Usability Test Report

Team 6: micro:bit

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Introduction:

Working with the micro:bit educational circuit board, the micro:bit application is a web-based, button-controlled graphing app that supports mouse control over graph navigation. The app logs data from the micro:bit and visualizes it in a graph format. The application will allow users to graph a wider range of data than Makecode enables. Additionally, it will allow the user to interact with the data in ways that are not supported by Makecode such as finding features of interest.

The goal of this usability test is to uncover usability problems under various use scenarios. The test covers most app functions and interactions. Participants of the usability test consist of a variety of MTU students. All tests were conducted over Zoom with screen recording and camera recording. A total of 6 sessions were scheduled, 5 were conducted. Micro:bits were ordered two weeks earlier to the test sessions and mailed to each participant. All participants were asked not to connect their micro:bit to the computer prior to the session in order to control over proficiency.

Each usability test session was broken up into three scenarios, except for one session with additional multiple connections. The test simulates normal data collection tasks with the app. Interviews were conducted after each scenario. A post-experiment questionnaire was also included.

*Final design documents and group site:
http://www.csl.mtu.edu/classes/cs4760/www/projects/s20/group6/www/

Test Scenario 1:

Name: Single Connection test

Goals:

- To check if the app start up and initialize successfully
- To check if the participants are able to successfully follow the instruction to connect the micro:bit to their computer
- To check if the participants are able to navigate to the connection menu
- To check if the app can identify the paired micro:bit
- To check if the app can connect successfully with the paired micro:bit

Scenario description:

You are a owner of a micro:bit. You have very little knowledge about the micro:bit. You just found this web app that advertises itself that it can help you to connect and test your micro:bit. You then decided to open the app and connect your micro:bit.

Task list:

- Open the app
- Read the instruction and follow to connect the micro:bit
- Click the connect button

- Select your paired micro:bit
- Click connect
- Check the connection status to see if you are connected

Quantitative measurements:

- Time for the app to load
- Time from start reading the instruction to connect the micro:bit
- The number of times the participant ask for help

Qualitative measurements:

- Any question during the test
- Errors occurred during the operations

Potential observations of participant:

- Responding time for each operation
- Confusion and think aloud comments

Post Scenario interview and questionnaire questions

1. Do you have any trouble connecting the micro:bit?
2. Is the interface and instruction clear and helpful?

Test Scenario 2:

Name: Data collection test

Goals:

- To check if the participants are able to successfully follow the instruction to start/pause/stop data collection
- To check if the app can successfully graph data collected
- To check if the participants are able to interact with the graphed data and focus on the data they are interested in

Scenario description:

You are a owner of a micro:bit and you wanted to see the data you collected more intuitively. After connecting the micro:bit, you decided to start data collection. After data collection for about one minute, you pause for several seconds then continue for another several seconds then finally stop. You are interested in data from 20 to 30 seconds. Therefore you zoom in the graph so that you can only see data from 20 to 30 seconds, and report the exact data of 25 second.

Task list:

- Start the data collection
- Pause for several seconds then continue

- Navigate and interact with the plotted data
- Zoom and click on one(any) data point, report the value and the time
- Repeat previous step
- Stop the data collection

Quantitative measurements:

- Time used in navigating the graph
- The number of times the participant ask for help

Qualitative measurements:

- Any question during the test
- Errors occurred during the operations
- Correctness in finding or reporting the numbers

Potential observations of participant:

- Responding time for each operation
- Confusion and think aloud comments

Post Scenario interview and questionnaire questions

1. Does the plotted data make sense to you?
2. Do you have any trouble focusing on any data point you wanted?
3. Is the interface and instruction clear and helpful?

Test Scenario 3:

Name: Multiple Connection test

Goals:

- To check if the participants are able to successfully follow the instruction to connect multiple micro:bits to their computer
- To check if the app can identify each paired micro:bit
- To check if the app can connect successfully with multiple paired micro:bits
- To check if the app can successfully graph data collected with multiple micro:bits
- To see if the participants are able to navigate between different micro:bit's data graph

Scenario description:

You are a owner of several micro:bits. You already know this web app can help you with one micro:bit. You decided to connect a second micro:bit.

Task list:

- Read the instruction and follow to connect the second micro:bit
- Click the connect button
- Select your second paired micro:bit

- Click connect
- Check the connection status to see if you are connected with the second micro:bit

Quantitative measurements:

- Time from start reading the instruction to connect the micro:bit
- The number of times the participant ask for help

Qualitative measurements:

- Any question during the test
- Errors occurred during the operations

Potential observations of participant:

- Responding time for each operation
- Confusion and think aloud comments

Post Scenario interview and questionnaire questions

1. Can you tell which one is the second micro:bit?
2. Is the interface and instruction clear and helpful?

Test Scenario 4:

Name: Export csv file

Goals:

- To check if the app can successfully export the data collected

Scenario description:

You are a user that cares about the data you collected and want to save the data to a file. After some period of collection, you decided to output the data you collected to a csv file for later examination.

Task list:

- Stop the data collection if not already stopped
- Export the file and choose where to store it
- Navigate to the csv file and open it

Quantitative measurements:

- Time used to store the data

Qualitative measurements:

- Any question during the test
- Errors occurred during the operations
- Problem with the stored data in csv file

Potential observations of participant:

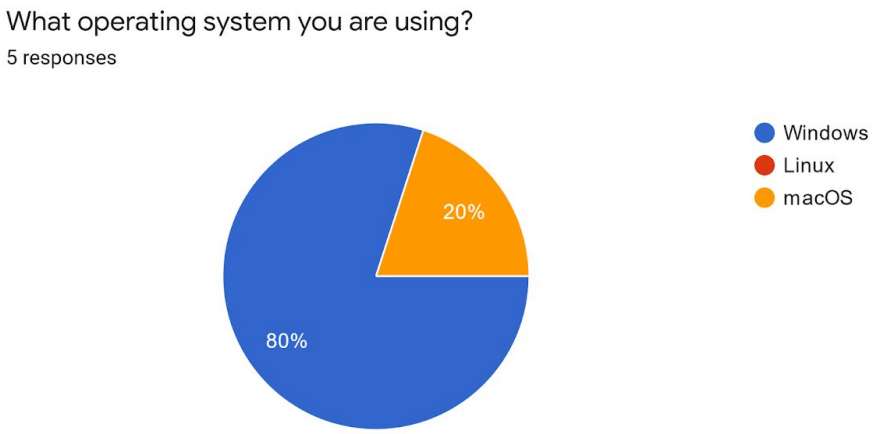
- Responding time for each operation
- Confusion and think aloud comments

Post Scenario interview and questionnaire questions

1. Do you find any problem with saving the data?
2. Can you find your saved data easily?

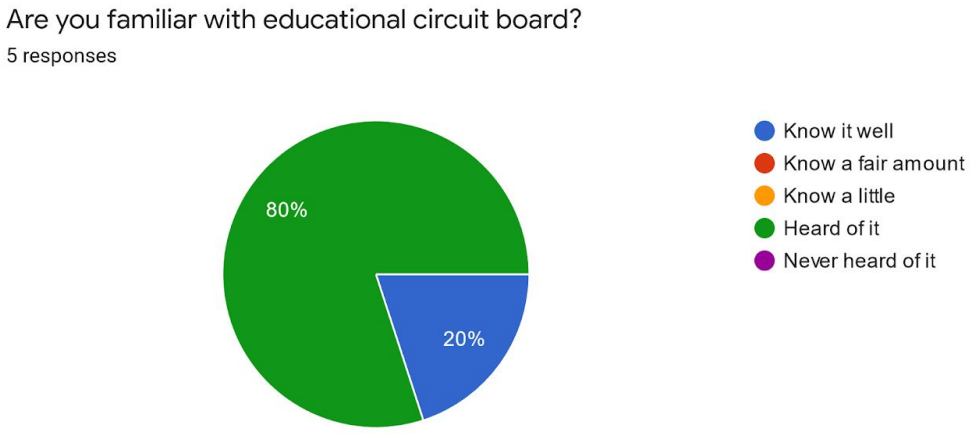
Results:

- Set up detail and user habits



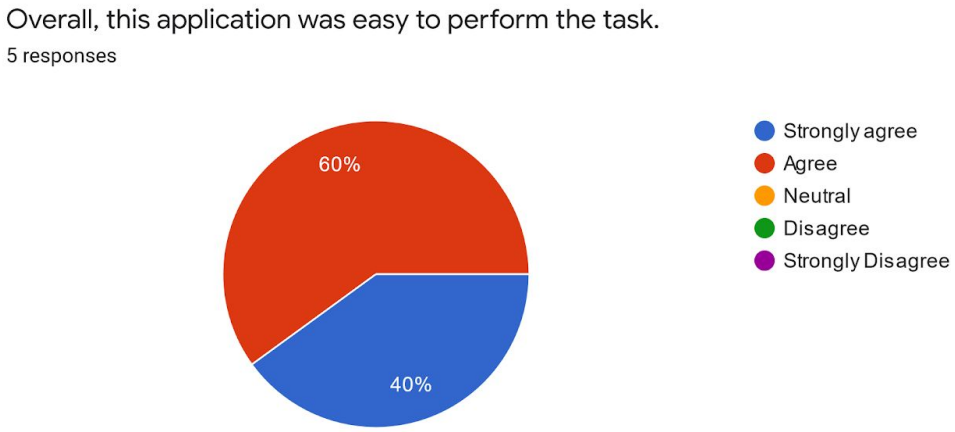
Four out of five participants are using windows 10, version 1909. One is on macOS with version 10.15.3.

All participants are Chrome users.

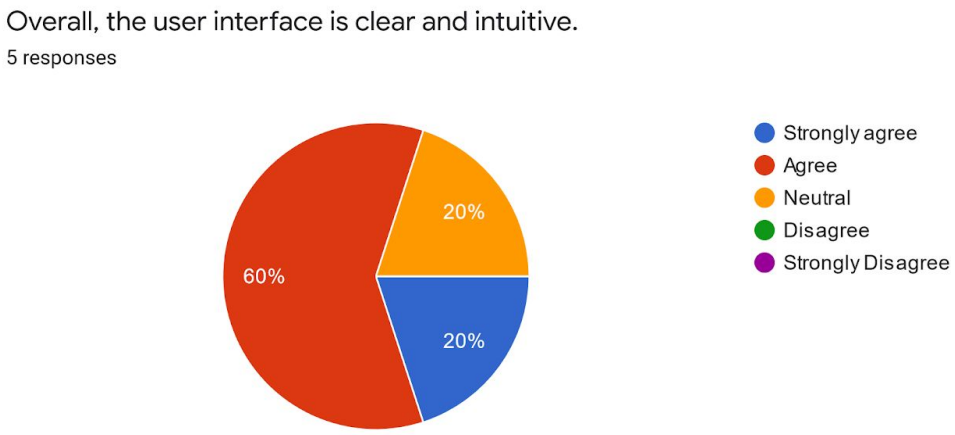


Only one particular participant has previous experience and knows very well about educational circuit boards and also owns a Raspberry Pi.

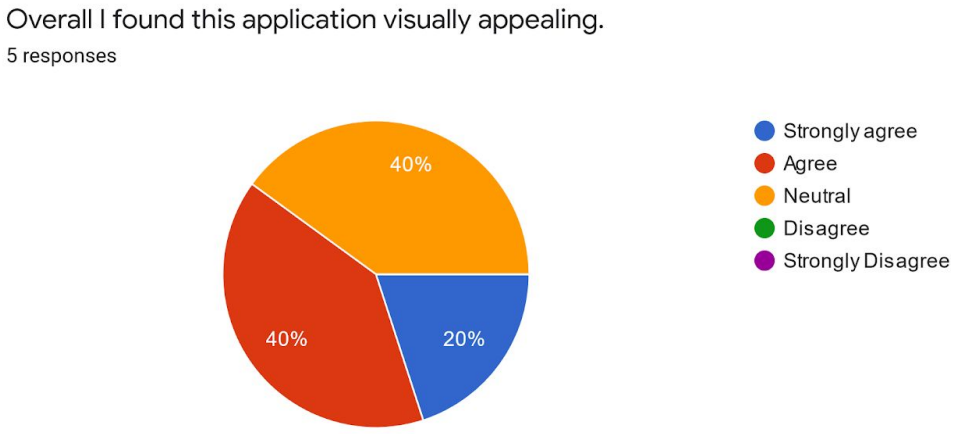
- Overall performance



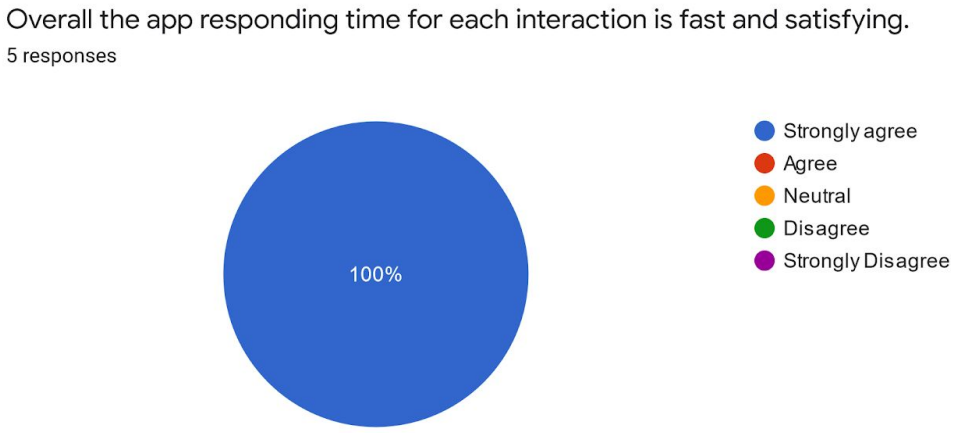
The app is overall easy to use.



The UI is overall good. Detailed analysis later.



The application is above average on visual.

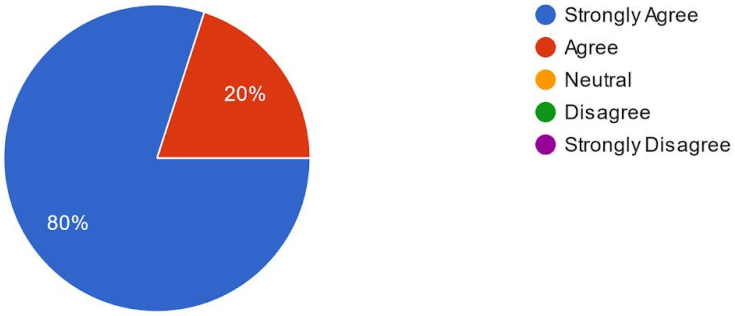


Responding time is fast with no noticeable latency.

- Detailed evaluation

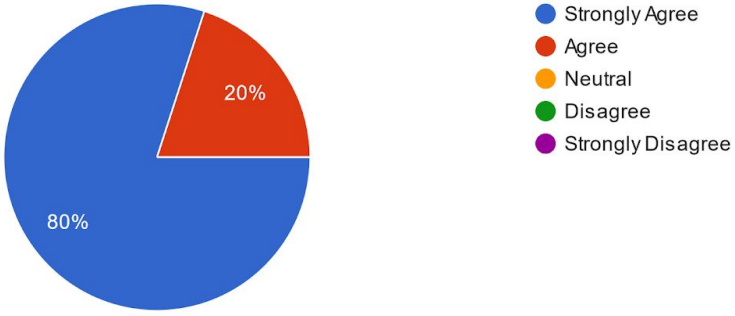
The connection is easy and I can easily figure out whether the device is connected or not.

5 responses



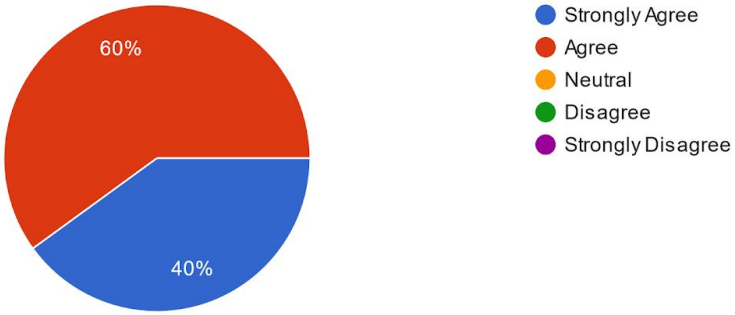
The control over start/pause/stop the data collection is straightforward.

5 responses



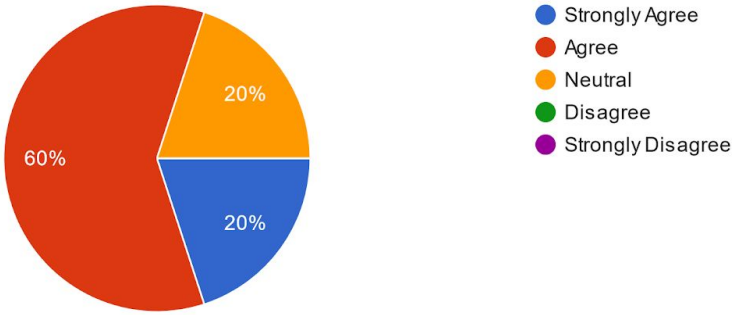
The plotted data graph clearly shows the data collected and easy to understand.

5 responses



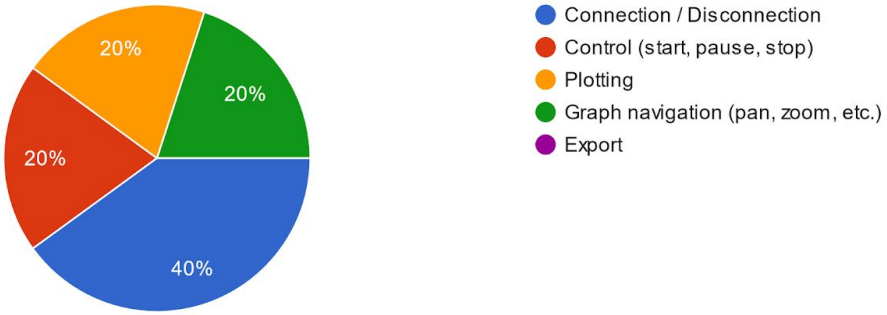
The plotted data graph is easy to interact with and I can navigate to anywhere I want on the graph.

5 responses



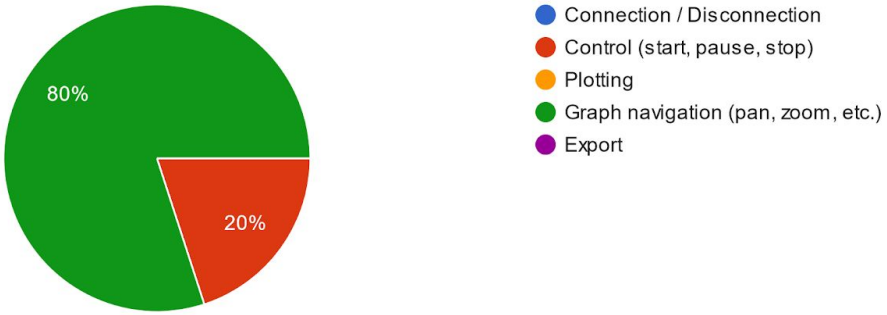
What is the best part of the app?

5 responses



What is the worst part of the app?

5 responses



The part where participants have most issues with is the graph navigation.

Conclusions & Suggestions:

In general, the response time is really fast, there is no noticeable lag in any situation tested. Then UI is generally looking good to the participants, there is no complaint about it. Using only one micro:bit, the app is generally good. As for two micro:bits, there is a problem.

The tab design for multiple connections is not working. Once the second micro:bit is connected, a second tab will show up for a split second and disappear. Other problems with the connection interface include it is unclear which one is the second one and connection indicator was sometimes cropped out of the screen.

We also observed that there is an extremely large number that will show up randomly, we checked and eliminated the possibility of hardware issue, firmware version, the way we programed the micro:bit, the hex file we used in programming the micro:bit and operating system. The issue was still there regardless of those.

A related issue with previous one is that the extremely large number will mess up the rage of displaying, the graph will be a straight line with a spike and even adjusting the range so that the large number is out of the range of displaying, sometimes, the graph cannot zoom in to adapt to the range of the value.

It is also notable that after moving the range of displaying, the time axis is not

aligned with the graph.

There are also several cosmetic problems. The first one is the timer on the left is not working, however there is a second working timer at the bottom. I suggest removing the one down there and make the one on the left functional.

Then, a small issue with the exported file that stores the data. The key column which is the time starts with 0 instead of 1. And one is what we used in the graph. This made many of the participants confusing.

And finally, the rename for each graph is not working. Which is a known-issue by the development team.

Personal suggestions:

1. Consider making a first-time guide. So users may have less issues with the navigation. Especially for the range adjusting part. Participants found it confusing. Also, the two graphs are also confusing for some users. You can make it clear the function for each graph.
2. Rename the button controlling the data collection from **play** to **start**.

Appendix A:

	Apr 16 THU 4:00 PM 5:00 PM	Apr 16 THU 5:00 PM 6:00 PM	Apr 17 FRI 11:00 AM 12:00 PM	Apr 17 FRI 3:00 PM 4:00 PM	Apr 17 FRI 4:00 PM 5:00 PM	Apr 17 FRI 5:00 PM 6:00 PM
5 participants	✔2	✔2	✔2	✔2	✔2	✔2
	★	★	★	★	★	★
Sam			✔			
Jared Schrauben	✔	✔				
Tyler Marenger				✔	✔	✔
Brandon Searle				✔	✔	✔
Wiley Roemer	✔	✔	✔			

*Sam refers to Sam Stevenson

Appendix B: Bug Report Form

*the form was merged from different test sessions

Bug #	Name	Location	Scenario #	Description
1	Scaling Y	Graph	2	Can't zoom to certain y values
2	csv zero value	csv	4	csv gave different value than graph because csv starts at 0 and graph starts at 1. So every number is off by 1
3	Time Elapsed not working	Graph controls	2	Time elapsed does not show time elapsed on the left side of the graphs controls
4	micro:bit connected off screen	Right side		micro:bit connected is partially off of the screen
5	hex file data error		2	Makecode dummy data generation plots very extreme values sometimes.
6	Multiple Graphs	Add micro:bit	3	The application was failing to add multiple micro:bit and showing graphs.
7	Data Error	Graph 2	2	When two micro:bits are connected an extreme value data point occured on the second graph.
8	Data Error	Graph data	2	A very large negative value was generated and messed the graph and the scale up.

Appendix C: Testing Challenge Form

*the form was merged from different test sessions

Challenge #	Name	Description	Verbal Comments
1	Set up Micro:Bit	Unpack and connect Micro:Bit to computer. Set up makecode	"Well packaged"
2	Connect	Add micro:bit through chrome browser	"Physical connectors are small", "Connected to the app perfectly"
3	Data Collection	Start data collection for about 1 minute, pause, continue.	"It picks right back up when you resume",
4	Zoom in 30-40 sec	Zoom the graph data, and find the exact value at 35 seconds	"The value at 35 is 7", "How do I move it upwards to see the higher point?"
			"No problems scrolling, finding a decimal point would be difficult"
			"Once I figured out the slider, viewing different ranges was easy"
			"Buttons and interface are clear and self-explanitory
5	Save the data	Save the data to a .csv file and open it up	"Save, there's the .csv file. I can open it up, and there it is in excel"
6	Single Connection	Set up one micro bit and connect to chrome application	"No trouble connecting, a little bit with the battery", "Yeah"
7	Data Collection - part 1	Start data collection, record for 1 minute, pause, continue, and stop	"I dont know how to...", "Is this supposed to be manual data collection?"
			"I don't like that the timer isn't by the pause button"
8	part 2	Zoom in from 30-40 seconds and record exact Y value at 35	"35 seconds the value is 10", "I don't know why there's a plot up here and down here"
			"I wouldn't now how to zoom out", "It's not

			super clear, but I don't know the data"
			"I can't look at a value like 35.5",
9	Save	Save the file and open it up in Excel, Y value at 35 seconds	"Opens up. The value is 17"
11	Connect micro:bit	Open the application and connect the micro:bit device	"Alright, I got the graph up", "No trouble connecting, it works alright"
			"The interface is clear"
12	Collect data	Collect data for several seconds, pause the micro:bit, resume, and stop	
		Look at the data from 10-15 seconds, find the exact value at 13	"Exact value at 13 is 4.0", "The data plot makes sense", "Axis labels?"
			(Did not immediately realize the lower graph is for scaling the x axis)
			"The bar at the bottom is not explained, have to figure it out"
			"Mention using the dots on either end of the box to control width"
13	Save and open data	Save as a .csv and open in excel	"I see the data in excel, the value at 13 is 16.8" (zero indexed)
14	Identify micro:bit Connected	Confusing to the user which micro:bit connected was the one actually connected. They wanted the name of the device to be different which is out of our control.	
15	Difficulty Adjusting Data Range	Due to the user's window size, he did not see the bottom portion of the graph and had difficulty adjusting the data range at first.	
Final Comments:			
Thoughts?	"I didn't find anything strange"		
	"Most		

	operations were intuitive"		
Any problems?	"No, I don't think so."		
Suggestions?	"Have labels, 'click this to get this'"		
	"Have a help bar, or descriptions of how to interact with the graph"		
	"Something like a tutorial, you could have it all in a help button in the corner"		
	"Rename the Play button to Start"		
	General Opinion:	Pretty good, easy to use. Coloration is good, easy to connect and disconnect.	
	Any difficulty?	Nope, other than random weird values. Usability is very good	
	Suggestions?	Scale the y-axis	