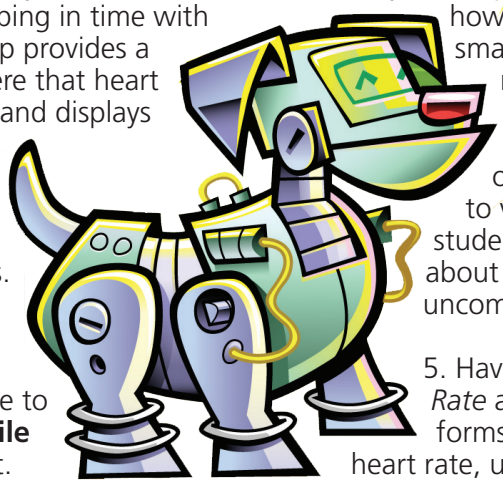
HEALTH TECHNOLOGY

Teacher's Guide

This activity builds on the free *Instant Heart Rate* app developed by Azumio, which is available in the Technology section of **STEM Mobile Labs**.

Instant Heart Rate uses the camera built into a smartphone or tablet to detect the slight color changes that occur as the capillaries in your fingertip expand and contract with each heartbeat. To use the app, place the soft part of your fingertip over the camera lens and press gently, holding your fingertip very still. Within a few seconds, the app will begin beeping in time with your pulse. After 10 seconds, the app provides a heart rate measurement, shows where that heart rate falls on a cardio-workout scale, and displays a real-time chart showing your heartbeat.



1. Begin by distributing copies of the activity sheet to your students. If they have not installed **STEM Mobile Labs** already, have them scan the QR code on the sheet or use their app store's search feature to download and install **STEM Mobile Labs** onto a smartphone or tablet.

2. Have students open the Technology section of **STEM Mobile Labs** and take a moment to review the free apps listed there. (Note: The selection of apps is slightly different for Apple and Android devices.) Discuss how these apps combine mobile connectivity with different technologies built into smartphones and tablets to create new uses for these devices. Have students identify some of these technologies — GPS, text messaging, the camera and flash, the microphone — and describe how they are re-purposed to turn a smartphone or tablet into an emergency warning system, a code reader, a wind gauge simulator, etc.

3. Tell students that they will be using the *Instant Heart Rate* app to investigate how physical activity affects heart rate. Have students download and install the app, then divide them into small groups to complete the activity. Group students who do not have a smartphone or tablet with those who do, so that everyone can participate. You should also ask students about their data plans and have them use the app on your school's Wi-Fi network, if necessary, to avoid unexpected charges.

4. Briefly discuss the heart's function and how physical activity can impact heart health. Then explain how the *Instant Heart Rate* app uses a smartphone or tablet camera lens to measure heart rate. Before students begin experimenting with the app, we suggest that you ask for two or three students in each group to volunteer as test subjects, so that students who may have privacy concerns about their heart rate are not put into an uncomfortable situation.

5. Have students use the *Instant Heart Rate* app to gather data on how different forms of physical activity and rest impact heart rate, using the chart provided on the activity sheet. Provide time for students to develop and conduct additional tests of their own. Then have each group complete Part 3 of the activity by evaluating their data to recommend long-term steps that can improve heart health, such as regular sleep and exercise.

6. To extend the learning, you and your students can explore other examples of how mobile technology is providing new tools for monitoring and improving personal health. The *Instant Heart Rate* app includes advertisements for a range of health apps developed by Azumio, including fitness training apps, glucose and blood pressure monitoring apps, and the Argus pedometer. (There is no obligation to download any of these apps, many of which are available for free.) Students can also find a variety of health apps at their App store, such as calorie counters, first aid guides, and medical advisors. Ask students to brainstorm ways such apps could someday change healthcare, and encourage them to suggest new health app ideas of their own.

HEALTH TECHNOLOGY

Reproducible Master

Your heart is one of your most important organs, pumping 1,900 gallons of blood through your body per day! A healthy heart pumps blood efficiently, beating faster when you are physically active and slower when you are at rest. Now, with mobile technology, you can monitor and learn how to improve your heart health.

PART ONE Download **STEM Mobile Labs** to your smartphone or tablet using the QR code on this activity sheet or the search feature at your app store. Touch the Technology door on the **STEM Mobile Labs** homescreen to explore some of the best free apps available for learning how mobile technologies are changing our lives. Share your ideas for using these technologies in new ways to make mobile devices even more multi-purpose and powerful.

PART TWO Now use **STEM Mobile Labs** to download the free *Instant Heart Rate* app, which takes your pulse by using your mobile device camera lens to detect the blood flow in your fingertip. Work in small groups to experiment with this app and test how physical activity affects heart rate, recording your data in the chart above.

- First, measure the resting heart rate of your test subjects by having them sit still for ten minutes.
- Next, have your test subjects stand up and sit down ten times, then measure their heart rate. How does it compare to their resting heart rate?

Test Subjects	#1	#2	#3
Resting Heart Rate			
After standing and sitting back down 10 times			
After sitting with eyes closed for 2 minutes			
After doing 10 jumping jacks			

- Now have your test subjects sit with eyes closed for two minutes and measure their heart rate. How does it compare to their resting heart rate?
- Then, have your test subjects do ten jumping jacks, then measure their heart rate. How does it compare to the standing/sitting test?
- Continue testing the effects of other physical activities on heart rate. Note that the free version of *Instant Heart Rate* stores only five measurements, so use the chart to record your data.

PART THREE Use your test data to compare how normal physical activity (like standing and sitting) and exercise (like jumping jacks) affect heart rate. Then compare how extended rest and shorter forms of rest affect heart rate. Based on these results, what are some long-term steps someone could take to help their heart work efficiently? How could an app like *Instant Heart Rate* help someone achieve that goal?

NOTE: Standard data rates apply. If necessary, download and use these apps on a Wi-Fi network to avoid unexpected charges.

The Wireless Foundation

Want to see more amazing Science, Technology, Engineering, and Math apps? Explore the rest of the STEM Mobile Labs app to find innovative ways to use your mobile device for classwork, homework, and test prep. Available for Apple and Android smartphones and tablets.