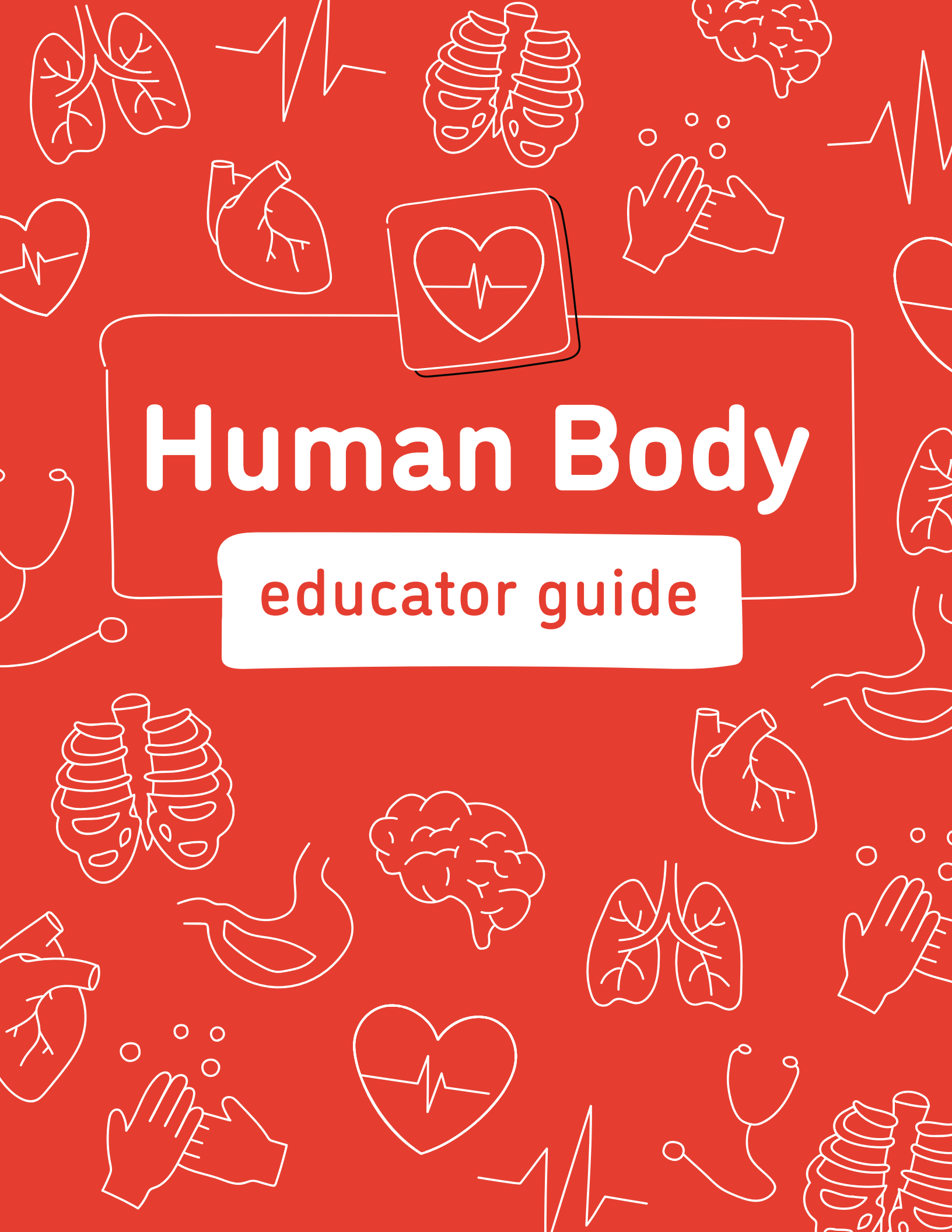

# Human Body

## educator guide

# WELCOME TO THE HUMAN BODY Educator Guide!

In this Educator Guide, you'll find Grade Banded Learning Standards aligning to each of the activities. You will also find a QR Code linking you to COSI Connects, an online universe of science through videos, activities and so much more! COSI Connects also includes a section called Community Connects, a digital hub for online and in-person resources from museums, cultural institutions, and other nonprofits.

**COSI Connects**

For additional resources, including book recommendations, and video instructions for completing each of the activities inside your box be sure to check out **cosi.org/connects/kits/**.

**For questions regarding the content inside this educator guide, please email ScienceQuestions@cosi.org.**

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# Facilitating STEAM Learning with Kits

## Kits Overview

COSI Connects Kits contain carefully designed hands-on STEAM activities that support fun, engaging learning about a topic or theme. Each box comes with:

- **Supplies**: Materials for activities are in the box
- **Activity book:** This guide provides directions for setting up and completing activities, explains relevant STEAM content knowledge and skills, and offers discussion prompts to deepen the learning experience
- **Instructional videos:** Each kit has a QR code linking you to short videos demonstrating how to complete different steps of the activities. If you cannot scan the QR code, you can find the videos online at **cosi.org/connects/kits**. Click on your kit, then click the "Parent/Educator Resources" tab.

## Goals for Using Kits

At COSI, we know science is everywhere and for everyone. To reinforce this message, we've designed our kits to do so much more than just teach STEAM content knowledge. Every kit, regardless of the content or topic, also provides important non-content learning opportunities such as:

- Engaging with STEAM in fun, inspiring, and creative ways
- Making sense of scientific observations
- Seeing oneself as a capable, welcome, and valued STEAM community member
- Practicing a growth mindset by valuing effort and learning over ease and knowing
- Bonding with peers, family, and educators over shared experiences and excitement

## Techniques for Facilitating COSI Connects Kits

Decades of research show that learning is rarely as straightforward as receiving information. This is especially true when the goal is to *understand* and *apply* information, not simply recognize and repeat it. Learning and understanding requires the student to make sense of the information for themselves: Have they heard anything like that before? Does it make sense? Does it support or contradict something they already know? Is it useful or interesting enough to warrant the effort to learn and remember it?

When helping your learners accomplish the goals of using a COSI Connects kit, you'll want to ask more questions than you answer (unless they're practical or logistical questions about the directions).

Why? For a few reasons:

1) If learners have a question in mind before doing an activity, or before doing a step of the activity, they'll be primed to notice information that is useful for sense-making or question-asking.
2) This technique helps you model the process of science for your learners. Instead of assuming what they do or don't know and thus what you need to tell them, you are being curious, collecting data (their knowledge and ideas) and interpreting those data to decide how to most effectively help them.
3) This invites critical thinking: you can follow most questions with things like, "Why do you think that?" or "What did you observe during your activity that makes you think that?"
4) It shows your learners that you are interested in their experiences, and that you find them valuable and interesting to know.
5) If something isn't working, it can help you troubleshoot the issue: Did they skip a step? Use a different material? Was the reaction really fast or really subtle and they missed it?

Make sure you ask your questions with curiosity and openness: you are asking the question because you want to learn your learners' answers, not because you will try to change their minds (even if you do want to!). This will help them feel more comfortable sharing, which will deepen and sustain their conversations and learning.

| Technique | Examples of Effective Questions |
|---|---|
| **Model the scientific method before, during & after**<br>Model the scientific method before, during & after<br>Scientists work together to collect information (evidence) they can use to answer questions about how things work, why things happen, or even if/when things *will* happen!<br>They collect this evidence by learning from their peers, making observations, and conducting experiments. Additionally, scientists are never "done" learning: experiments often leave scientists with more questions than answers, which is exciting! | · What questions could we answer by doing this activity?<br>· What information could we collect to answer that question? What changes or results could we look for?<br>· What do you think will happen? Why?<br>· What information or knowledge did you use to come up with your answer?<br>· What new questions do you have? What about those questions is interesting to you? How would you collect evidence to answer your questions? |
| **Focus on ideas rather than terminology**<br>If a learner is having a hard time with a particular word or phrase (pronouncing, understanding – anything!), help them find other words to use instead. It's more important for learners to learn by making sense of ideas and practicing skills than it is for them to use terminology correctly. | · What are other words that mean the same thing?<br>· How would you explain it to a younger sibling?<br>· Can you act out the word, or draw the word?<br>· Is there a similar word that means something different, and that's making this feel confusing?<br>· How can you remember the information/skill even if you forget the specific word(s)? |

| | |
|---|---|
| **Help learners see themselves as scientists by challenging negative misconceptions**<br><br>Importantly, "science" is a *process*, not a product - science is not simply a collection of information or facts. Science is a process of asking questions, making observations to collect information, and thinking carefully to make sense of the information.<br><br>The goal of science is not to "prove" that a certain idea is "right," or to get "the correct result" from doing an experiment. If an experiment produces an outcome that suggests a scientist's idea was wrong, that's great because there is something new to be learned!<br><br>A "good" scientist is not somebody who is already very smart, works all by themselves without any help, and never makes mistakes. A "good" scientist is curious, collaborative, and learns from their mistakes. | · What does the word "science" mean to you?<br>· Do you think science is interesting? Fun? Exciting? Scary? Boring? Why?<br>· How do we use science to learn about things?<br>· How does science help us understand things?<br>· How do you use science to understand things?<br>· What does the word "scientist" mean to you?<br>· What does a scientist do?<br>· What makes somebody a "good scientist" or "good at science"?<br>· Do you think you can be a scientist?<br>· How are you like a scientist every day?<br>· What attributes make you a good scientist?<br>· Why do you think it's more important for a scientist to learn from mistakes than to never make mistakes?<br>· Have you ever made a mistake that helped you learn something really useful? |
| **Invite sense-making and peer discussion**<br><br>It's great for learners to have questions because that means they're curious, and they have the opportunity to learn something new! Ask your learners to share what kit activity information and experiences they're curious or confused about and want to understand better. Ask other learners in your group to share how they figured something out.<br><br>This is especially helpful when you have learners who want to work more quickly than others: capitalize on their energy and help them engage more deeply! | · Was any part of the kit activity surprising, strange, or even counterintuitive to what you expected?<br>· Why do you think that was surprising/strange/counterintuitive – what made you think that something else would happen?<br>· Did any part of the kit activity not make sense?<br>· Did you see or try anything in the kit activity that helped something make sense?<br>· Do you have any other information or experiences from before the kit activity that helped something make sense? |
| **Explore real-world connections**<br><br>Learners are more likely to value the effort required to learn or complete a task if they believe the results will provide something useful and relevant. Personal connections can also help learners see themselves as capable STEAM community members and practitioners. | · Is this something you've ever wondered about?<br>· Would a friend or family member find this interesting?<br>· How could you use something you learned from this activity in your own life?<br>· How could you use something you learned from this activity to help someone else? |
| **Reflect on progress and experiences**<br><br>At the end of each activity, or even after a step within an activity, ask your learners questions that help them see things like:<br>· They learned a new fact or skill<br>· They had a fun/cool/interesting experience<br>· They overcame an obstacle and achieved success<br>· They are scientists and they're doing science<br>· They changed their mind with new information<br>· They turned a "mistake" into a learning opportunity<br>· They wondered new and interesting questions | · What is the most interesting thing you learned?<br>· Was anything confusing at first, but now you understand it better?<br>· Was anything frustrating at first, but it helped you learn something?<br>· Why was it confusing at first? How did you get to understand it better?<br>· What is something you learned that you want to tell a friend or family member?<br>· What is something you learned that you want to use in your everyday life? |

# Kit Accessibility Tips

This is an additional resource to support the success of learners. Below are tips and tools from COSI's accessibility experts that can be used when adapting for learners.

## Fine Motor Adaptations

- Get creative! When completing a movement required activity, think of different ways to accomplish it, like moving an object by attaching it to a wheelchair.
- If an object is too small to handle, swap for similar but larger objects, like switching a bouncy ball for a basketball. You can also attach the smaller object to a larger one to make it easier to hold.
- Use hand over hand to support students when completing fine motor tasks.
- For the writing portions, provide notepaper to give extra space for writing.

## Blind and Low Vision Adaptations

- Use puffy paint on the activity book images to create additional tactile images.
- Use manipulatives (objects) for students to touch when explaining how something works to help students process what is happening.
- Use the camera on a phone or tablet to magnify the words and images in the activity book.

## Deaf Adaptations

- Utilize COSI's demonstration videos with closed captioning when completing an activity.
- Visually demonstrate the activity steps.

## Cognitive Adaptations

- Break the activity into smaller steps to make processing easier.
- For harder to understand concepts use manipulatives (objects) to explain or relate to a practical process.
- Model the steps for the child to follow and complete at the same time.
- Ask leading questions to help students problem solve. For example: "How could you change the shape of the wings to make it fly better?"

## Speech Adaptations

- Have students present in alternate ways, like with drawings or by demonstrating what they did.

# Standards Alignment and Extension Questions

The following pages will include Ohio Learning Standards and Next Generation Science Standards that are aligned with each activity in the kit. In addition to these standards, you will find extension questions to scale up or scale down the content of each activity according to your students' abilities or grade level. These extension questions are arranged in grade level bands of Kindergarten – Second Grade, Third – Fifth Grade, and Sixth – Eighth Grade. Each set of these questions are also aligned with both Ohio Learning Standards and Next Generation Science Standards.

Throughout the kit activities, your students will find opportunities to write down their scientific findings and connect to digital learning resources through COSI Connects. This will allow them to fulfill the Ohio English Language Arts, Technology, and Digital Literacy Learning standards listed below.

## Kindergarten – 2nd Grade

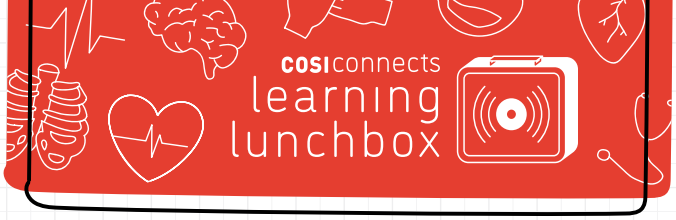
- K-2.ICT.3.b.: Use visuals found in digital learning tools and resources to clarify and add to knowledge.
- W.K.2: Use a combination of drawing, dictating, and writing to compose informative/ explanatory texts that name what is being written about and supply some information about the topic.
- W.1.8: With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question.
- W.2.8: Recall information from experiences or gather information from provided sources to answer a question.
- K-2.ST.2.a.: Communicate and collaborate using several digital methods.

## Third Grade – Fifth Grade

- 3-5.ICT.1.a.: With guidance, identify and use digital learning tools or resources to support planning, implementing and reflecting upon a defined task.
- W.3-5.10: Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.
- 3-5.ICT.4.d.: Produce and publish information appropriate for a target audience using digital learning tools and resources.

## Sixth Grade – Eighth Grade

- 6-8.ICT.4.b.: Select and use a variety of media formats to communicate information to a target audience.




# Human Body

## ACTIVITY 1 : The Nervous System

Test your Reaction Time and experience Optical Illusions. The nervous system controls everything you do! How fast are signals sent through the nerves in your body? Use our Reaction Time Ruler to find your own reaction time!

### Ohio Learning Standards

**Kindergarten Science K.LS.1:** Summarize numerical data sets in relation to their context and find the quantitative measures of center (median and/or mean) for a numerical data set and recognize that this value summarizes the data set with a single number.

**6th Grade Science 6.LS.4:** Living systems at all levels of organization demonstrate the complementary nature of structure and function

### Next Generation Science Standards

**K-LS1-1 From Molecules to Organisms: Structures and Processes:** Use observations to describe patterns of what plants and animals (including humans) need to survive.

**3-PS2-2 Motion and Stability: Forces and Interactions:** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

**MS-LS1-8 From Molecules to Organisms: Structures and Processes:** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

GRADES K–2

### Extended Learning Questions:

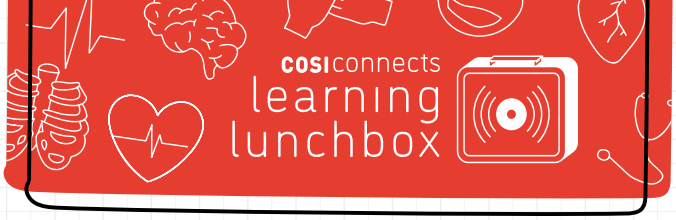
1) Play a game of Red Light / Green Light. How quickly can you react when someone changes the light?
2) Play a game of Freeze: Everyone dances while the music is playing. When the music stops, you must quickly FREEZE! How quickly can you react to the music turning off?
3) Your nervous system controls your five senses. What are your five senses?
4) Go outside to observe some animals. What different animals do you see? Watch carefully. Do they react to people being around them? Why or why not?

### Ohio Learning Standards:

**Kindergarten Science K.LS.2:** Living things have physical traits and behaviors, which influence their survival.

### Next Generation Science Standards:

**2-LS4-1 Biological Evolution: Unity and Diversity** Make observations of plants and animals to compare the diversity of life in different habitats.

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GRADES 3–5

### Extended Learning Questions:

1) What are some examples of everyday things that you need quick reaction time for?
2) Do you think reaction time gets better with practice? Why or why not?
3) When might reaction time be important for survival? Think about humans and other animals – when do you need to react quickly?
4) Choose one sport. Why might athletes who play that sport need good reaction time? Look online to learn more about reaction time for that sport. Write a paragraph describing what you learned.

### Ohio Learning Standards:

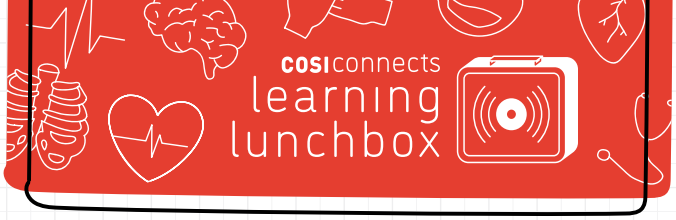
**3rd through 5th Grade ELA W.5.2:** Write informative/ explanatory texts to examine a topic and convey ideas and information clearly.

**3rd Grade Physical Education Standard 2.2:** Explain how appropriate practice improves performance.

### Next Generation Science Standards:

**4-LS1-1 From Molecules to Organisms: Structures and Processes** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

**4-LS1-2 From Molecules to Organisms: Structures and Processes** Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.




# Human Body

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GRADES 6–8

### Extended Learning Questions:

1) What do you think is the difference between visual reaction time and auditory reaction time? Develop an experiment to determine whether someone's visual or auditory reaction time is faster.
2) Your nervous system is responsible for the things you sense in the world around you. Pick one sense (smell, touch, taste, hearing, or sight). Research how some animals experience that sense differently from humans. Write a one-page paper explaining the difference and share it with the group.
3) If you had to give up one of your senses, what would it be and why? Do some research on people who are currently living without that sense, or with limitations to that sense. How might their everyday experiences differ from your own?

### Ohio Learning Standards:

**6th Grade English Language Arts L.6.6:** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

**6th through 8th Grade Technology 6-8.KC.3.a.:** Students demonstrate and practice the ability to effectively use research strategies to locate appropriate digital resources in support of their learning.

**Sixth through Eighth Grade ELA W.6-8.2:** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

### Next Generation Science Standards:

**MS-LS1-8 From Molecules to Organisms: Structures and Processes** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

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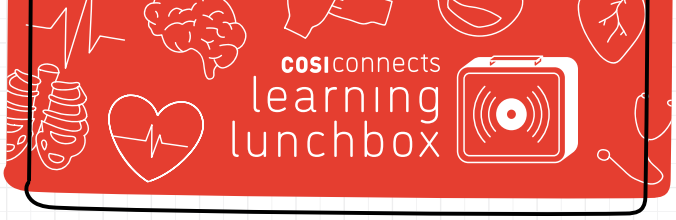
**cosi.org/connects**

COSI Center of Science and Industry




# Human Body

## ACTIVITY 2: The Cardiovascular System

The cardiovascular system is constantly pumping blood throughout your entire body. Learn about the heart as you build a model to show how it pumps blood. Then find your own pulse!

### Ohio Learning Standards

**2nd Grade Science 2.PS.1:** Forces change the motion of an object.

**3rd Grade Mathematics 3.OA.7:** Fluently multiply and divide within 100.

**6th Grade Science 6.LS.4:** Living systems at all levels of organization demonstrate the complementary nature of structure and function.

### Next Generation Science Standards

**K-LS1-1 From Molecules to Organisms: Structures and Processes:** Use observations to describe patterns of what plants and animals (including humans) need to survive.

**2-PS1-1 Matter and Its Interactions:** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

**K-2-ETS1-2 Engineering Design:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

**3-5-ETS1-3 Engineering Design:** Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**MS-LS1-8 From Molecules to Organisms: Structures and Processes:** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

GRADES K–2

### Extended Learning Questions:

1) Look at a picture of a doctor using a stethoscope. Talk about it: what is the doctor doing? Why? Optional: Get a real stethoscope and have students listen for their heartbeat.
2) Sit on the ground for 1 minute. What is your breathing like afterwards? Now get up and jump and run around for one minute! What is your breathing like afterwards? Why?
3) What activities make your heart beat faster?
4) One way to slow down your heart rate is through slow breathing. Go through 5 long, slow, breaths together as a class. Count each one on your fingers. Afterwards, how do you feel?

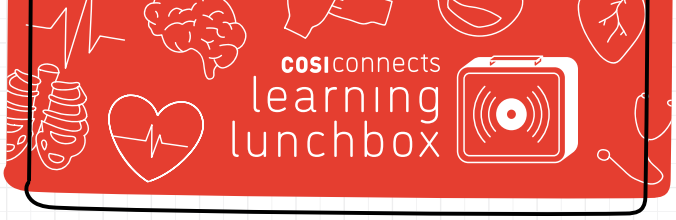
### Ohio Learning Standards:

**Kindergarten Physical Education Standard 3.2:** Recognize that when one moves fast, the heart beats faster and breathing becomes faster.

**Second Grade Physical Education Standard 3.2:** Name activities that increase heart rate.

### Next Generation Science Standards:

**K-LS1-1 From Molecules to Organisms: Structures and Processes** Use observations to describe patterns of what plants and animals (including humans) need to survive.




# Human Body

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GRADES 3–5

### Extended Learning Questions:

1) Take chalk and go outside. Make a chalk obstacle course. Consider options to jump, hop on one foot, touch your toes, etc. Then make your way through the obstacle course!
2) Sit in your chair for 30 seconds. Then, track your heart rate for 10 seconds. Write down your heart rate. Then, walk for 30 seconds and track your heart rate again. Write down your heart rate. Then, run for 30 seconds and track your heart rate again. Write it down. Graph your heart rate and how it changes from sitting to walking to running. What trends do you notice?
3) Name three activities that would result in a low, or resting, heart rate. Name three activities that would result in a moderate heart rate. Name three activities that would result in a high heart rate.

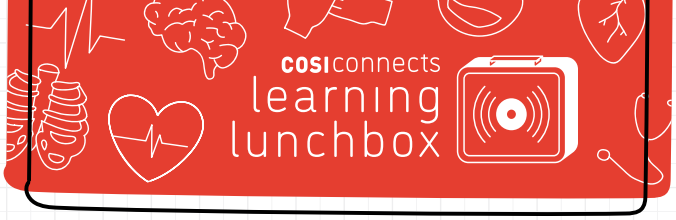
### Ohio Learning Standards:

**3rd Grade Physical Activity Standard 3.2:** Assess heart rate during physical activity and exercise.

**5th Grade Physical Education Standard 3.2:** Interpret heart rate during physical activity and exercise to determine appropriate level of intensity.

### Next Generation Science Standards:

**4-LS1-1 From Molecules to Organisms: Structures and Processes** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.




# Human Body

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The cardiovascular system is constantly pumping blood throughout your entire body. Learn about the heart as you build a model to show how it pumps blood. Then find your own pulse!

GRADES 6–8

### Extended Learning Questions:

1) Why might some people use technology (like phones, pedometers, and watches) to monitor their physical activity? Optional: Predict how many steps you take in a day. Then wear a pedometer or fitness tracker for one week and record the results. Did the results surprise you at all? Why or why not?
2) There are many different ways to keep your body physically active. But sometimes, something that is enjoyable for one person may be stressful to another person. For example, some people like yoga. Others like to take walks. Still others like playing sports. Why might some of these activities be enjoyable for some people but cause stress for others? Think of a few different ways you like to be active. Share with a partner. Do you see any similarities? Any differences?
3) Some animals have hearts that look very different from human hearts. From octopuses, which have three hearts, to wood frogs, whose hearts stop beating in the cold wintertime, to jellyfish, which have no hearts at all. Choose one animal that has a heart that is different in some way from a human heart. Do some research to learn about how that animal's heart works. Write a paper about what you learned.

### Ohio Learning Standards:

**6th through 8th Grade Physical Education Standard 3.1:** Describe and use technology to monitor fitness (e.g., heart monitor, pedometer, phone and iPod apps).

**6th Grade Physical Education Standard 5.1** Identify enjoyable physical activities.

**7th Grade Physical Education Standard 5.1:** Analyze reasons to enjoy specific physical activities.

**8th Grade Physical Education Standard 5.1:** Discuss the reasons for participating in a selected physical activity.

**6th through 8th Grade Technology 6-8.KC.3.a.:** Students demonstrate and practice the ability to effectively use research strategies to locate appropriate digital resources in support of their learning.

**6th through 8th Grade ELA W.6-8.2:** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

### Next Generation Science Standards:

**MS-LS1-3 From Molecules to Organisms: Structures and Processes** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

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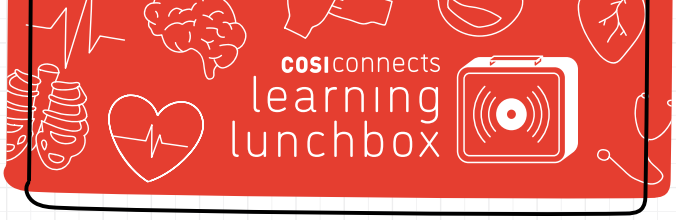
COSI Center of Science and Industry




# Human Body

## ACTIVITY 3 : The Respiratory System

The respiratory system is responsible for helping you breathe: something you do every minute of every day! Make a model of the lungs and learn about diseases that could affect them.

### Ohio Learning Standards

**6th Grade Science 6.LS.4:** Living systems at all levels of organization demonstrate the complementary nature of structure and function.

### Next Generation Science Standards

**K-LS1-1 From Molecules to Organisms: Structures and Processes** Use observations to describe patterns of what plants and animals (including humans) need to survive.

**2-PS1-1 Matter and Its Interactions:** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

**K-2-ETS1-2 Engineering Design:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

**MS-LS1-8 From Molecules to Organisms: Structures and Processes** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

GRADES K–2

### Extended Learning Questions:

1) Where does air go when you breathe it in? Take a deep breath. Watch your belly and chest. Does it get bigger or smaller? What happens when you let that air out?
2) Try breathing air in through just your nose. Now plug your nose and try breathing through just your mouth. Can you grab some air with your mouth and hold it in your cheeks?
3) Does air push or pull things? Try it out – place some empty paper cups on the edge of a table. Now take a big breath of air. Can you use just that air to push the cup off the table?
4) Can you use your breath to make music? What instruments do we use our breath to play? Optional: try some out!
5) Name one thing that might make you breathe faster. Maybe running, jumping, or dancing. Then, try it out! Does it make your breathing faster? What do these things (running, jumping, dancing) have in common?

### Ohio Learning Standards:

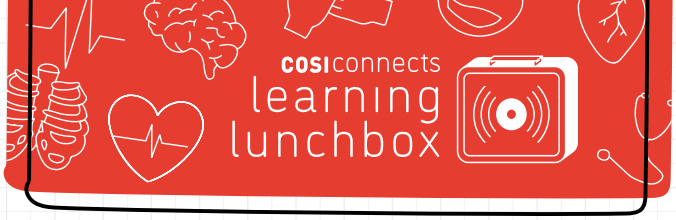
**Kindergarten Physical Education 3.2:** Recognize that when one moves fast, the heart beats faster and breathing becomes faster.

**Kindergarten Science K.PS.2:** Some objects and materials can be made to vibrate and produce sound.

**2nd Grade Science 2.PS.1:** Forces change the motion of an object.

### Next Generation Science Standards:

**K-PS2-1 Motion and Stability: Forces and Interactions** Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.




# Human Body

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GRADES 3–5

### Extended Learning Questions:

1) How much air can your lungs hold? Get a balloon. Take in a deep breath, then blow as much air as you can into the balloon without taking another breath. Compare different peoples' balloons. Are some larger or smaller? What does that mean?
2) Where does the air you breathe go after it gets to your lungs? Do some research about where it goes. Then, imagine you are an oxygen atom. Write a one-page story describing your journey after you are breathed in by a human.
3) How do animals that live in the water get the oxygen they need to survive? If an animal that lives in the water was placed on land, what would happen? Is the answer different for different creatures? Why or why not?
4) How do you think we smell things?

### Ohio Learning Standards:

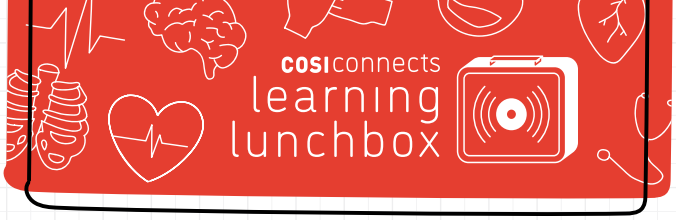
**3rd Grade Science 3.LS.2:** Individuals of the same kind of organism differ in their inherited traits. These differences give some individuals an advantage in surviving and/or reproducing.

**4th Grade Science 4.LS.1:** Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful.

### Next Generation Science Standards:

**3-LS3-2 Heredity: Inheritance and Variation of Traits** Use evidence to support the explanation that traits can be influenced by the environment.

**3-LS4-3 Biological Evolution: Unity and Diversity** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.




# Human Body

## ACTIVITY 3 : The Respiratory System

The respiratory system is responsible for helping you breathe: something you do every minute of every day! Make a model of the lungs and learn about diseases that could affect them.

GRADES 6–8

### Extended Learning Questions:

1) Our bodies need oxygen from air to survive and function. But air has more in it than just oxygen. Look up what different elements and compounds are in air. How do you think our bodies pull out the oxygen? What role do different organs, tissues, and cells in our bodies play?
2) What comes to mind when you think of the term "air pollution"? Are there types of air pollution that are not obvious? Do you know of any current organized efforts to reduce the effects of pollution on these populations? Are there any efforts that you think should exist to reduce the effects of pollution? Write a paragraph about your ideas.

### Ohio Learning Standards:

**6th Grade Science 6.LS.3** Cells carry on specific functions that sustain life.

**6th Grade Science 6.LS.4** Living systems at all levels of organization demonstrate the complementary nature of structure and function.

**7th Grade Science 7.PS.1** Elements can be organized by properties.

### Next Generation Science Standards:

**MS-LS1-2 From Molecules to Organisms: Structures and Processes** Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

**MS-LS2-4 Ecosystems: Interactions, Energy, and Dynamics** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.

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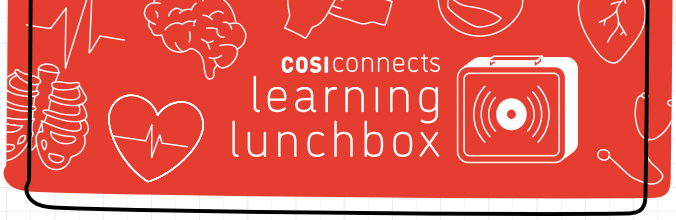



# Human Body

## ACTIVITY 4 : The Digestive System

Learn about the digestive system, which is responsible for breaking down the food you eat and getting the nutrients out of it to your body. Explore how bile works with a fun and colorful activity that uses soap, milk, and food coloring.

### Ohio Learning Standards

**2nd Grade Science 2.PS.1:** Forces change the motion of an object.

**6th Grade Science 6.PS.1:** Matter is made up of small particles called atoms. Molecules are the combination of two or more atoms that are joined together chemically.

**6th Grade Science 6.LS.4:** Living systems at all levels of organization demonstrate the complementary nature of structure and function.

**8th Grade Science 8.PS.2:** Forces can act to change the motion of objects.

### Next Generation Science Standards

**K-LS1-1 From Molecules to Organisms: Structures and Processes** Use bservations to describe patterns of what plants and animals (including humans) need to survive.

**MS-PS1-2 Matter and its Interactions:** Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

**MS-LS1-3 From Molecules to Organisms: Structures and Processes:** Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

**MS-LS1-7 From Molecules to Organisms: Structures and Processes** Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

**MS-LS1-8 From Molecules to Organisms: Structures and Processes** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

GRADES K–2

### Extended Learning Questions:

1) Can you name some foods that you like to eat? Draw a picture of your favorite meal.
2) Why do our bodies need food?
3) Point to different parts of the digestive system as you talk about them. Use sticky notes to label some of the parts on a doll or the teacher! (Your **mouth** chews food. Chewing is an important first step in the digestive process. When you swallow it, it travels down your **esophagus** to your **stomach**. Etc.)

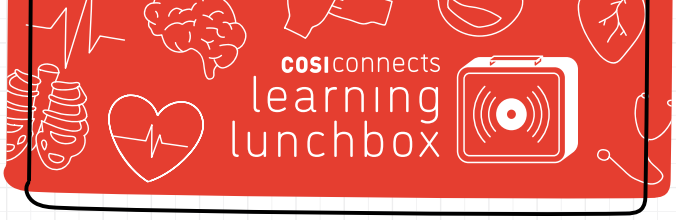
### Ohio Learning Standards:

**Kindergarten Physical Education Standard 3.3:** Recognize that food provides energy for physical activity.

**Kindergarten Visual Arts K.1CR** Explore environments and experiences to generate original artmaking ideas.

### Next Generation Science Standards:

**K-LS1-1 From Molecules to Organisms: Structures and Processes** Use observations to describe patterns of what plants and animals (including humans) need to survive.

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GRADES 3–5

### Extended Learning Questions:

1) What is the role of our digestive system in providing us with energy? How does your digestive system use energy?
2) Why do you think bile is important in digestion?
3) How do different foods affect the digestive system? Are there some foods that are easier or harder to digest for certain people? Why is that?
4) Write a short story from the perspective of a piece of food traveling through the digestive system.

### Ohio Learning Standards:

**4th Grade Science 4.PS.2:** Energy can be transferred from one location to another or can be transformed from one form to another.

**5th Grade Science 5.LS.2** All of the processes that take place within organisms require energy.

**3rd through 5th grade ELA W.3-5.3** Write narratives to develop real or imagined experiences or events using effective technique, descriptive details, and clear event sequences.

### Next Generation Science Standards:

**4-LS1-1 From Molecules to Organisms: Structures and Processes** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

GRADES 6–8

### Extended Learning Questions:

1) How does the structure of the digestive system help its function?
2) Different cultures around the world have different diets. Why is that? Now think of the results of different diets. Because they eat different types of foods, do you think people's digestive systems are different in different regions? Explain.
3) In humans, chewing food is the first step of the digestive process, and it happens in the mouth. But some other animals don't have mouths. Research one animal that does not have a mouth. How does it get the nutrients it needs? What body parts support getting nutrition? Learn a bit about the structure and function of these body parts. (Some options: giant tube worms, sponges, luna moth).

### Ohio Learning Standards:

**Sixth Grade Science 6.LS.4:** Living systems at all levels of organization demonstrate the complementary nature of structure and function.

**6th through 8th Grade Technology 6-8.KC.3.a.**: Students demonstrate and practice the ability to effectively use research strategies to locate appropriate digital resources in support of their learning.

### Next Generation Science Standards:

**MS-LS1-7 From Molecules to Organisms: Structures and Processes** Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.

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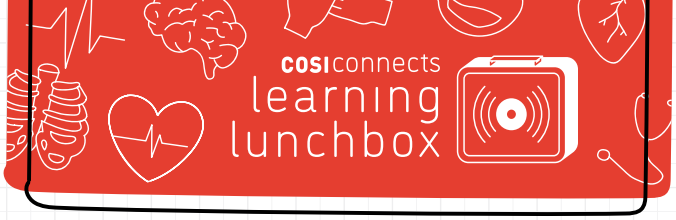



# Human Body

## ACTIVITY 5 : The Immune System

Our immune system works hard every day to protect you from invaders like germs, bacteria and viruses. Learn about some of the important parts of your immune system as you make a model of the different cells in your blood. Then do a simple activity with soap and pepper to demonstrate how we can help our immune systems out by washing our hands!

### Ohio Learning Standards

**2nd Grade Science 2.PS.1:** Forces change the motion of an object.

**6th Grade Science 6.LS.1:** Cells are the fundamental unit of life.

**6th Grade Science 6.LS.3:** Cells carry on specific functions that sustain life.

**6th Grade Science 6.LS.4:** Living systems at all levels of organization demonstrate the complementary nature of structure and function.

### Next Generation Science Standards

**K-LS1-1 From Molecules to Organisms: Structures and Processes** Use observations to describe patterns of what plants and animals (including humans) need to survive.

**K-2-ETS1-2 Engineering Design** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

**5-PS1-1 Matter and Its Interactions** Develop a model to describe that matter is made of particles too small to be seen.

**MS-LS1-8 From Molecules to Organisms: Structures and Processes** Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.

GRADES K–2

### Extended Learning Questions:

1) Organize the different objects you put into the blood model by size. Which is the largest? Which is the smallest?
2) List five ways to keep your body strong and healthy.
3) Germs are what make us sick – they give us the cold, the flu, and all other illnesses. Pretend that you are a superhero white blood cell. What kinds of germs would you fight?
4) Play immune system tag. One person is "it" - they're the white blood cell. Everyone else is a germ. The white blood cell has to tag all the germs! Once you get tagged, pretend you're a white blood cell too.

### Ohio Learning Standards:

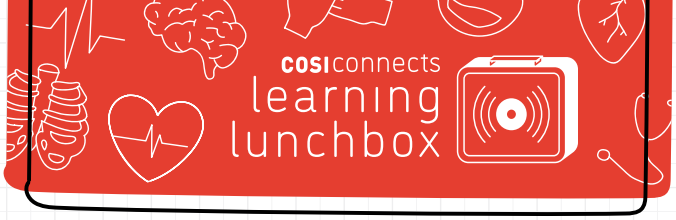
**Kindergarten Science K.PS.1:** Objects and materials can be sorted and described by their properties.

**Kindergarten – 2nd Grade Physical Education Standard 3:** Demonstrates the knowledge and skills to achieve and maintain a health-enhancing level of physical activity and fitness.

**Kindergarten – 2nd Grade Physical Education PE.K-2.E.1:** Engage in physical activities that contribute to good health.

### Next Generation Science Standards:

**K-LS1-1 :** Use observations to describe patterns of what plants and animals (including humans) need to survive.

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GRADES 3–5

### Extended Learning Questions:

1) How do red blood cells and white blood cells differ?
2) Why do people get vaccines? If you aren't sure, do some research using a reliable source to learn more.
3) Look at a picture of blood cells under the microscope. Do they look how you pictured? Why or why not? Note that scientists often stain (dye) cells to see them under a microscope. Don't be surprised if the white blood cells look purple!

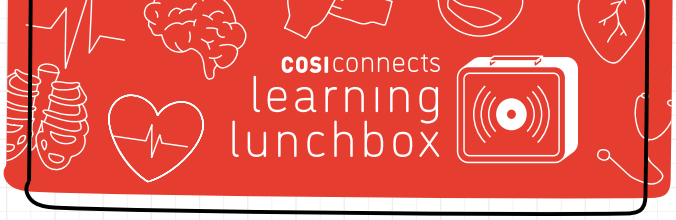
### Ohio Learning Standards:

**4th Grade Science 4.LS.1:** Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful.

**3rd through 5th Grade Technology 3-5.KC.3.a.:** Students collaborate with a teacher to employ appropriate research techniques to locate digital resources that will help them in their learning process.

### Next Generation Science Standards:

**4-LS1-1:** Construct an argument that plants and animals have internal and external structures that function to support survival.

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GRADES 6–8

### Extended Learning Questions:

1) A blood cell is about 10 micrometers in diameter. How many meters is 10 micrometers?
2) Count the number of red blood cells, white blood cells, and platelets in your model. Write those numbers down. What percentage of the cells in your model are red blood cells? What percentage are white blood cells? Platelets? How does that compare to actual counts in blood?
3) How does your immune system remember the diseases you've had before?
4) Research a famous historical pandemic (such as the flu of 1918, smallpox, or COVID-19). What sorts of things did different countries do to help counter the illness? Choose two different countries to research; compare and contrast how they dealt with the pandemic. Write up a one-page paper on what you learned.

### Ohio Learning Standards:

**6th Grade Math 6.NS.3:** Compute fluently with multi-digit numbers and find common factors and multiples.

**6th Grade Math 6.RP.3c:** Find a percentage of a quantity as a rate per 100.

**6th through 8th Grade Technology 6-8.KC.3.a.**: Students demonstrate and practice the ability to effectively use research strategies to locate appropriate digital resources in support of their learning.

**7th Grade Social Studies 7.HS.3:** Events in world history are shaped by geographic, social, economic, and cultural factors.

### Next Generation Science Standards:

**MS-LS1-2:** Develop and use a model to describe the function of a cell as a whole and ways parts contribute to the function.

**MS-LS1-3 :** Use argument supported by evidence for how the body is a system of interacting subsystems composed of cells.

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# Glossary:

**Cardiovascular system –** a body system that, in humans, includes the heart and a network of blood vessels that carry blood through the body.

**Digestive system –** a body system that breaks down the food you eat to provide your body with the nutrients it needs.

**Nervous system –** a body system that, in humans, includes the brain, spinal cord, and nerves. It controls everything you do.

**Plasma –** the liquid part of blood.

**Platelets –** fragments of cells in your blood that help stop the bleeding when you get a cut.

**Red Blood Cells –** the cells in your blood that pick up oxygen from your lungs and carry it to all the parts of your body.

**Respiratory system –** a body system that allows us to breathe and supply oxygen to our cells.

**White Blood Cells -** cells in your blood that help fight disease.