

Lesson Plan: Health Tech and Data Analysis

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Objective: Students will explore the intersection of health and technology through the use of Micro:Bit devices which they will program using block coding and Python. They will analyze real-life health data from the United States, develop data analysis skills, and apply their understanding to meet high school standards from the NGSS and Common Core.

Grade Level: High School (9th-12th grade)

Duration: 7-8 class periods (approximately 60 minutes each)

NGSS Standards (Engineering Design):

- HS-ETS1-2: Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- HS-SEP-7: Engaging in Argument from Evidence. Students construct, use, and/or present an oral and written argument or counter-arguments based on data and evidence. This includes claims, reasoning, and evidence that are clear, accurate, and logical, and results in a scientific explanation or design solution.

Common Core Standards (Statistics):

- CCSS.MATH.HSS-ID.A.1: Represent data with plots on the real number line (dot plots, histograms, and box plots).
- CCSS.MATH.HSS-ID.A.2: Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
- CCSS.ELA-LITERACY.RST.11-12.1: Cite specific textual evidence to support analysis of science and technical texts.
- CCSS.ELA-LITERACY.WHST.11-12.7: Conduct short research projects to answer a question.

Materials:

- [Micro:bit devices](#)
- Computers with internet access
- Smartboard
- Graphing software or spreadsheet program

Pre-Work: Introduction to Health Tech

Description: To develop background, students will analyze the data in their phone's health app. Then, as a class watch [this video](#) and discuss.

Prewrite Student Worksheet (Homework)

Name: _____

Remind students to turn on tracking for their health app.

Directions: Open the "Health" app on your smartphone. Click on "Show all health data" for a list of your personal health data tracked by your phone's sensors. Fill in the table below and answer the following questions

Resting Energy	
Active Energy	
Steps	
Walking + Running Distance	
Flights Climbed	
Headphone audio levels	

Questions:

1. Did you know that your phone was tracking this data? How do you feel knowing it is?
2. Did any of your data surprise you? Why or why not?
3. Compare your data with a classmates' data. What do you notice?
4. How might you use this data in your daily life?
5. If you could add a type of data to this app, what would it be? Why?

Day 1: Inquiry

Description: Students will analyze a graph and read an article. Then, they will engage in an inquiry discussion about the uses/benefits of personal health devices in our society through an Inquiry Circle.

Day 1 Student Worksheet:

Name: _____

Part 1: What's Going on in this Graph?

Directions: Analyze [this graph](#) and fill in what you notice/think/wonder below.

I notice...

I think...

I wonder...

Part 2: Article Annotation & Inquiry

Directions: Read and annotate [this article](#). Answer the following questions citing evidence from the text/graph. Be ready to discuss in an inquiry circle

Questions:

1. What is the main topic of the article?
2. What are personal health apps? Give some examples.
3. What data do personal health apps typically collect from users?
4. Have you ever used a personal health app or do you know someone who has? What was it like for you/them?
5. Do personal health apps have a positive impact on healthcare systems? Why or why not?
6. What are possible connections between personal health apps and the graph we looked at?
7. Are there any potential drawbacks or challenges associated with using personal health apps that were mentioned in the article?
8. If you were to design a personal health app tailored to your needs/goals, what features would you include, and how do you think it could positively impact your overall health and well-being?

Day 2: Intro to Computing (slides available [here](#); full lesson plan [here](#))

This lesson was adapted from the Micro:bit website, [Introduction to Computing 1](#).

Teachers should set up a micro:bit classroom so that they can review student work there. Students should have already been introduced to the word: algorithm. Use the slides to guide them through creating an algorithm in words and a flow chart and developing a program for micro:bit using pseudo code.

Directions:

1. Students work in pairs to fix the jumbled algorithm on slide 2-3
2. Complete the beating heart tutorial at this link: <https://makecode.microbit.org/>
3. Use the algorithm and flow chart on slide 11 to make a working program using microbit.

Day 3: Analyzing/Comparing Health Data

Description: Students will find average values from 32 US fitbit users' data points. Then, they will choose one data point and compare their own data to the fit bit users.

Day 3 Student Worksheet

Name: _____

Directions: Make a copy of [this data](#), from 32 Fitbit Users. Find the average for each variable and write it below.

Variable	Average for the dataset
Steps Total	
Steps Average	
Distance Total (km)	
Distance Average (km)	
Very Active Minutes Average	
FairlyActiveMinutes Average	
LightlyActiveMinutes Average	
SedentaryMinutes Average	
Calories Average	
Heart Rate Average	

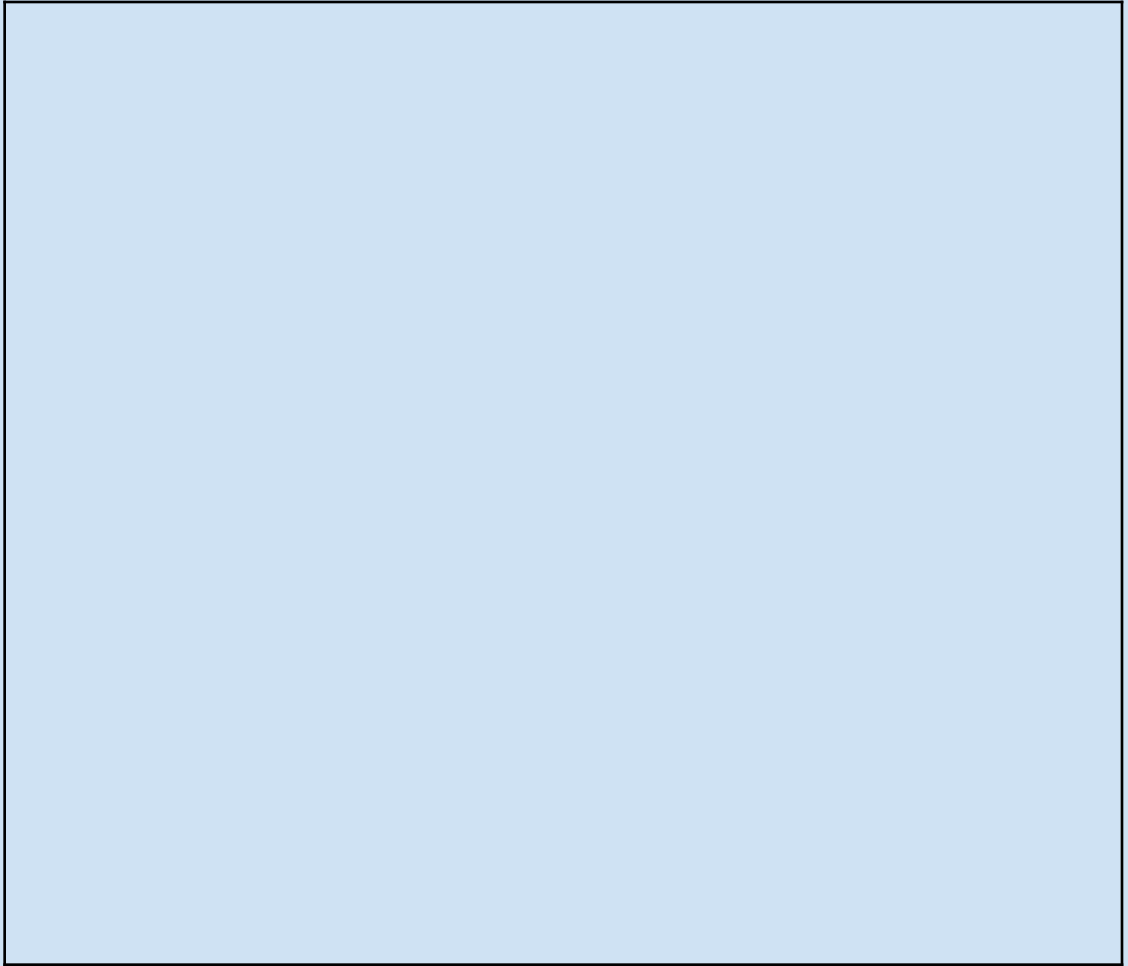
1. Select (circle/highlight) one of the following data points for comparison:

- Steps Total
- Steps Average
- Distance Total
- Calories Average
- Heart Rate Average

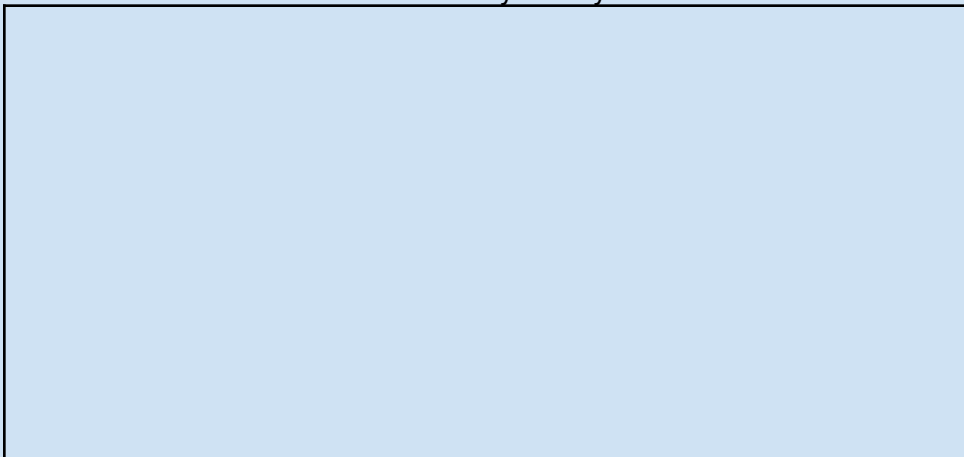
2. Record...

Partner 1 value (from phone):	
Partner 2 value (from phone):	
Fitbit user's value (from table above):	

3. Make a bar chart in google sheets showing the data in step 2. Paste a picture of the bar chart below.



4. What do you notice? Are the values different? Why or why not?



Day 4: Program the MicroBits

Description: Have students try out the pre-made heart rate and step counter codes on the MicroBit site. Then, challenge students to come up with a new program that can count steps and heart rate together. (Must be able to reset heart rate manually for multiple activity sessions without clearing step number)

Day 4 Student Worksheet

Name: _____

Directions: Go to [this website](#) and take out your MicroBit device.

Part 1: Heart Rate

1. Look at the "Counter" program. Talk through each line of the pseudocode with your partner. Make sure you know what each block of code does.
2. Describe how this program works in your own words/flowchart

3. Download the "Counter" program onto your MicroBit device.
4. Work with your partner and use your MicroBit to track the number of heart beats you have in one minute. Describe below how you accomplished this.

Part 2: Step Counter

1. Look at the "Counter" program. Talk through each line of the pseudocode with your partner.
2. Describe how this program works in your own words/flowchart

3. Download the "Step Counter" program onto your MicroBit device.
4. Practice using the program with your partner. Try attaching your microbit to your foot. Then try attaching it to your wrist. What do you notice?

Part 3: Your turn to program!

1. Your goal is to create a program that counts a users' steps AND heart rate simultaneously. Below, write a flow chart of how the program would work.

2. Go to [this site](#) & open a new project. Use your flow chart to write and test your program. Paste or share your working code below.

Day 5: Data collection

Directions: Divide students into partners and provide each group with a micro:bit device with their program downloaded on it. Go outside to take data on heart rate and total steps through a set of 3 varying-intensity activities.

Day 5: Student Worksheet:

Name: _____

Today we will go outside to take data on your micro bit devices. Each group will need the following data from one member of the group. Decide with your group whether to place the step counter on your wrist or on your foot.

Resting heart rate (beats per minute)	
Lightly active heart rate (beats per minute)	
Highly active heart rate (beats per minute)	
Total number of steps	

Record each group member's data here : [Google Form for data collection](#) (do one form for each person)

Day 6: Analyzing Health Data

Directions: Ask students to generate questions they are interested in about the data we collected. Write on sticky notes and post. Have each pair choose a different question. Have students create graphs or visual representations of the data they collected to illustrate the changes in health metrics (e.g., heart rate) before and after exercise.

Name: _____

1. We collected data on health and physical characteristics yesterday. What questions could we ask of our data? Write at least one question below.

2. Share your question with the class and help generate a list of which questions we can answer with our data. Of the class list of questions, choose one that you will investigate and write it below.

3. Use this google sheet to analyze data about your question. Create at least one table or chart that helps answer your question and paste it below.

4. Answer your question using the format: Claim, Evidence and Reasoning. Your data from your table or graph should be part of your evidence.

Day 7: One Minute Presentations & Reflection on the Process

Directions:

1. Plan a one-minute presentation for the class including the following:
 - a. Your research question
 - b. Your visual representation of data
 - c. Your evidence-backed claim made from the data

You can use [Presentation Rubric](#) & [Presentation Template](#)

2. After hearing all presentations, write a one-page reflection using this [template](#)¹. In this reflection, you will provide links to your program, data, and visual representation. Together, this will be graded as a **summative assessment**.

¹ The reflection asks students to review 360's Portrait of a Graduate, which we call ipace. It includes all the key competencies we want our students to develop during their time at 360 High School. Teachers may want to substitute their school's key competencies in this section.