanations emphasize evidence, have logically consistent arguments, and use scientific principles, models, and theories. The scientific community accepts and uses such explanations until displaced by better scientific ones. When such displacement occurs, science advances.
- Science advances through legitimate skepticism. Asking questions and querying other scientists' explanations is part of scientific inquiry. Scientists evaluate the explanations proposed by other scientists by examining evidence, comparing evidence, identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations.
- Scientific investigations sometimes result in new ideas and phenomena for study, generate new methods or procedures for an investigation, or develop new technologies to improve the collection of data. All of these results can lead to new investigations.

Abilities Necessary to do Scientific Inquiry

- Identify questions that can be answered through scientific investigations.
- Design and conduct a scientific investigation.
- Use appropriate tools and techniques to gather, analyze, and interpret data.
- Develop descriptions, explanations, predictions, and models using evidence.

- Think critically and logically to make the relationships between evidence and explanations.
- Recognize and analyze alternative explanations and predictions.
- Communicate scientific procedures and explanations.
- Use mathematics in all aspects of scientific inquiry.