PEANUTS and SPACE FOUNDATION

Brittle Bones

OBJECTIVES

Students will:

- Read *Snoopy, First Beagle on the Moon!* and *Shoot for the Moon, Snoopy!* to give students some background knowledge.
- Understand what bone density is and why bone density is important to the human body.
- Create a drawing of a bone of their choice labeling the bone marrow, periosteum, compact bone, and cancellous bone.

SUGGESTED GRADE LEVELS

5th – 8th

SUBJECT AREAS

Science, Math

TIMELINE

90 – 120 minutes

NEXT GENERATION SCIENCE STANDARDS

- 5-PS1: Develop a model to describe that matter is made of particles too small to be seen.
- MS-PS1: Develop models to describe the atomic composition of simple and extended structures.
- MS-LS1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- MS-LS2: Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

21st CENTURY ESSENTIAL SKILLS

Critical thinking/Problem solving, Collaboration and Teamwork, Communication, Information literacy, Flexibility, Leadership, Initiative, Social Skills, Organizing Concepts, Predicting Patterns, Constructing Explanations, Obtaining/Evaluating/Communicating Ideas

BACKGROUND

- According to NASA.gov, NASA has proudly shared an association with Charles M. Schulz and his American icon Snoopy since Apollo missions began in the 1960s. Schulz created comic strips depicting Snoopy on the Moon, capturing public excitement about America's achievements in space. In May 1969, Apollo 10 astronauts traveled to the Moon for a final trial run before the lunar landings took place on later missions. Because that mission required the lunar module to

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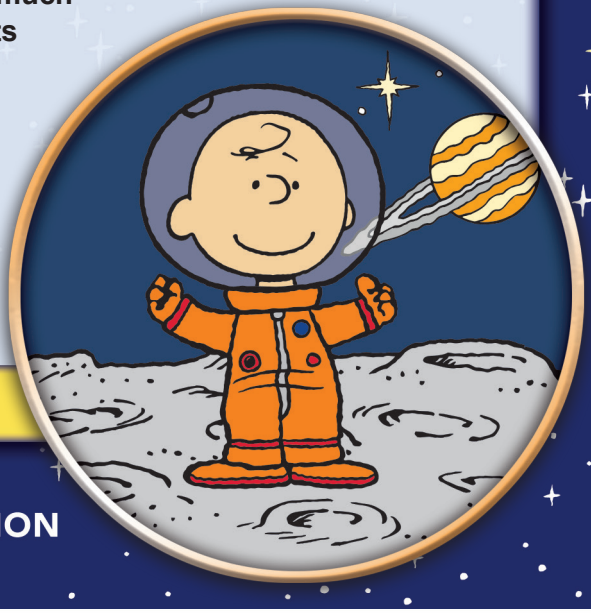
skim within 50,000 feet of the Moon's surface and "snoop around" to determine the landing site for Apollo 11, the crew named the lunar module Snoopy. The command module was named Charlie Brown, Snoopy's loyal owner.

- These books are a united effort between Peanuts Worldwide, NASA and Simon & Schuster to generate interest in space among today's younger children. The character of Snoopy has been allowed to be reimagined for this special partnership and for the opportunity to head into outer space.
- The skeletal system of the human body provides support, structure, produces blood cells and stores minerals for the body's survival. Students should have previously learned the basic components of the skeletal system and will now be looking at bones more closely including why proper nutrition is so important to not only the body's health but to bones as well. Bones need ample amounts of calcium in order to grow and maintain bodily structure. Our daily activities can both help bones grow and repair themselves, but they can also cause bones to lose density. Density is how much matter is packed into a space. Bones can lose density due to environmental conditions and nutritional deficits. As we age bone density can decrease as well. The loss of bone density lends our bodies to be more fragile and can result in fractures. Students should know about eating a balanced diet and what foods make up which food groups to do their best during this lesson. In this lesson students will observe how the loss of bone density increases the likelihood of a fracture, how some food (soda) can cause the decay of bones and observe the characteristics of bone marrow, joints and long bones.
- Once an astronaut has lived in microgravity for several days, some of the processes and functions of bones change. This is due to the lack of weight the bones are supporting and lack of movement stress. In microgravity, the calcium stored in the bones is broken down and released into the bloodstream. The density of the bones decreases and results in what is called disuse osteoporosis.
- Extended time in space results in more bone density loss. Extended stays on Mars may result in losses of bone mass, of as much as 20%. Studies continue to research whether astronauts can regain bone mass lost while in space as well as preventive methods for both microgravity and on Earth.

VOCABULARY

Density, Bone Marrow, Calcium, Skeletal system, Periosteum, Compact bone, Cancellous bone, Disuse Osteoporosis



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MATERIALS

- Puff Cereal (2 boxes)
- 10 sandwich bags
- 10 quart size bags
- Fresh chicken bones (remove meat, wings work best)
- Wax paper or other covering for tables
- Clorox wipes or other disinfectant for cleaning surfaces
- Soda (Coke or other dark colored soda pop)
- Latex gloves
- Science journal
- Graph paper
- Labeled and laminated color photos of the parts of bones (google search)
- Permanent marker
- Sticky notes

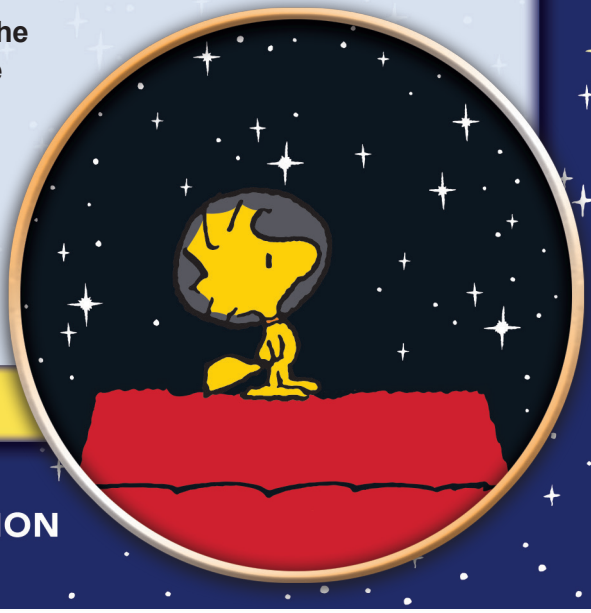
LESSON PROCEDURES

Before the lesson begins:

1. *Read Snoopy, First Beagle on the Moon!* and *Shoot for the Moon, Snoopy!* to the entire class, to give students some background knowledge.
2. Label one sandwich bag 100%, another 90% and so forth down to 20%.
3. Fill one bag completely full and then count how many puff cereal pieces it takes to fill the bag completely. Write this number on the bag of 100%.
4. Calculate what each bag should hold given the labeled percentage. Write this number on each bag so students will know how many to put in each bag.

During the Lesson:

5. Review information about the skeletal system and nutrition.
6. Divide students into (about 4 per group) working groups. These groups will work together at various stations around the classroom.
7. Have students choose one sandwich bag and fill with the correct number of puff cereal. The bags should then be labeled with a percentage and number of puff cereal which is equivalent to that percentage.
8. Have students seal the sandwich bag after they have released all the air out of the bag.
9. Place the puff cereal bag into the quart bag (sealed side down) and again all air should be removed and bag sealed.



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10. Drop a heavy book onto the bag of puff cereal from a height of 5 feet.
11. Turn the bag over and repeat the book drop.
12. Count each puff cereal that is still whole (or mostly whole, 50%) .
13. Record number of whole puff cereal.
14. Have each group share their puff cereal numbers with the class.
15. Create a graph of the class results and complete analyses.

EXTENSIONS

- Draw conclusions about the effects of low bone density on the human body.
- Explain to students the causes of lower bone densities and the importance of keeping bones strong.
- Use the information above to lead a discussion about how astronauts experience reduced bone density and why this might happen. Have students brainstorm ways astronauts might prevent their own bone density loss knowing what they know about nutrition and exercise.
- Set up microscopes with premade slides for students to examine other samples.

RESOURCES

Schultz, Charles M. (2019). Snoopy, First Beagle on the Moon! New York, NY: Simon & Schuster.

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Bag of Bones Activity. Retrieved from https://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Bag_of_Bones_Activity.html

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