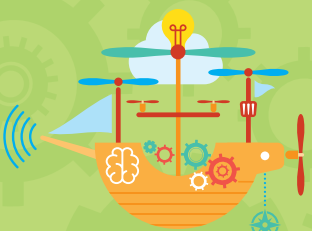


Science of the Human Body

Grades 4-6

CURRICULUM SAMPLE



STEAM
ENRICHMENT

edventures.com

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(208) 343-3110



Science of the Human Body

GRADES: 4-6

COMPLETE PROGRAM



STUDENTS

Up to 30

TIME

12, one-hour lessons

SUBJECTS

- Physical Science
- Life Science
- Engineering Design
- Math Connections

SETTINGS

- Summer camps
- Classrooms
- Before & After-school programs

PRINT MATERIALS



Using **exercise and movement** as a teaching tool, learners examine human anatomy and physiology and discover the importance of nutrition through **science and engineering design** activities.

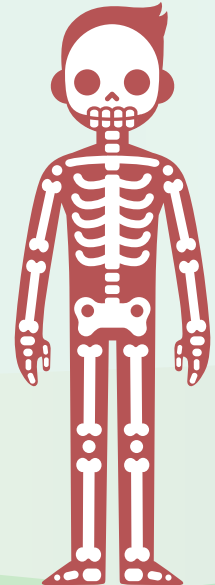
🔄 refill kit available

TECH REQUIREMENTS / PREREQUISITES

- None

PRICING OPTIONS

- Complete Program: \$675⁰⁰
- Curriculum Print & Digital: \$425⁰⁰
- Refill Kit: \$195⁰⁰



REFILL KIT



CURRICULUM SAMPLE



Scan or Click QR Code for:

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The Heart!



STEM CONNECTIONS

Science: Structure and Function



DURATION

60 Minutes



MATERIALS

- **Page pockets** (1 per student) **holding:**
 - **You've Got the Beat Data Sheet**
 - **Work It Out, Part Two Data Sheet**
- **Dry erase markers** (1 per student)
- **Stethoscopes** (1 per group)
- **Stopwatch**

SCHEDULE

- Intro: Stethoscopes (15 min)
- You've Got the Beat Activity (20 minutes)
- Work It Out, Part Two (20 minutes)
- Wrap Up (5 minutes)

OBJECTIVE

Students get their hearts pumping as they explore the role of the circulatory system.

ALIGNED STANDARDS

NGSS 4-LS1-1. Structure and Function.

CCSS.MATH.CONTENT.5.NBT.B.5 Fluently multiply multi-digit whole numbers using the standard algorithm.

CCSS.MATH.CONTENT.6.RP.A.3.D Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

21ST CENTURY SKILLS

- Leadership and Responsibility
- Flexibility and Adaptability

HABITS OF MIND

- Listening with Understanding and Empathy
- Applying Past Knowledge to New Situations
- Finding Humor

KEY TERMS AND BACKGROUND INFORMATION

“To be or not to be, that is the question.” You might be familiar with this line, but you might have also noticed that the rhythm sounds appealing to your ears, just like how the beat of a pop song might sound good to you – and get stuck in your head all day! This famous Shakespeare line, along with many pop songs, is written in what’s called iambic pentameter. da DUM da DUM da DUM da DUM da DUM... Some researchers believe that this is the most popular beat because it is the same natural rhythm as the human heart.

When your doctor puts a stethoscope on your chest, he or she is listening for this very rhythm. The heart is a rather musical muscle, so by listening, the doctor can determine if there are any problems with it. What kind of instrument do you think the heart sounds like?

The heart’s most important job is to pump oxygen-rich blood and nutrients to every part of your body -- from your bones and brain to the very tips of your toes. Your blood travels through your body on perfectly mapped out little highways. Some of these pathways are called veins, and many people can see or feel them through their skin. If you hold your finger to your wrist, you can feel the pulse of your heart beating through your body like a drum. Do some jumping jacks, and you can probably feel that pulse even more.

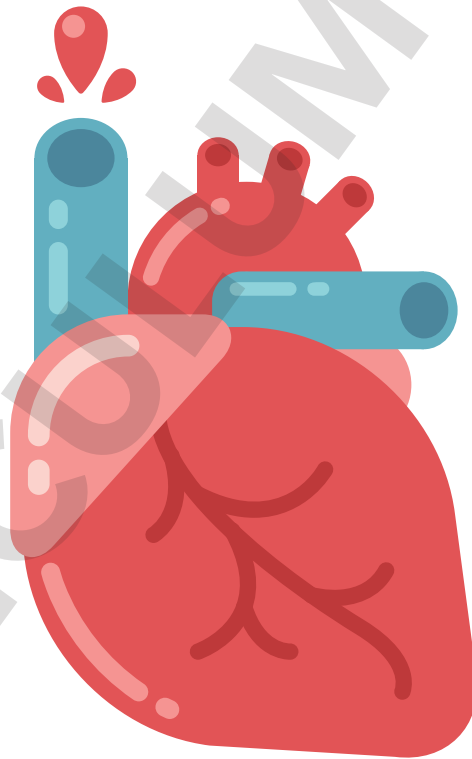
If you were to listen to the sound of your heart through the stethoscope, you’d hear all kinds of swooshes, knocks and snaps. This is because your heart is doing a lot of work! Your heart sure keeps busy, and rests for only four-tenths of a second every minute. This means that your heart never sleeps, even if you’re sleeping!

OVERVIEW

Today, students learn about the circulatory system through three heart-pumping activities, starting with listening to the sounds of the heart using stethoscopes. If possible, let students choose their own groups for this up-close-and-personal activity. Another option is for students to take turns using the stethoscopes to listen to their own hearts. The stethoscope should be placed over clothing; a thin shirt is preferable to a sweater or sweatshirt.

DAILY PREP

- Make a plan for splitting students into 8 groups to share the stethoscopes in the Intro Activity.
- Prep You've Got the Beat and Work It Out, Part Two Data Sheets in page pockets.
- Prepare the room: Make sure there is enough room for students to run, walk and dance for one minute.
- You may want to have sanitizing wipes available for students to clean the earplugs of the stethoscopes before they hand them off to the next person.



STEP-BY-STEP DIRECTIONS FOR INSTRUCTORS



Whole Group

INTRO: STETHOSCOPES

Ask students to guess what part of the human body you'll be studying today by sharing facts about the heart from the background info until someone guesses correctly. Then launch into the discussion and fun intro activity to gauge what students already know and engage their interest in the heart and circulatory system. Record their answers, if possible.

- Where is the heart?
- What does a human heart really look like?
- Why do we have hearts? Why are they so important?

Introduce the stethoscope, maybe even by calling attention to one that's been hanging casually around your neck.

Doctors listen to your heart to make sure that it's working properly. One way they do this is by using a special instrument that amplifies sound called a stethoscope. Today you're going to need to be both a doctor and a patient! And to listen to someone's heartbeat, you've got to know where to look..

Show everyone how to place a hand over the heart, like you're saying the pledge of allegiance or making a solemn oath. Explain how the heart pumps.

Many of us think that our heart is on the left side of our chest, but it's actually located more in the middle. Take the hand over your heart and move it to the right. Your palm should rest on the sternum. Now make a fist. This is the real location of your heart and its actual size. Adults have hearts that are as big as two fists together!

Your heart is actually a very strong muscle. It contracts and elongates just like other muscles. As your heart contracts, it pushes blood throughout your body. When it elongates, it allows blood to enter that heart that will then be pushed out. But unlike your skeletal muscles, your heart is always working hard and never stops beating, even during sleep. In a whole minute, it only gets to relax for less than a second.

Have students pretend their fists are hearts and make them beat by squeezing and relaxing. Then break them into 8 groups of 3-4, hand out a stethoscope to each group, and talk through how to use them.

Now let's listen in on some real hearts. Decide who wants to be the doctor first and who wants to be the patient. You can also be both the doctor and patient at the same time and listen to your own heart. It's up to you. If you're the doctor, ask your patient to show you where their heart is. Place the stethoscope earplugs in your ears and the flat part over their heart. Now listen. If you can't hear the heart beating, slightly move the stethoscope up or down, or left or right. Ask your patient to remain quiet and to breathe normally.

Once you locate the heart and hear it beating, listen closely. What does it sound like? You should hear something that sounds like *lub-dub*. This is the sound the heart makes each time it beats. As the heart fills with blood, the lub sound can be heard. As the heart opens, blood is released and pumped throughout the body. This is the dub noise.

Take turns using the stethoscope within your group. Everyone should have the opportunity to use the stethoscope and listen to a heart. Make sure you are a considerate doctor and cooperative patient.

After everyone has had a chance to be both doctor and patient, collect the stethoscopes to use again.



Small Groups

YOU'VE GOT THE BEAT ACTIVITY

Stethoscopes aren't the only way to know what's going in with your heart. Teach students how to find and count their pulses, to get them ready to calculate how many times their hearts will beat over one hour, one day, one year, and an entire lifetime.

Doctors not only want to hear what your heart sounds like, but they also want to know your heart rate - how fast or slow your heart is beating. Instead of listening to your heart with a stethoscope, doctors feel how many times your heart beats in one minute by finding and feeling your pulse. As your heart beats, it pumps blood to the rest of the body through large vessels called arteries. Your pulse is actually an artery where you can feel each beat of the heart.

There are many arteries in your body. But the easiest artery to find and feel is in your wrist. It is called the radial artery because it is next to the radius bone. To find the radial artery, bend your hand backwards. With your other hand place the tips of two or three fingers just below your wrist on the same side as the thumb, and between your radius and the tendon next to it. Since your thumb also has a pulse, it should not be used to feel the pulse in your wrist.

If students are having trouble finding their pulse, tell them to move their fingers slightly towards or away from the wrist, or apply more or less pressure.

Now that you have found your pulse, can you find it on your other wrist? Can you find your teammates' pulses?

Make sure everyone feels comfortable with someone else finding their pulse. When students are done exploring, explain the idea of resting heart rates.

Remember, doctors want to know how fast or slow your heart is beating. This helps them determine how strong and efficient your heart is, so they can tell how fit or healthy you are. The doctor is most interested in your resting heart rate. Your resting heart rate is the number of times your heart beats in one minute after you have just woken up or after you've been quiet and relaxed for a couple of minutes.

Ask students if they have any idea what their resting heart rate is or how many times their heart beats in an hour, day, or year. Hand out dry erase markers and page pockets holding the You've Got the Beat Data Sheets so students can record their predictions.

Alright, we've all made our hypotheses. Let's see how close our guesses are! To find your resting heart rate, find a comfortable position. You can lie on the floor or sit on a chair. You must remain as still and relaxed as possible for up to two minutes. You may even want to close your eyes. Make sure that you can easily find your pulse without moving around too much after the two minutes are up.

Closing eyes, turning down the lights, and spacing students far enough apart from each other will all help bring their heart rates down even more. After at least two minutes, give students a countdown to start counting their heartbeats. After one minute, call time and have them write down the number of the You've Got the Beat Data Sheets.

Kids 9-12 years old should have a resting heart rate between 60-110 beats per minute (bpm). Was everyone within this range or close to it? If not, have students check by counting their pulse again for six seconds and then multiplying by ten. Any students who lost count could also re-take their pulse for 6 seconds and then multiply. (Remind them that the easy trick for x10 is to add a zero to the end of the number.)

Explain that the heart is the body's hardest-working muscle - if it can beat over 100 times in a minute, just think how many times it could beat in an entire year! Either guide students through the rest of the You've Got the Beat Calculations all together or challenge them to work through them independently. If you have calculators, this is the time to pass them out. Otherwise, challenge students to practice some long multiplication using the page pockets. (See the following page for some example calculations.)

The Heart

You've Got the Beat, Answers

Your pulse is the rate at which your heart beats. Your pulse is usually called your heart rate, which is the number of times your heart beats per minute (bpm).

Answers will vary based on resting heart rate.

Hypothesis: I predict that during rest, my heart will beat 101 times in one minute. This is called resting heart rate.

Find your pulse in your wrist. Your instructor will tell you when to start and stop counting.

Data: My heart beat 90 times in one minute. My resting heart rate is 90 bpm.

There are 60 minutes in one hour. How many times will your heart beat in one hour? 5400

$90 \text{ beats per minute} \times 60 \text{ minutes} = 5400 \text{ beats per hour}$

There are 24 hours in one day. How many times will your heart beat in one day? 129,600

$5400 \text{ beats per hour} \times 24 \text{ hours} = 129,600 \text{ beats per day}$

There are 365 days in one year. How many times will your heart beat in one year? 47,304,000

$129,600 \text{ beats per day} \times 365 \text{ days} = 47,304,000 \text{ beats per year}$

I am 10 years old. That means my heart has beat 473,040,000 times since I was born.

$47,304,000 \text{ beats per year} \times 10 \text{ years} = 473,040,000 \text{ beats per decade}$

If I live to be 100 years old, my heart will beat 4,730,400,000 times.

$47,304,000 \text{ beats per year} \times 100 \text{ years} = 4,730,400,000 \text{ beats per century}$



Whole Group Discussion

Gather together after the activity to talk it out. Some possible discussion questions are:

- Did any of the numbers surprise you? Why?
- What did your pulse feel like? (Throbbing, pulsating, pushing up against skin - the heart is so powerful!)
- While you were feeling your pulse, did it ever stop? (No, your heart never stops, although sometimes the pulse is hard to find or feel.)
- Not everyone had the same resting heart. Why might that be? (Feeling stressed, sick, hungry, thirsty, nervous, or excited can all affect your pulse rate. People who play sports and exercise a lot tend to have lower resting heart rates too.)
- How could being sick affect your heart rate? (The heart rate increases to help fight the disease, since blood carries many of the immune cells that fight off germs.)
- How do you feel right before a test or when someone scares you? (Stressed, which means your heart rate increases - that's why people say their hearts were "racing.")
- How could exercise affect your heart rate? (During and right after exercise your heart rate increases in order to pump more blood and oxygen to the muscles. Your resting heart rate should decrease over time as your heart gets stronger - just like your other muscles!)

If you're running short on time, this is a good place to end.



Whole Group

WORK IT OUT, PART TWO

Our heart never stops working and never stops beating, no matter what we are doing. For the calculations in the last activity, we assumed that our heart rate would stay the same all the time, but anyone who's had to sit through a scary movie or run a mile knows that's not true! Work It Out, Part Two extends these calculations so students can discover how different activities affect their heart rates.

Before beginning the activity, have students write their resting heart rates on the Work It Out, Part Two handout, and as a class choose a fifth activity. Ask students to predict which activity will cause their heart rate to increase the most and least.

Then, help keep time as students perform each activity for one minute. If there is not an open space, students can run or walk in place, around the room, or from point to point. "Playing a video game" can be done seated or standing but should mimic how they'd move when playing at home. When dancing, students can make up their own dance. If possible, play music for the students to dance to!

After each activity, have students take their pulse for 20 seconds and multiply by 3 to find their heart rate in beats per minute. Record all data on the Work It Out handout. At the end, be scientists and analyze the data together. Were their predictions correct?



Whole Group Discussion

WRAP UP

Collect dry erase markers and page pockets to use again.

Debrief the activity and revisit students' initial ideas about the heart. Use this time to share any information from the background section that may be new and interesting to them. Here are some possible discussion questions:

- Which activity caused your heart rate to increase the most?
- Which activity causes your heart rate to increase the least?
- Why do the activities have a different effect on your heart rate? (Larger muscles, more muscles, bigger movements, and standing up all make the heart work harder...)
- How is each activity good for your body? (Running, walking, and dancing are beneficial for the bones, muscles, and heart. These activities help keep you in shape and help burn energy. Video games are great for hand-eye coordination, brain activity, and general happiness...)
- Activities like running, walking and dancing tend to increase your heart rate the most. But what would happen if we did them all day long? (We'd be exhausted. We need time to rest and recover. Our muscles need time to recover, and our heart is a muscle.)
- What would happen if we played video games all day long? (Our hearts, muscles, and bones would atrophy, meaning they'd get weaker and smaller. Playing video games generally does not challenge our bodies enough to keep us healthy and strong.)

CHECK FOR UNDERSTANDING

- Make a fist and put it over your heart.
- Why is your heart important?
- What are some ways to keep your heart strong and healthy?

EXTENSIONS

- Find and count the pulse in the neck and ankle. How do these compare to the radial pulse?(The strength of the pulse tends to decrease as you get farther away from the heart. The pulse in the ankle is often hard to detect and the pulse in the carotid artery in the neck tends to be more accurate.)
- Make a human bar graph. Have students form five lines according to their resting heart rate. (If you choose to dive into a discussion of the patterns in the data, which emerges naturally from the activity, proceed with caution and compassion. Students may feel uncomfortable having their level of fitness on display for the entire class.)
 - Less than 70 bpm
 - 70-79 bpm
 - 80-89 bpm
 - 90-99 bpm
 - 100 and up bpm



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