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Cancer Growth Lesson Plan

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Katie Smith and Mackenzie Meyer
Computational Modeling
Lesson Plan
July 22, 2013

Lesson Plan

BASIC INFORMATION
Name of Instructor: Katie Smith and Mackenzie Meyer
Course Name: Living Environment
Grade Level: 9
Unit: Immune System
Time/Period: 50 minutes
Lesson Topic: Cancer

LESSON CONTENT, OBJECTIVES, & STRATEGIES

Lesson Rationale:

Students will explore a cancer simulation model utilizing a worksheet. Most students
have known someone who has had cancer. This lesson is designed to introduce
students to the behind the scene components and facts related to cancer. Students will
understand how cancer will keep growing until treatment such as chemotherapy or
radiation is used to shrink the tumor or kill the cancer. The cancer simulation game will
allow students to role play and act like a natural killer cell that can kill a cancer cell.
Students will be able to understand what their friend, family member, or acquaintance
may have endured during a cancer diagnosis and an implemented treatment protocol.
Cancer is the 2nd leading cause of death in the United States. This lesson is used to
bring cancer to the forefront of class discussion. All students will benefit from this
lesson because it is hands on allowing students to explore and analyze two model
simulations. Students will then construct a graph using excel illustrating the total
number of cancer cells present and removed.

New York State Standards:

1.1 Elaborate on basic scientific and personal explanations of natural phenomena, and
develop extended visual models and mathematical formulations to represent one's
thinking.

1.1a Scientific explanations are built by combining evidence that can be observed with
what people already know about the world.

3.1 Use various methods of representing and organizing observations (e.g., diagrams,
tables, charts, graphs, equations, matrices) and insightfully interpret the organized data.

5.2i Gene mutations in a cell can result in uncontrolled cell division, called cancer. Exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.

<u>Next Generation Science Standards:</u>

HS-LS1-2.	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

<u>Content Objectives:</u>

C1 - Students will be able to **identify** and **distinguish** between chemotherapy and radiation therapy for cancer treatment.

C2 - Students will be able to **construct** a graph in excel using data from the simulation program representing the growth of cancer cells over time with and without treatment.

C3 – Students will be able to **discuss** and **defend** factors that decrease one's probability of contracting cancer.

<u>Academic Language Demands:</u>

Cancer-A class of diseases characterized by out-of-control cell growth.
Radiation Therapy-Uses targeted energy from x-rays to kill cancer cells, shrink tumors and provide relief of certain cancer-related symptoms. This is considered a "spot" treatment approach.
Chemotherapy-Medicine or drugs used to kill cancer cells throughout the entire body that have *metastasized* or spread to parts of the body far away from the primary (original) *tumor*.
Tumor- An abnormal mass of tissue that may be solid or fluid-filled.   A tumor can be benign (not cancerous), pre-malignant (pre-cancerous), or malignant (cancerous).
Natural Killer Cell-A type of lymphocyte (type of white blood cell) that responds to virally infected cells and tumor formation by causing apoptosis or cell death.
Virus-Small infectious agent that can replicate only inside the living cells of an organism.
Red Blood Cell-The most common type of blood cell in which its primary role is to deliver oxygen (O_2) to the body tissues via the blood flow through the circulatory system.
Platelet-Small disk shaped clear cell fragments that allow blood to clot.
White Blood Cell-Cells of the immune system involved in defending the body against both infectious disease and foreign materials. There are five different types including the following: Monocytes, Lymphocytes, Basophils, Eosinophils, and Neurtophils.
Bone Marrow-Is the flexible tissue in the interior of the bones where red bloods cells, some white blood cells, and platelets are produced.

<u>Assessment (Formal and Informal):</u>

Informal: Jumpstart, Exit Slip
Formal: Cancer Simulation Worksheet, Cancer Growth Graph

I will assess each student's understanding by checking each student's response to the jumpstart and exit slip question of the lesson. During the lesson I will ask the students additional questions including:

Do you know anyone who has had cancer?
What do you think causes cancer?
Do you think cancer always spreads?
What can treat cancer?
Why do you think cancer is on the rise?

Students will also check their answers with other students at their table and resolve discrepancies on their own. I will walk around the room and help students if they need it. I will also collect the worksheet at the end of class to monitor and assess each student's learning. The students will then participate in a class discussion to determine what factors contribute to the rise of cancer. I will use each student's worksheet and graph to demonstrate that the students met the objectives of the lesson. I will be able to determine performance using the scale below:
Exemplary-Students provided correct answers to all questions and created a graph utilizing the data from the simulation model including labeling both axis and inserting a title.
Proficient –Students provided correct answers to 85% of the questions and created a graph including all necessary components.
Developing-Students provided correct answers to 70% of the questions and created a graph without a labeled axis and graph title.

Instructional Strategies and Learning Tasks:

Students will **explore** a cancer model simulation and **construct** a graph using data from the simulation to show cancer growth with and without treatment. Students will **predict** what will happen when using chemotherapy and radiation therapy icons in the simulation. The students will then **discuss** what factors will decrease the probability of contracting cancer.

Time	Objectives	Learning Activities	Purpose
0-5 min.		BEGINNING ACTIVITIES OR QUESTIONS Jumpstart- What does the word cancer mean in your own words? I will start off asking students to explain what they think cancer is. I will walk around to see each student's response. I will prompt students to provide examples of the types of cancer they are aware of. I will then explain that the goal of today's lesson is to learn how cancer spreads	Activate background knowledge, Relate to real life

		and how specific therapies are used for treatment.	
5-25 min.	C2	LEARNING #1 I will use the teacher modeling instructional strategy to execute the model and construct a graph using the data from the simulation before allowing students to explore the model on their own utilizing the directions indicated on the worksheet. After this brief orientation I will prompt students to follow the instructions on the worksheet and answer each question. Students will follow the instructions specified on the worksheet to construct a graph using the data from the simulation. Students will then play the cancer simulation game in an effort to get the natural killer cell to the cancer cell to remove it or induce apoptosis.	Making predictions, Visual representation, Model exploration
25-45 min.	C1, C3	LEARNING #2 I will first post 5 questions (see below) on the board to get students thinking prior to watching the cancer video. This video explains cancer in detail by providing symptoms, causes, treatment options, real cancer survivor stories, and possible prevention strategies. Students will be instructed to think about what type of cancer they would like to research while watching the video. As a class we will discuss answers to the 5 questions posted on the board which include: Do you know anyone who has had cancer? What do you think causes cancer? Do you think cancer always spreads? What can treat cancer? Why do you think cancer is on the rise? Students will debate whether the causes are considered questionable or confirmed. Students will also be expected provide evidence to support their claim. I will assist in the discussion by using additional prompting statements when needed. The last question may be the most difficult in which I will ask students to think about foods that have been speculated to cause cancer or vitamin deficiencies linked to cancer or medications that may increase cancer risk.	Making connections, Making predictions, Using evidence to support claim, Create class discussion, Monitor and repair understanding

45-50 min.		CLOSURE Exit Slip- Can cancer be completely prevented? Why or why not? Provide one, two, or three examples. I will recap what we learned today and have the students answer the exit slip question. We will discuss answers as a class. I will walk around to see each student's response. I will prepare the students for tomorrow's class which will introduce the cancer research project.	Assess learning, Accommodate various student ability levels, Stimulate interest for cancer research project

Reflection:

Why is this lesson important?

This lesson is important for students to learn because most students know someone who has been affected by cancer in some way. Cancer is the 2nd leading cause of death in the United States. Knowing what causes cancer and what some of the warning signs are will provide students with the knowledge to live a healthy lifestyle in an effort to avoid acquiring the disease. Students will be able to identify things in the environment and lifestyle factors that may increase an individual's chance of acquiring cancer. Of course not all factors can be controlled such as genetic makeup.   Students will also learn about possible cancer treatments and the important role of natural killer cells in the destruction of cancer cells. This lesson also requires students to combine science and mathematical skills by constructing a graph representing cancer cell growth. The cancer model is not limited to cancer alone in which it incorporates cancer within the digestive system. In addition, our cancer simulation game depicts the components of the circulatory and immune system emphasizing the importance of how the immune system responds to foreign invaders within the tissues. These models allow students to explore real world phenomenon in a more simplistic, hands on approach.

How will you assess student learning? Formative and summative?

See above (page 3)

How you will use concept of abstraction for teaching science and math?

The cancer simulation model represents the growth of cancer within the human body in particular the digestive system. In the real world it would be unrealistic to cut open a living organism and watch cancer grow within an organ. This model allows students to

observe the growth of cancer at a fast pace while emphasizing how the cancer cells change over time and how they randomly infect a particular area, system, or organ.

How will your lesson help students to improve math and computational thinking skill?

This lesson allows students to predict what would happen to the cancer cells at different points in the simulation by counting the number of cancer cells present and determine the percentage of cancer cells that were removed via the treatment icon. It also encourages students to use simulation data to construct a graph in excel typically used in mathematics. Students will also learn how to make trend lines using the constructed graph.