Cells & Cell Division

a lesson plan from CancerEd

Grades K-2

Subject: Science

Crossovers: ELA and Mathematics

Topic: What Is Cancer?

Links to Other Lessons: If you do not have additional help from teacher aides, older students or parents, you can use the "whole class" version of the *Cells & Cell Division* lesson plan (available on the CancerEd website).

Description: Students teams visit three stations and participate in activities that demonstrate: the number of cells in a human body, the process used to make new cells (cell division), the different types of cells in the body, and the differences between healthy cells and cancer cells. A large group discussion is used to reinforce the lessons students have learned at each station.

Time Required: 40 minutes

Background Information (for Teacher): *What is Cancer?* Backgrounder

Prerequisite Knowledge (for Students): None

Learning Objectives:

Students will understand…

- All living things are made of cells. Humans are made of a very large number of cells.
- There are many different types of cells, each with a specific job.
- Division of healthy cells is important for growth and repair.
- There are several differences between healthy cells and cancer cells.
    - Cancer cells divide when they should not.
    - Cancer cells do not perform their normal job.

Standards Addressed: See end of document

Supplementary Materials:

- *How many?* cards
- *How Big is a Cell?* activity sheet
- *Vehicles* cards
- *Vehicles Power Point*
- *Body Outline* activity sheet
- *Cell Division* activity sheet
- *Cells & Cell Division* video (optional)

Classroom Materials:

- Play-Doh; 4 cans, at least two colors
- Toy vehicles (at least 6), each with a different function (ex. Fire engine, bulldozer, taxi, tractor, snowplow, school bus – if you cannot find toy vehicles, picture cards or a PowerPoint can be found in the lesson plan on our website).
- Circle (3/4" or smaller) stickers with at least 4 colors per sheet; 6 sheets
- Small bowl of sand

Preparation & Setup:

- Divide students into six teams. It is recommended that a guide (teacher, parent, older student) be assigned to each team.

- Prepare 3 stations in the classroom as described below. Each station will have enough materials so that two student teams can visit a particular station at the same time:

  Station 1: How Many Cells
  - (2) *How Many?* cards (printed and cut apart)
  - Small bowl of sand

  Station 2: Cell Division
  - (2) *Cell Division* activity sheets
  - 4 cans of Play-Doh

  Station 3: Cell Types and Their Jobs
  - (6) *Body Outline* activity sheets (one per team)
  - (6 or more) toy vehicles (or (2) *Vehicles* cards cut apart)
  - (6) sheets of circle stickers

Alternate Setups: Consider one of the following options if the setup described above is not possible in your classroom:

- Invite a few children to help in the front of the room to demonstrate activities as you discuss key concepts.
- Have all student teams work on the same activity at the same time.

Lesson Opener:

Invite students to think about sandcastles.

- **What are sandcastles made of?**
  A lot of very small pieces of sand!
- **What is the difference between a small sandcastle and a large sandcastle?**
  The amount of sand needed to build it.

Explain to students that they, like sandcastles, are made up of a lot of very small "pieces". These pieces are calls **cells**. *Cells are the building blocks of all living things.* Cells are very small and can only be seen with a microscope.

(You may want to display a picture of a cell at this time).

Invite students to answer the following questions:

- Do children and adults have the same number of cells in their bodies?
  No, just like a large sandcastle is made of more pieces of sand than a small sandcastle, a large human (an adult) is made of more cells than a small human (a child).
- How do you think a child gets more cells?
  (It is unlikely that children will be familiar with the concept of cell division, but encourage them to think of possible ways to obtain new cells).

Tell the students that they will be learning more about cells as they visit the three stations that are set up around the classroom.

Development

Station 1: How Many cells?

Key Concepts: We have a lot of cells in our bodies.

Materials Needed: (2) *How Many?* cards, small bowl of sand

Activity Description:

1. Have the students work together to place the *How Many?* cards in order – from smallest number to largest number

2. Discuss the correct order (see table)

Number of…	Actual Number
Students in your class	(number will vary)
Stars you can see	2,000
Hairs on your head	100,000
People in the world	7 billion
Cells in your body	50 trillion

3. Encourage the students to talk about what surprised them. (*Are they surprised that there are more cells in their body than there are people on the Earth?*)

4. Encourage students to think about the size of cells. (*If there are so many cells in there body, then each cell must be very, very small.*)

5. Have students examine a single grain of sand and ask them t consider this question: **Which is larger, a grain of sand or a cell?** (*A typical grain of sand is approximately 100 times larger than an average human cell! A scale image of this size relationship can be found at the end of this activity.*)

Station 2: Cell Division

Key Concepts:

- Division of healthy cells is important for growth and repair.
- Cancer cells divide when they should not.

Materials Needed:

Play-Doh, (2) *Cell Division* activity sheet

Activity Description:

1. Demonstrate cell division using Play-Doh:
   - Explain that cells grow (to roughly double their original size) before they divide.
   - Start with one cells (a ball of Play-Doh, the size of a marble). Add Play-Doh to the cell to represent the growth that occurs before cell division.
   - Divide the cell into two pieces (two cells) – this is cell division! Each new cell should be the size of the original cell.

   Ask students: **Why do cells divide?**
   To increase the number of cells (for growth)
   To repair damaged cells (due to an injury or normal wear-and-tear)

   Ask students: **When should cells divide: all of the time or only sometimes?**
   Only when needed! (when growing or repairing/replacing damaged cells)

2. Have students simulate the division of **healthy cells** using the Healthy Cells Circle on the *Cell Division* activity sheet.
   - Instruct students to grow and then divide the two Play-Doh cells – students should add new Play-Doh to the cells and then split each cell in half.
   - Instruct students to continue to grow and divide the cells until a single layer of cells covers the inside of the Healthy Cells circle. (For the Healthy Cells, the Play-Doh should not exceed the boundaries of the circle and should *not* be stacked on the "other" cells)

   Explain that healthy cells stop dividing when they contact other cells – when growth is no longer needed or when repair is complete.

   You may want to discuss how quickly one cell becomes many cells: 1 ➔ 2 ➔ 4 ➔ 8 ➔ 16…

3. Have students simulate the division of cancer cells using the Cancer Cells circle on the *Cell Division* activity sheet.
   - Begin with a single cancer cell (use a different color of Play-Doh and make the cell odd-shaped to distinguish it from a healthy cell).
   - Explain that cancer cells do not look or behave like normal cells.
   - Instruct students to divide the cancer cells.
   - Students should continue to divide the cells until a single layer of cells covers the inside of the Cancer Cells circle, then divide the cells again.

Explain that cancer cells do not stop dividing when they contact other cells.

Ask the students: **Where do you think the new cancer cells will go?**
Since there is no longer enough room for all of the cells in the circle, new cells may pile on top of other cells or extend beyond the border of the Cancer Circle.

- When cells grow on top of one another, a **tumor** (clump of cells) is formed.
- When cells grow in areas where they should not be growing (move beyond the Cancer Circle) they harm the healthy cells that are in those areas.

***Cells & Cell Division* video is an optional YouTube video that demonstrates the activity. All supplementary materials can be found under this lesson plan on our website.

Station 3: Cell Types and Their Jobs

Key Concepts:

- There are many different types of cells in the body; each has a specific job.
- Cancer cells do not perform their normal job.

Materials Needed:

(6) *Body Outline* activity sheets, circle stickers, toy vehicles with different functions or (2) *Vehicle* Cards or the *Vehicle Power Point*

Activity Description:

1. Let the students examine the vehicles.

   Ask the students:
   What is similar about all of these things? (They are all vehicles)
   What is different about these vehicles? (They have different jobs; they do different things)
   What are the jobs of each of these vehicles? (Take students to school, drive people places in big cities, get snow off roads, plow a field on a farm, construction, drive to put out fires, etc.)

   Explain that our cells are like these vehicles – there are many different types and each has a different and important job.

2. Introduce students to several of the following cell types and ask students: **What is the job of each type of cell?**
   - Brain cells/Neurons: allow us to think, see, smell, balance, etc.
   - Skin cells: protect our bodies from germs and chemicals, help to keep our bodies from getting too hot or too cold
   - While Blood Cells/"Defender" cells: fight germs – bacteria and viruses – that enter our body
   - Lung cells: necessary for breathing, delivering oxygen to all the parts of our body
   - Muscle cells: allow movement

   As the students discuss each cell type, have them add stickers (use a different color for each cell type) to the *Body Outline* in the location where each cell type is found.

   You may want to show the students an image that demonstrates that different cell types look different – these different structures enable the cells to perform different functions.
   http://biology.about.com/od/cellbiology/tp/Different-Cell-Types-in-the-Body.htm

3. Invite students to examine the vehicles again.

   Ask students: **What would happen if one of these vehicles broke down?**
   Fire truck – fires would not be stopped; building would burn down

   Then ask: **What would happen if one type of cell was no longer doing its job?**
   Brain cells – may affect the ability to see, do math problems, balance, etc.

   Explain that cancer cells do not do their normal job. Encourage students to think about the effect that cancer

cells have on the body's ability to work properly.

Closure:

Bring the students together after all groups have visited each station, and invite students to review what they learned at each station.

Use questions like those that follow prompt discussion:

- What did you learn about the number of cells in your body? The size of cells in your body?
- Why do cells divide? Can they divide all the time?
- How are cells like vehicles?
- What are some differences between healthy cells and cancer cells?
- Why are cancer cells harmful?

Encourage students to ask additional questions about cells, cell division, and the difference between healthy cells and cancer cells.

Assessment:

During the closure portion of the activity, assess the student understanding of key concepts as they describe what they learned at each station. Do the children understand..

…their bodies are made up of many, very small cells?
…cell division generates new cells and is necessary for growth and repair?
…cancer cells divide when they should not, this often generates masses of cells (tumors)?
…there are several different types of cells in the body?
…each cell type performs a different and important job?
…cancer cells do not do their job and therefore harm the body (inhibit ability of body to work correctly)?

Alternate assessment strategy: Ask students to draw picture after completing each station activity. Then, when all the activities are finished, the student can use their pictures to explain what they learned to a teacher, parent, or older student.

Further Exploration:

Explore cell division further by viewing a video of cell division as observed through a microscope:
https://www.youtube.com/watch?v=rgLJrvoX_qo

If you have access to a microscope, you can demonstrate the relative size of cells by preparing a slide that contains both cheek cells (obtained from a student volunteer) and a hair (also obtained from a student volunteer). Instructions for preparing a cheek cell slide can be found here: https://www.youtube.com/watch?v=i2x3MKSJez4

Additional Resources:

Read this resource that explains the different types of cells in the human body.
http://biology.about.com/od/cellbiology/tp/Different-Cell-Types-in-the-Body.htm

Check out this resource from Biology4Kids explaining how different cells have different functions.
http://www.biology4kids.com/files/cell2_main.html

Watch this quick, 22-second clip explaining how cancer cell division is different from normal cell division.
https://www.youtube.com/watch?v=bDjDw18HJto&feature=youtu.be

The book *Nana, What's Cancer?* by Beverlye Hyman Fead is a great resource for children ages 5 to 12 to learn about cancer.

Questions or Comments?

Please contact us at: info@CancerEd.org

Standards Addressed:

Next Generation Science Standards K-2	
Practices	*Practice 2: Developing and Using Models* • Distinguish between a model and the actual object, process, and/or events the model represents. • Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). *Practice 3: Planning and Carrying Out Investigations* • Make predictions based on prior experiences.
Core Ideas	*LS1.B: Growth and Development of Organisms* • Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. *LS3.A: Inheritance of Traits* • Young animals are very much, but not exactly, like, their parents. Plants also are very much, but not exactly, like their parents. Cells are just like their parents. *LS3.B: Variation of Traits* • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. There are different kinds of cells just like there are different kinds of plants and animals. *PS1.A: Matter and Its Interactions* • A great variety of objects can be built up from a small set of pieces. All things are made up of cells, including people.
Cross Cutting Concepts	*Scale, Proportion, and Quantity* • Relative scales allow objects and events to be compared and described (e.g., bigger and smaller; hotter and colder; faster and slower). *Energy and Matter: Flows, Cycles, and Conservation* • Objects may break into smaller pieces, be put together into larger pieces, or change shapes. *Structure and Function* • The shape and stability of structures of natural and designed objects are related to their function(s). *Stability and Change* • Some things stay the same while other things change • Things may change slowly or rapidly
Common Core State Standards	
ELA/Literacy	• *SL K.1* Participate in collaborative conversations with diverse partners about kindergarten topics and texts with peers and adults in small and larger groups. • *SL. 1.1* Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups. • *SL 2.1* Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
Mathematics	• *MP.2* Reason abstractly and quantitatively