

Problem Solvers Activity SE 14: Bodies Have Bones

CHILDREN ARE LEARNING...¹

Science Content:

- Bones are the hard parts of our body under the skin.
- Bones give our bodies form and structure and protect our body parts.
- Bones can be visible through x-rays.
- Some animals have no bones inside their bodies. Instead, their bodies are protected by a hard covering called an exoskeleton.

CHILDREN ARE DOING...

Science Practices:

- Make observations
- Ask questions
- Develop and use models

MATERIALS NEEDED:

Play-dough, 1 container per child

Materials to represent bones such as: cotton swabs, toothpicks, craft sticks, twigs from outside, straws, pipe cleaners/chenille stems, etc.

Small cups or bowls, to hold materials above

Tray

Handout 1: Our Skeleton

Handout 2: Animals with Exoskeletons

Handout 3: Human X-Rays

Handout 4: X-Rays and Matching Animals

PREPARATION:

- **For the ENGAGE activity:**
 - Print **Handout 1**.

¹ Adapted from the Next Generation Science Standards (kindergarten): <https://www.nextgenscience.org/>

- **For the EXPAND activity:**
 - Print **Handout 2**. Review the images and note the hard shell (exoskeleton) on each animal. Keep aside until the discussion of exoskeletons.
 - Place cotton swaps, toothpicks, craft sticks and pipe cleaners in separate bowls or cups. Place the cups on a tray along with the play-dough.
- **For the EXPLORE activity:**
 - Print **Handout 3**. Review to make sure you can identify the various body parts shown here. Keep aside until the opening discussion of x-rays.
 - Print the images on **Handout 4**. Put the dog, duck, iguana, and snake images in one pile. Place the matching x-rays for the dog, duck, iguana, and snake in a separate pile. Shuffle the x-ray images.
 - *Optional:* If you are going to play two rounds of the matching game, keep the remaining images (fish, hawk, turtle, human) and matching x-rays (for fish, hawk, turtle, human) aside in separate piles.

Activity Instructions

ENGAGE

Gather a small group of 4 children in a circle on the floor. (Note: Groups of 6 children work well if you are teaching 4-year-olds. Adjust materials as needed.)

INTRODUCE: Today we are going to talk about something that is inside our bodies...bones! What do you know about bones? *(Encourage children to share their knowledge. Common themes often include: bones/skeletons as a part of Halloween decorations, dogs with bone toys or treats, people they know who have had broken bones, knowledge of meat with bones inside—like chicken drumsticks or pork ribs).*

ASK: Use questions like the ones below to explore children's knowledge of and curiosity about bones:

- What do you know about bones?
- What questions do you have about bones? *(Note these on a flip chart or whiteboard.)*
- Have you ever seen a bone? What does it look like? What does it feel like?
- Do you think bones grow? What do you think makes bones grow?
- Do you think humans have a lot of bones or just a few? What makes you think that?
- What do you think humans would look like if we didn't have any bones? *(Take a moment to have children act out how they think they would look with no bones. Would they be able to sit? Stand up?)*
- What do you think is important about bones?
- Do you think all animals have bones or just humans? What makes you think that?

EXPLAIN:

- Bones are the hard parts under our skin—let's try to find a bone. Touch your arm or your knees or your chin. Do you feel any hard parts under your skin? You are feeling your bones!
- We have bones from the tips of our toes to the top of our head. Together, all of our bones form our skeleton. Have you ever heard that word before? Here is a picture of a human skeleton—here are all our bones. (*Show **Handout 1.***) Humans have 206 bones, that's a lot!
- Our skeleton gives our body support and helps to form our shape. Bones are strong enough to support the weight of our bodies.
- Bones also help to protect our bodies. For example, bones like your rib cage (*point on the skeleton image, point to your own ribs, and encourage children to find their rib cage*) protect your heart, lungs, and other body parts.
- All of you were tiny babies once, but then you grew! Your bones helped you get taller. Do you know how? Bones are living, growing things. Your bones are getting a little bit larger, heavier, and longer every day, and that makes you taller.
- You can help your bones grow by eating foods that have a mineral called calcium. Calcium makes our bones stronger. Foods like milk and cheese, broccoli, tofu, nuts, and fish like salmon have lots of calcium. Do you know what else helps your bones grow? Exercising, playing, and running around helps your bones grow strong and long too!

TEACHER'S TIP:

Since skeletons are so often associated with scary, spooky themes, it's important during this part of the activity to normalize the skeleton. A skeleton is not scary. A skeleton just shows us what our bones look like inside our bodies, under our skin.

EXPLAIN: Today we are going to discover more about bones. We're going to learn how doctors can see your bones, even though they are inside your body. And we're going to make a model of a bone. Let's start!

EXPAND

EXPLAIN: Do you know what's amazing—every single one of our bones has a different name! Let's learn some of the names of our bones.

(Use this as a movement activity. Encourage children to stand and point to/touch/bend these different bones as you introduce them. Prompt children to repeat the names of these different bones. While the vocabulary is complex, exposure to these new terms gives children a deeper understanding of the concept of bones.)

- Let's start with our skull. Has anyone heard the word **skull** before? It is the name of the bone that protects our brain and supports our face structure—like our nose and eye openings. Can you feel your skull? (*Demonstrate touching your own skull.*)
- We learned about **ribs** earlier. They are the curved bones that protect our lungs and heart. Does anyone remember where they are? Can you feel your bumpy ribs?
- Now this next bone is tricky for us to reach. It's called your **spine**. Your spine is actually a collection of bones that go down the middle of your back in a line. Your spine helps you stand, bend and twist. Can you reach back and try to touch part of your spine? (*If children are having difficulty, you can offer to touch their spine so they know where it is.*)
- The next bone we're going to discover is the bone in your thigh. It's called your **femur** (*pronounced fee-mer*). Can you touch the top of your thigh and see if you can feel something hard inside your leg? Can you lift your femur?

- Now walk your hand down your thigh to your knee. Our kneecap has a special name called a **patella**. Our kneecap is pretty hard so it's easy to find that bone! Let's see if we can touch it.
- Finally, our fingers and toes have bones too. These small bones have an interesting name. They are called our **phalanges** (*pronounced fah-lan-jeez*). Let's wiggle our phalanges!

IMPLEMENT: Gather children at the table. Place the tray with bone materials on the table. Keep the play-dough close by.

INTRODUCE:

- Now we're going to make a model of a bone. A **model** is a way of showing us something that we usually can't see on our own, like how a bone sits inside our bodies.
- We've talked about how a bone is the hard part under our skin. Bones help to support our skin and give our bodies form.
- We have some materials on the tray that can be a model for our bone. We have (*point to each*): cotton swabs, toothpicks, craft sticks, and chenille stems.
- Can you choose one of the materials on your table to be a model for your bone? (*As children explore the materials, ask what made them choose their selected material to represent bone. There is no "right answer" here—each material could potentially represent bone.*)
- Now, let's complete our model. What is on the outside of our body, covering our skeleton? (Skin.) Now we are going to use play-dough to be a model for our skin. You can use the play-dough skin to cover your bone. (*Remind children to cover their "bone" completely: Can they see any bones through their skin? No, because our skin completely covers our bones.*)

SHARE: Invite children to show their model to their peers and discuss the material they chose to represent bone. Note that children may be interested in removing the play-dough "skin" and discovering the bone underneath—this is fine! This type of repetition helps children to internalize the concept of bones existing under the skin.

ASK: We've been talking about animals that have a spine and skeleton. But do you think that *all* animals have a skeleton? What about animals like insects: bees, flies, or ladybugs? What about spiders? Or animals like crabs and lobsters...do you think they have a skeleton? (*Take children's ideas.*)

EXPLAIN:

- There are some animals, like bees, flies, ladybugs or spiders that don't have a spine or a skeleton *inside* their body.
- Instead, they have a hard covering on the *outside* of their bodies. This is called an **exoskeleton** and it means "outside skeleton."
- The exoskeleton is like a hard shell that supports their body and protects them. Animals like crabs and lobsters have exoskeletons too. Let's look at this picture and see if we can find the exoskeleton on these different animals. (*Show **Handout 2**.*)
- When animals with an exoskeleton grow, their soft inside parts get bigger. But their exoskeleton stays the same size. Uh-oh, what do you think happens then? (*Take children's ideas.*) When the animal's inside body gets too big for the exoskeleton, the exoskeleton splits open and falls off! This is called **molting**. The animal's body grows a new exoskeleton that is just the right size for its new, bigger body parts!

SUMMARIZE:

- Bones are the hard parts of our body under our skin.
- Bones give our bodies form and shape. Because they're very strong, our bones can also protect our other body parts.
- Our collection of bones is called our skeleton. For animals that have a spine, our skeleton is on the inside of our bodies.
- For animals that don't have a spine—like crabs, bees, flies, ladybugs, and spiders—they have a skeleton on the outside of their body. This is called the exoskeleton. The exoskeleton gives their body strength and also protects them.

EXPLORE**EXPLAIN:**

- When someone takes a picture of you, like when your grown-up takes a picture of you on their phone, does it show your outside face and skin or does it show your bones inside? That's right, usually photos show your outside—like your face and body.
- But doctors can use a special kind of picture, called an x-ray, to see through your skin to the bones underneath. The doctor who takes x-rays and can tell us what is happening in these pictures is called a **radiologist**.
- The radiologist uses an x-ray machine to take a picture that shows your bones on the inside. Let's look at some x-rays together. (*Show **Handout 3** and ask children to guess which body part is being shown in each image. See if they can point to each place on their own bodies.*)

TRY IT:

- We are going to play a game using X-rays. We're going to pretend to be radiologists!
- I am going to show you 4 pictures of animals. Then I will put down a set of 4 x-rays.
- You will choose an x-ray from the pile. You will pretend to be a radiologist and look at the x-ray. You can try to imagine what animal skeleton the x-ray is showing us.
- Then you can choose the animal picture that matches the skeleton in the x-ray.

IMPLEMENT:

- Display the four prepared animal images (the dog, duck, iguana, snake). Name these four animals, if children are not familiar with them. Shuffle the four x-rays and place them face-down in a pile.
- Give each child a turn to select an x-ray and find its matching animal image. As children select, ask them to share what clues they used to decide which animal it was.
- *If time allows*, display the fish, human, turtle, and hawk images. Place their matching x-rays in a pile face-down, and play a second round of the game.

SUMMARIZE:

- X-rays are a special kind of picture that shows all the bones we have on the inside, but it doesn't show anything on the outside of our body, like our skin or faces.
- X-rays can tell us if our bones are healthy or if we have broken a bone.
- We can look at the skeleton in the x-ray and know what kind of animal it is.

REFLECT

To close the activity, use a reflective question/s - like those below - to prompt children's thinking about bones.

- What do you remember about bones from our activity today? What did you like best?
- What do you want to tell your grown-up about bones?
- What do you think is the most important fact about bones that we learned today?
- Tell me how you made your model of bones and skin. How did you choose your materials?
- What did you enjoy about exploring bones?
- What do you still want to learn about bones?

SUMMARIZE: Today we learned about bones and skeletons. We discovered that every single bone has its own name and we made a model of a bone. We learned that there is a way to take a picture of our bones, called an x-ray, and that we can use the x-ray to make sure our bones are healthy. You can match the skeleton in an x-ray to the animal by using their bones as a clue!

Individualizing the Activity

Make it more challenging:

- In the **Engage** activity, children learn that humans have 206 bones. Together with children, count out 206 paper clips or pennies and put these in a box. Show children the collection and explain that these represent all the bones they have. Let children touch/explore. Talk about whether they think this is a lot or a little bit of bones. **Note:** Both paper clips and pennies could be choking hazards, so supervise carefully and place these materials out of children's reach when the activity is complete.
- In the **Expand** activity, once children have completed a bone model, ask if they would like to create a model of the ribs. Give each child a small paper cut-out of a heart and think together about how to place "bones" over the heart to protect it. Use Handouts 1 (skeletons) and 3 (human x-rays) to guide children's understanding of anatomy. A "pancake" of play-dough, paper towel, napkin, or cloth can be used as "skin" to cover the ribs.
- In the **Expand** activity, give children the opportunity to make a model of an exoskeleton by wrapping chenille stems around a ping-pong ball or large pom-pom. If children are interested in animals with exoskeletons, this video (<https://www.youtube.com/watch?v=8pEsPi1VKe4>) shows the process of a blue crab molting (especially 1:00-1:57).
- In the **Explore** activity, split the children into pairs and give each pair 4 images/x-rays to match up together.
- For a more challenging literacy experience, seek out the book *Give Me Back My Bones* by Kim Norman which depicts a skeleton's attempt to put itself back together, using anatomically correct names for all the bones.

Make it less challenging:

- In the **Expand** activity, limit the materials offered to children for the bone model to two choices. Provide more guidance, as needed, to help children complete the model—for example, having them touch the bones in their arm or knee and imagine what materials might be hard like those bones.
- In the **Explore** activity, lead the x-ray/animal matching activity as a group. Skip the discussion of animals with exoskeletons.

MAKING CONNECTIONS ACROSS THE DAY:

- Talk about healthy eating as a way to help with growth at mealtimes and snack-times. Note that children may mention bones in meats they eat at home—sometimes it is a shock to children that the bones in their food mean that they are eating an animal! You can validate: Some humans eat meat and some humans do not eat meat. It is a family choice.
- Add the x-ray/animal matching game to the classroom's free play choices.
- Invite parents/community members who work in the health care field to visit and talk with children about staying healthy and how doctors can fix bones.
- Partner with children to make a cardboard box "x-ray" machine for the pretend play area. Add a clipboard, dolls, stuffed animals, and animal x-ray images (printed from the Internet) to spark pretend play with an x-ray theme. You can also provide some bandages for children to wrap their stuffed animals' "broken bones."
- Notice animals that have skeletons when you are outside: birds, dogs, chipmunks, other humans!
- Notice animals with exoskeletons when you are outside: ladybugs, beetles, bees/flies, spiders, etc. Model how to be a good scientist and carefully observe these small animals. Offer children a magnifying glass, clipboard, paper, and pencils to draw these animals in their habitat.

Song: *Bones!*

Model the movements suggested in the song. Encourage children to move like you do, clap their hands, and/ or dance freely!

Hey everybody, gather near. (Clap hands)

There's something important gotta tell you here!

In everybody's body is a skeleton,

And that skeleton is made of lots of...

Bones, bones, bones, gotta have bones! (Keep clapping)

Inside our head there is a skull. (Point to head)

It keeps our brain safe if we ever fall. (Shake head side to side)

Let's shake our heads to the steady beat,

Cause we're doing this dance, and it's really neat...about

Bones, bones, bones, gotta have bones! (Clap hands)

Along our backs, we have a spine. (Point to spine)

It can move, it can groove, and it's really fine. (Move back and shoulders)

Let's wiggle our spine from our neck to our hips,

Cause we're doing this dance, and it really rips...about

Bones, bones, bones, gotta have bones! (Clap hands)

At our hips we have a pelvis (Point to hips)

We can shake it all around, just like Elvis! (Shake hips side to side)

Let's shake it side to side and keep on moving

Cause we're doing this dance, and it really grooves...about

(Clarinet interlude) (Clap hands)

At our knees we have patellas (Point to knees)

They help our knees bend; they're really good fellas (Bend knees up and down)

Let's bend our knees both up and down

Cause we're doing this dance, and it's the best in town...about

Bones, bones, bones, gotta have bones! (Clap Hands)

At our feet we have phalanges. (Point to toes)

The bones in our toes can wiggle like banshees! (Wiggle toes)

Let's move our toes all around,

Cause we're doing this dance without a sound...about

Bones, bones, bones, gotta have bones! (Clap hands)

Now there are some animals like spiders and flies (Wiggle fingers like a spider)

That don't have a spine or bones inside. (Shake head no)

They have armor that they can't hide;

Their exoskeleton is on the outside! (Free dance, whole body)

Bones, bones, bones, gotta have (Clap hands)

Bones, bones, bones, gotta have bones!

(Spoken) Gotta have bones!

Making Literacy Connections

Share the following book with children as an opportunity to deepen their understanding of the skeleton.

Suggested Book: *Bones* by Stephen Krensky

AS YOU READ:

- On the first page, the text suggests actions (walk, jump, bend your knees, hold your nose). Can children perform these movements? Their bones are helping out!
- On the next page, pause as you read: "These bones fit together perfectly. Together they form your... (pause)." See if children will fill in the word "skeleton."
- On the next page, encourage children to find one of their bones and feel its shape, as suggested by the text.
- The next page talks about where the biggest and smallest bones in the body can be found. Pause after you read this page and say, "I think we just learned an important fact. Does anyone remember where the smallest bones in our body are? The biggest bones?"
- The book talks about how the skull protects our brain like a helmet. Ask children, "In the illustration, I see a child riding a bike wearing a real helmet. Why do you think it's important to wear a helmet?" (To protect our skull and brain in case we fall.)
- On the page about Halloween, ask the children in your classroom if they think skeletons are scary. What makes them think that? **(Skip this page if your community does not celebrate Halloween.)**
- Ask children if they have ever done a somersault. Was it hard? Was it fun? If they did, it's because the joints in their spine helped them to bend!
- On the page about broken bones, point out the x-ray in the illustration. Can children see if the bone is broken?
- The book briefly mentions fossils like dinosaur bones. What do children know about dinosaurs? Dinosaur bones have been discovered buried underground by scientists called **paleontologists**. They carefully find and dig up dinosaur bones so we can learn about these animals. Dinosaurs are no longer alive so we use their bones to learn what they might have looked like, what they might have eaten, and where they lived.
- Ask children to use their knowledge to predict whether a squirrel has bones smaller or larger than a human. What about a horse?
- Ask children to pretend to be a boneless blob, like in the picture. Then they can stand up, stretch, and use their skeletons to be tall and strong.

BUILD ON THE BOOK: FINDING FOSSILS

Materials: Cardboard cut into small bone shapes (or plastic bones), sand box or sensory bin.

Hide dinosaur "bones" in your sandbox or sensory bin. Tell children they will be paleontologists and try to find the bones in your classroom sandbox. Give children small spoons, tweezers, and paintbrushes to explore the box and discover these bones.

For children who are very interested in this topic, the book *Digging Up Dinosaurs* by Alike is a nonfiction title written for school-age children, but the text can be summarized for interested preschoolers. It also has clear, descriptive illustrations of paleontologists at work.

Handout 1: Our Skeleton



Handout 2: Animals With Exoskeletons



Crab



Beetle



Wasp



Grasshopper

Handout 3: Human X-Rays



Handout 4: X-Rays and Matching Animal

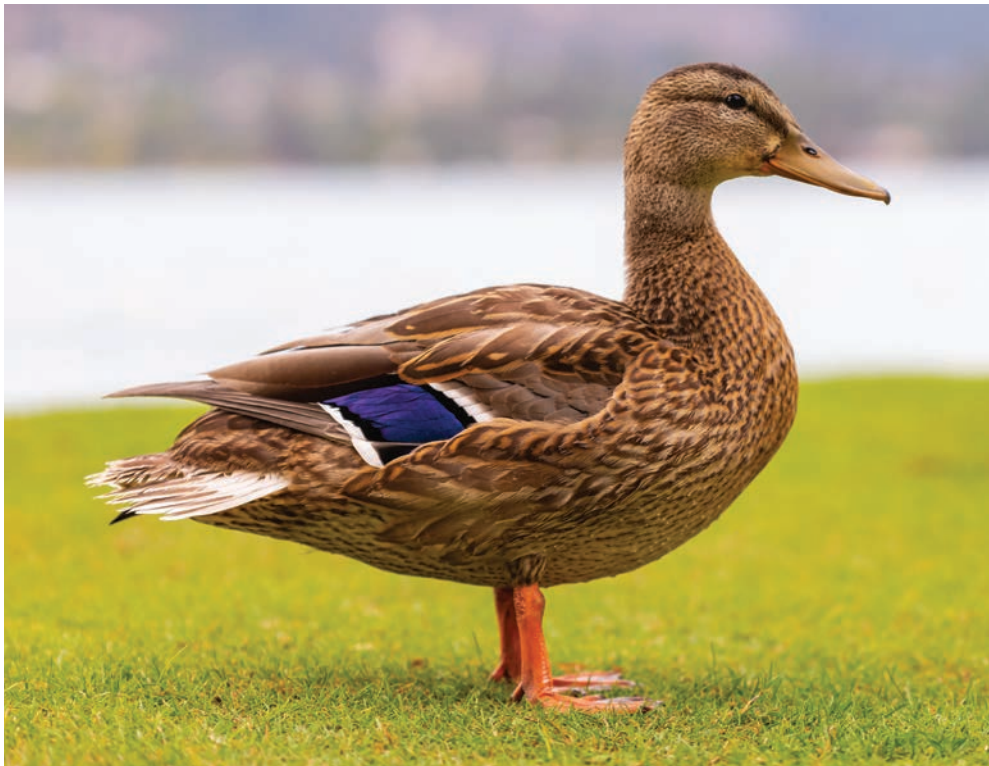
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DOG:



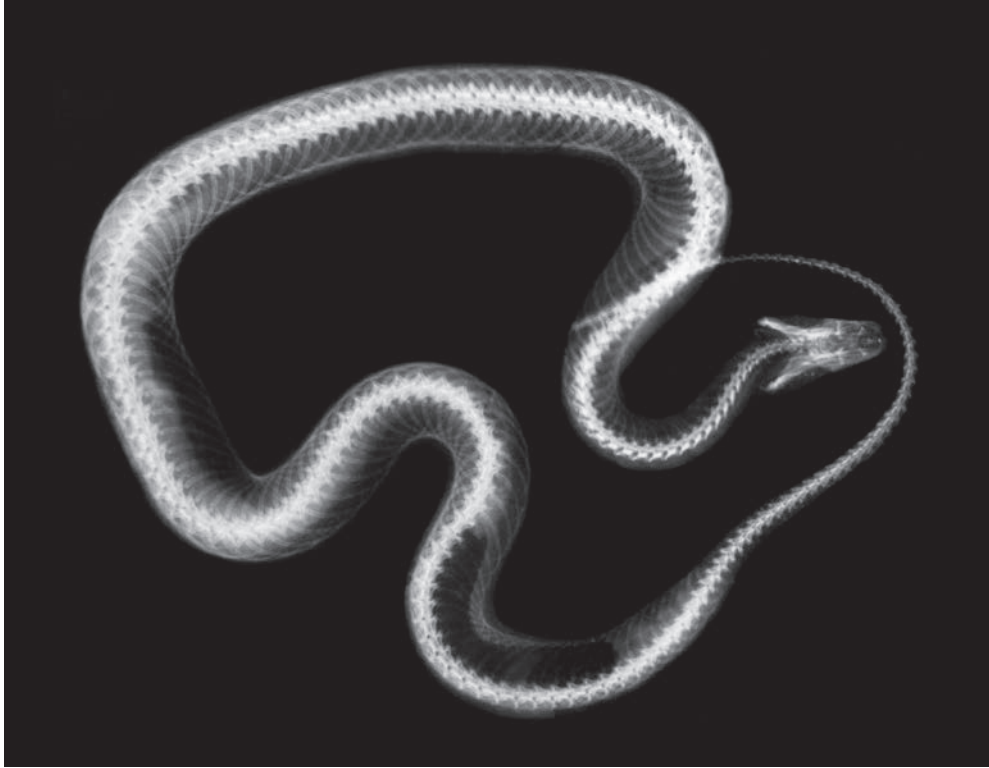
DUCK



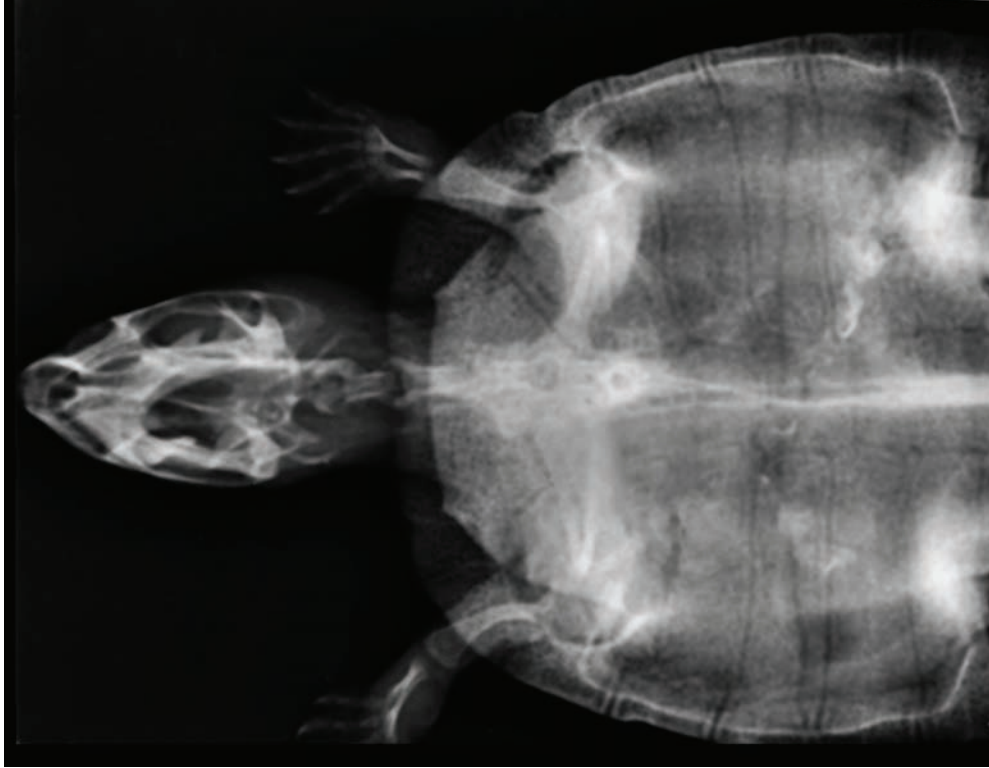
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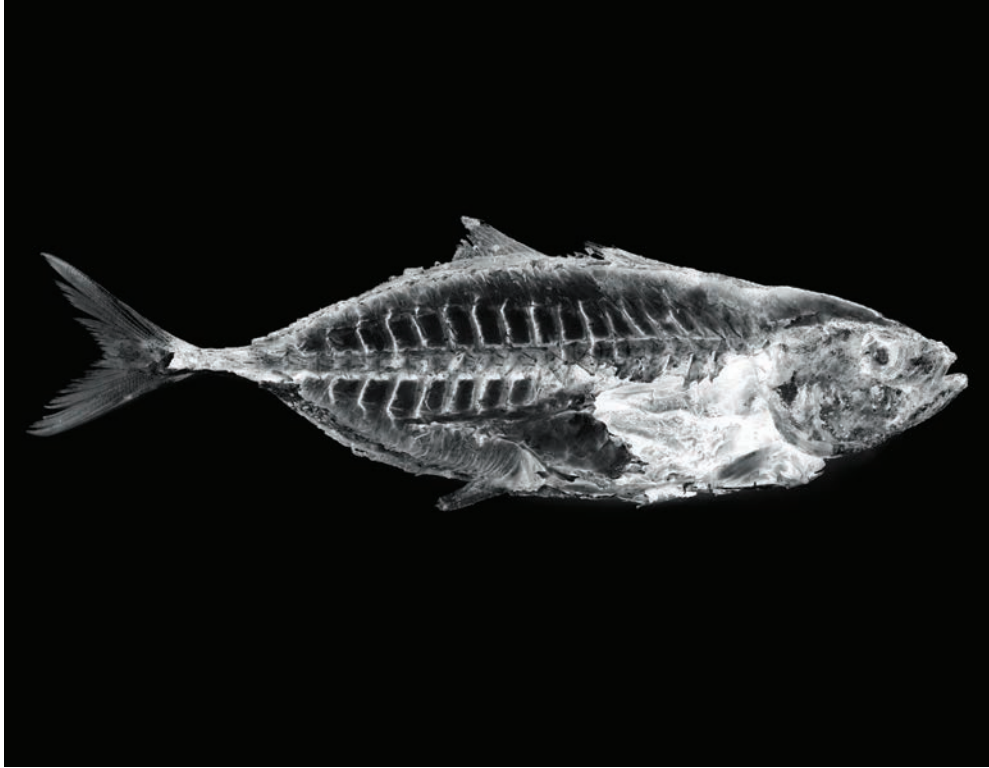
RATTLESNAKE:



TURTLE:



FISH:



HAWK:



HUMAN:



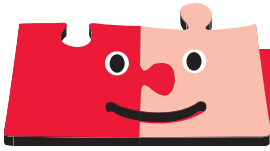


Learning About Bones

This week, children learned about bones and how bones grow. They learned that doctors can see their bones using a special kind of picture called an x-ray. You can help your child think about bones this week when you:

- Make a connection between the foods you serve and how they help children grow strong bones. Foods high in calcium (milk, yogurt, cheese, salmon, tuna, broccoli, kale, soybeans, etc.) are good for bone growth.
- Find time to exercise and play outside with your child each day. Let your child know that active play helps them build strong, healthy bones.
- Track your child's growth on a wall chart. Measure your child's height every few months and notice how they (and their bones!) have grown.
- Find animals in your community—like ladybugs, bees, spiders, or beetles—that don't have any bones. Instead, these animals have a hard shell on the outside of their body (called an **exoskeleton**) that helps to protect them.





Solo para familias

Aprender sobre los huesos

Esta semana, los niños aprendieron sobre los huesos y cómo crecen. Han aprendido que los médicos pueden ver los huesos utilizando un tipo especial de imagen llamada radiografía. Esta semana puede ayudar a su niño a pensar en los huesos cuando usted:

- Establece una relación entre los alimentos que le sirve y cómo ayudan a que los niños tengan huesos fuertes. Los alimentos ricos en calcio (leche, yogur, queso, salmón, atún, brócoli, kale, frijoles de soya, etc.) son buenos para el crecimiento de los huesos.
- Dedica tiempo a hacer ejercicio y a jugar al aire libre con su niño todos los días. Dígale que el juego activo le ayuda a tener huesos fuertes y sanos.
- Para saber si su niño está creciendo de acuerdo con su edad, anote su estatura en un gráfico colocado en la pared. Marque la estatura del niño en ese gráfico a intervalos de pocos meses y observe cómo han crecido, tanto el niño como sus huesos.
- Busque animales pequeños en su comunidad – como mariquitas, abejas, arañas o escarabajos – que no tengan huesos. En lugar de huesos, estos animales tienen un caparazón duro en el exterior del cuerpo (llamado **exoesqueleto**) que les ayuda a protegerse. ¿Pueden usted y su niño observar el exoesqueleto de estos animalitos?

