HEALTH & LIFE SCIENCES
ACTIVITY BUNDLE

For Grades 6-8

Four hands-on STEM activities that introduce K-2 learners to health science careers through investigation, movement, and nutrition.

STEM NEXT
OPPORTUNITY FUND

STEM Next Health & Life Sciences Activity Bundle (Grades 6-8)

Welcome to the STEM Next Health Science Activity Bundle! This bundle is one of three bundles now available from the Health & Life Sciences Center of Excellence, powered by the Institute for a STEM Ready America.

Use the four activities below to inspire youth grades 6-8 with hands-on science. Through these activities, youth will develop foundational STEM skills by engaging in hands-on investigations of health science concepts (medical imaging, nursing, and nutrition), while building career awareness by exploring how professionals use science, technology, engineering, and math.

Interested in more resources like this from STEM Next? Check out our Tools in our online Resource Library.

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Lesson 1: Fix That Fracture

In this lesson, youth will be able to:

- Understand how X-rays work on a basic level by seeing inside objects.
- Recognize the different types of bone fractures.
- Use the engineering design process to solve a problem.

Time needed: 60 minutes

Preparation

Materials	• Bone Fracture Cards • Celery stalks • Scissors • Plastic knife • Masking tape • Variety of materials with which to make a cast or splint, such as toothpicks, popsicle sticks, paint stirrers, gauze or bandage wrap, tissue, cotton balls, cotton batting, plastic wrap,cardboard, duct tape, velcro, plastic wrap, bubble wrap, old fabric, etc
Setup	• Print a copy of the Bone Fracture Cards. • Place all cast making materials in a materials hub, and allow youth access throughout the activity.
Presentation	Slides

Facilitation

Overview:

In this activity, youth will investigate X-ray technology through hands-on exploration. Working as biomedical engineers, small groups will recognize a bone fracture and design their own splint or cast.

Engage:

1. Show the X-ray examples (Slides 3–8). Ask youth if they can identify the bone or body part in the X-ray.

2. Ask: *How do doctors see inside your body without opening it? Who has had an X-ray before? Could you describe what happened? Where did you go for the X-ray? Why did you need an X-ray?* Tell youth that most people break at least two bones in their lifetime. Ask: What are the different ways bones break?

3. Show the different types of bone fractures (Slide 9). Explain: Not all fractures are alike. A common break that is hard to see is called a hairline fracture. It is hard to see because it is incomplete and does not break all the way through the bone. A linear break is a clean break along the bone. In an oblique fracture, the break is diagonal to the length of the bone. In a spiral fracture, one part of the bone has been twisted. When one bone breaks in two places, it is called a segmented fracture. When a bone breaks into three or more pieces, it is called a comminuted fracture. Bones that have moved after a fracture are called displaced and bones that have not moved are called non-displaced. There are many kinds of bone fractures. Sometimes, multiple types of bone fractures happen together. Bone is living tissue and can heal itself, but often it needs help.

4. Divide youth into groups of 2 or 3. Give each group a stalk of celery and a card depicting a type of bone fracture. Have the group illustrate the type of fracture by breaking the celery stalk or cutting it with a plastic knife.

Investigate:

1. Explain: (Slide 10) Bones heal in several stages. First, a blood clot forms around the break. Your immune system cleans the area. Next, a soft collagen cover forms over the break in a few days. This cover eventually hardens, as cells that create new bone add minerals like calcium to the bone. Finally, special cells trim the hard cover down to the size of the original bone.

2. Review the engineering design process and explain that youth will be acting as biomedical engineers, designing their own type of cast or splint for the broken bone they have in front of them (celery stalk). Explain that when engineers design a new or improved product, they work in groups and follow the steps of the engineering design process:

    a. Understand the problem or need.

    b. Come up with creative ideas and select the most promising idea.

    c. Make a plan to describe the idea

d. Create a prototype or model of the design.

e. Test what you have made

f. Improve on your design.

g. Share your design with others (Slide 11).

3. Introduce the criteria and constraints for the activity (Slide 13).

    a. Criteria: Must cover the broken bone, must be easy for the patient to wear, must draw a diagram of the cast before starting to build.

    b. Constraints: Can not use more than three different materials, can not be larger than the bone, can only use materials provided, can only go to the materials hub twice for materials.

4. Allow youth 5 minutes to brainstorm. Give groups 5 to 10 minutes to draw their design on their worksheet and list the materials needed.

5. Once groups have completed their design, direct one group at a time to obtain the materials they will use.

6. After groups have gathered their supplies, direct them to create their model casts, building around their broken bone. Allow groups 15 to 20 minutes to work.

7. Once all groups have completed their splint or cast, have youth clean their work areas.

Wrap-up:

1. Ask each group to describe the type of bone fracture they had and the design of their cast or splint.

2. As groups are presenting or after all have shared, ask: *What were some of the important factors you had to consider when designing your cast? After seeing other groups' ideas, what would you change on your own design?*

Implementation

Alternative Implementation and Extensions:

- An Introduction to the Human Body: In this pathway, youth take an in-depth look into anatomy and physiology, structural organization of the

human body, functions of human life, requirements for human life, homeostasis, anatomical terminology, and medical imaging.

- MRI the Magnetic Miracle Game: In this game, youth assist during an MRI investigation and sort images. Youth can earn five magnets out of five if they are good at memory games and know the differences between MRI, X-ray, and CAT images.

Career Connection:

- Share the career profile radiology technologist and emergency medical technician (EMT).
- A Day in the Life of a Bioengineer: In this interactive story, youth explore the decisions a biomedical engineer might make when designing technologies to keep people healthy.
- Play the Fracture Recovery Relay Simulation (Slide 16). Looking at the Emergency Room Map, have youth identify the healthcare professional that the patient comes into contact with at each stop on the map and what that person is responsible for in the care of the patient.
    - **Station 1:** The emergency medical technician (EMT) must stabilize the limb with a temporary splint using cardboard and soft ties.
    - **Station 2:** The nurse records vital signs and pain levels.
    - **Station 3:** The radiology technologist takes an X-ray image of a broken bone to give to the orthopedic doctor who must identify the type of fracture.
    - **Station 4:** The orthopedic doctor's team decides on a treatment plan. If it's a simple break, they apply a cast. If it's severe, they use internal fixation (pins or wire) to simulate surgical repair.
    - **Station 5:** The physical therapist (PT) designs exercises to help the patient regain strength. The occupational therapist (OT) helps the patient figure out a way to perform a daily task while wearing their new cast.

Lesson 2: Sports Medicine & Physical Therapy: Wrist Injuries

In this lesson, youth will be able to:

- Identify the severity of an injury.
- Wrap an injured wrist correctly.
- Perform numerous physical activities that rehabilitate an injured wrist.
- Follow instructions to complete a task.

Time needed: 60 minutes

Preparation

Materials	• Athletic tape • Injury Evaluation Chart
Setup	• Copy the Injury Evaluation Chart (one per youth)
Presentation	Slides

Facilitation

Overview:

This hands-on activity introduces youth to basic wrist injury care by teaching them how to safely wrap a wrist and perform simple rehabilitation exercises. Youth will work collaboratively to practice techniques while building communication and problem-solving skills. The lesson also connects to real-world careers such as sports medicine and physical therapy.

Engage:

1. Ask youth: Who plays a sport? What sport do you play? Has anyone ever been injured while playing a sport? What happened? How did you treat it?
2. Show the video about sprains.

Investigate:

1. Tell youth: *Today you are going to be a sports trainer and physical therapist. I will share the situation that led to a wrist injury. You will evaluate the patient, wrap the injury, and help the patient recover. Find a partner and decide who will be the patient and who will be the sports*

trainer. Allow youth 2 minutes to find a partner. Give each youth an Injury Evaluation Chart.

2. Read the injury situation to youth (Slide 3). Tell youth that they need to play the role of either the patient or trainer.
3. The sports trainer will complete the Injury Evaluation Chart. Allow youth 10 to 15 minutes to complete it. Once completed, have the pair switch roles. Reiterate that the patient has a wrist injury based on the information.
4. Demonstrate how to properly wrap an injured wrist (Slide 5). Distribute athletic tape to each pair. Have youth follow the directions to wrap their partner's wrist. Allow 10 minutes for youth to wrap wrists.

Wrap-up:

Gather youth back together. *Ask: What is important to consider when wrapping an injury? What kind of questions did the trainer ask? What other kinds of injuries are common in sports?*

Implementation

Alternative Implementation:

- Repeat the activity with various injuries, such as ankle or knee injuries.

Career Connection:

- Share the physical therapist career profile with youth.
- Rehab in Action: Have youth act as a physical therapist to help an athlete return from a wrist injury. You will need a small rubber or foam ball, stretch band, and 1 lb weight for this activity.
    - Tell the group: Once an injury heals, it is important to build back strength. A physical therapist is helpful in this area. Acting as a physical therapist or patient, complete the exercises at each station. One of you will be the physical therapist and the other will be the injured athlete. When I call time, you will switch roles.
    - Place the PT Station Cards and materials at each station. Allow youth 15 to 20 minutes to complete all stations.
- Bioengineer and Biomechanist: Kirsten Tulchin-Francis is a bioengineer and biomechanist who discusses how her interest in sports and science combine to help her to help people move better.

- Astronaut Fitness Trainer: Learn how Corey Twine assists astronauts to maintain good health and fitness while living and working in space.
- Sports medicine specialist or sports trainer and physical therapist: Invite a local team trainer to speak to the group.

Lesson 3: Emulsifiers

In this lesson, youth will be able to:

- Describe the difference between mixtures that separate and mixtures that stay combined.
- Define emulsifiers.
- Use the scientific method to make an hypothesis, complete an experiment, collect data, and draw conclusions.

Time needed: 60 minutes

Preparation

Materials	• Emulsifiers Handout • Vegetable or olive oil • Vinegar • Honey, mustard, garlic paste, tomato paste, or ketchup (at least 3) • Stopwatch • 10 mL graduated cylinder or measuring cups • Scoop or measuring spoons • Zip-top sandwich bags • Kitchen scale with weighing trays (optional)
Setup	• Place all materials in a Materials Hub allowing youth access throughout the activity.
Presentation	Slides

Facilitation

Overview:

This hands-on investigation introduces youth to the science of chemistry by exploring mixtures. Youth test familiar household ingredients to find an effective emulsifier. The activity builds skills in measurement, observation, and data collection while connecting chemistry concepts to real-world applications.

Engage:

1. Pour 1/2 cup of water and 1/2 cup or oil into a plastic sandwich bag. Ask youth to predict what will happen. Close and shake the bag. Say: *Oil and water don't mix! You may have heard that before and now you've seen it. But the truth is that we are surrounded by foods that are made by mixing oil and water. How can we explain this? Foods that mix oil and water are called emulsions. An emulsion is a type of colloid, which is a mixture of very tiny particles that are dispersed in another substance but do not settle out of the substance. Emulsifying is done by slowly adding one ingredient to another while simultaneously mixing. This disperses and suspends tiny droplets of one liquid through another. To prevent the mixture from separating, an ingredient, known as an emulsifier, that is attracted to both oil and water is added, allowing the oil and water to mix.*
2. Show examples of common mixtures (all ingredients mix evenly), colloids (cloudy appearance due to uneven mixing), and emulsions (need to be shaken to distribute evenly) and have youth classify them (Slides 3–4).

Investigate:

1. Divide youth into small groups of 2 or 3. Give each group an extra large hard-boiled egg, a medium hard-boiled egg, two plates, a measuring tape, a plastic knife, a pencil, and a handout.
2. Demonstrate to youth how to measure the length and circumference of an egg.
3. Allow each group time to measure the length, circumference, weight, shell color, and yolk color of their eggs. Direct youth to record this data on the handout.

Wrap-up:

1. Tell youth: *Today you will work in groups to make an emulsion. This emulsion is common in most houses: salad dressing. Most salad dressing contain some type of oil and vinegar along with flavors and an emulsifier. You need to find an emulsifier that will make the dressing stay mixed for as long as possible.*
2. Demonstrate how youth will conduct the experiment by doing the first of four trials together.

a. In a sandwich bag add 1/2 cup oil or measure 10 mL if using a graduated cylinder..

b. Add the same amount of vinegar. Ask youth: *Why is it important to add the same amount of both ingredients?* Have youth record the ingredients and the amount in the data table under Trial 1.

c. Seal and shake the bag for 15 seconds. Hold the bag upright without moving it and using a stopwatch or timer, time how long it takes for the two ingredients to separate. Have youth record the time in the data table under Trial 1. Tell youth this will be their control or what they will compare all the other trials to. Youth are trying to keep the ingredients mixed longer than the control by adding an effective emulsifier.

3. Divide youth into groups of 2 or 3. Provide each group with 4 sandwich bags, a set of measuring devices (measuring cups and spoons or graduated cylinders and a kitchen balance), and an Emulsifiers Handout. Remind youth to only test one new ingredient at a time, to measure the amount of each ingredient added, and to not cross contaminate ingredients. Direct youth to record separation times for each trial.

4. Note: If no separation occurs within 5 minutes, youth should record >5 minutes (Slide 5).

Wrap-Up

Bring youth back together to share their findings. Ask youth: *Which bag took the longest to separate? What was in the bag? Is there anything you would change about your experiment? What do you think would happen if you changed the amounts of ingredients?* If you have extra ingredients and time, have youth test alternative amounts either individually or as a group. Ask: *What kinds of products have the words "Shake before using" written on them? Why do you think you need to shake them?*

Implementation

Alternative Implementation and Extensions:

- What's in a Tablet? This scrollable explains why there are active and inactive ingredients in drug tablets. It looks at how medicine needs to be released in a way that is effective, but customer preferences, shelf life, and storage considerations must also be taken into account.

Career Connection:

- Pharmacist: Youth connect how emulsifiers work in salad dressing to how pharmacists mix medications safely and effectively.
    - Ask youth: *What would happen if medicine ingredients didn't mix well? Would you want a medicine where all the important parts sink to the bottom?*
    - Briefly explain: Pharmacists often need to mix ingredients that don't naturally combine, just like oil and vinegar. Pharmacists rely on emulsifiers to make medicines safe and consistent. Pretend you are a pharmacist creating a liquid medicine for a patient who can't swallow pills. The medicine has two parts that don't mix well. Which ingredient from your experiment worked best as an emulsifier? Why would that matter for medicine? What could happen if the medicine isn't mixed evenly?
- Share the career profile for a pharmacist.

Lesson 4: Make the Connection

In this lesson, youth will be able to:

- Name careers in the healthcare sector.
- Explain responsibilities or duties of several healthcare careers.
- Connect school subjects to specific healthcare career skills or duties.

Time needed: 20 minutes

Preparation

Materials	• Small whiteboards and markers (1 per group)
Presentation	Slides

Facilitation

Overview:

In this activity, youth will identify specific healthcare careers and match them to job duties and school subjects.

Engage:

1. Ask youth to name any of the healthcare careers they remember from the previous activities. Allow time to discuss any careers youth remember. Remind youth of the career profiles shared so far: radiology technologist, physical therapist assistant, medical and health service manager, emergency medical technician (EMT), and pharmacist.

2. Ask youth what subjects they think are important to study in order to be good at each of the careers.

Exploration:

1. Divide youth into groups of 2 or 3 and give each group a small whiteboard and marker. If you do not have small whiteboards, youth can use paper.

2. Explain the rules of the game:

    a. *I will read and show a short scenario.*

    b. *After reading the scenario, I will set the timer for 30 seconds. You will work with your group to identify which of the healthcare careers we have discussed are described in the scenario.*

    c. *You must write your answer on the whiteboard before the timer goes off.*

    d. *When the timer goes off, I will ask for your answers and all groups MUST share their answers at that time.*

    e. *Each group with the correct answer will earn a point.*

    f. *Each group that answers correctly will get 10 additional seconds to write what subject in school is important to develop skills needed for the career. Each group with correct subjects will earn 2 additional points.*

3. Ask groups if they have any questions. Display the first scenario and set the timer. Continue play until all scenarios have been discussed.

Wrap-up:

Ask youth if anyone would be interested in one of these careers. Ask if anyone knows anyone who works in a health field. Discuss other healthcare careers, such as nurse, speech therapist, pharmacist, etc.