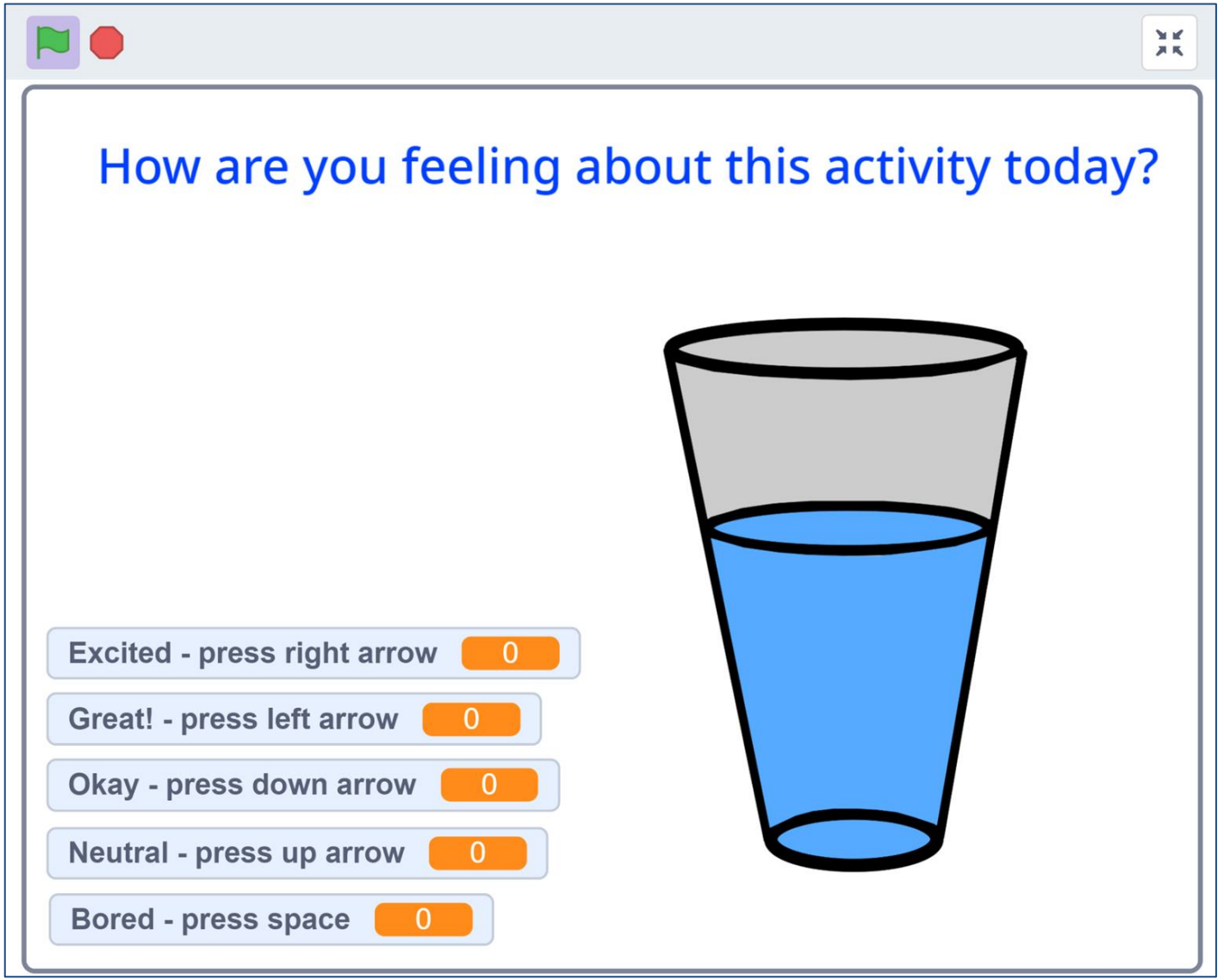
SYSTEMS IN ACTION

Grade 8

Gathering Data Using Input/Output Code

Class Poll


How are you feeling about this activity today?
Excited - press right arrow 0
Great! - press left arrow 0
Okay - press down arrow 0
Neutral - press up arrow 0
Bored - press space 0

What is Coding?

Coding is a set of instructions created and then followed to complete a task.

Coding can be done using paper and pencil to create written instructions, using mechanical devices which are positioned in a specific way to get a desired outcome, or by typing instructions on a computer.

The poll on slide two was created using coding in a program called Scratch.

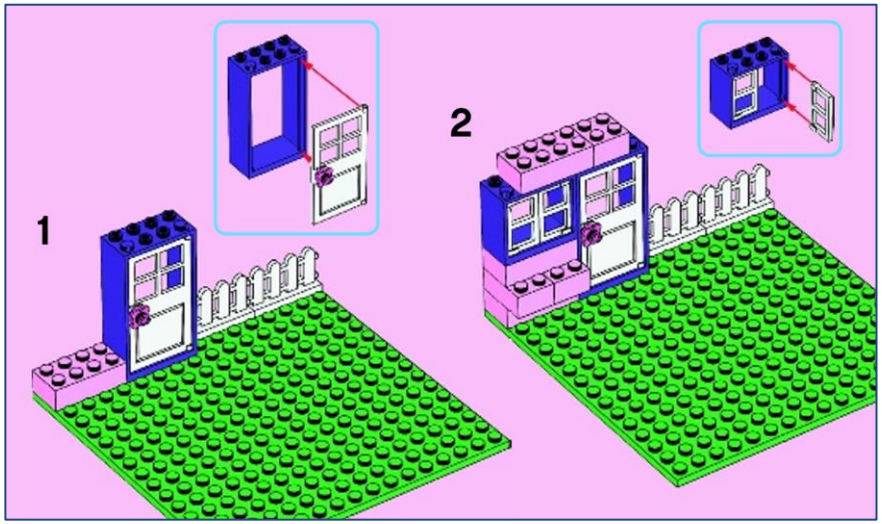
Coding Examples

Paper and pencil coding

- directions, including mazes or maps
- written or graphic instructions to follow when completing a project

How to Roll a Die

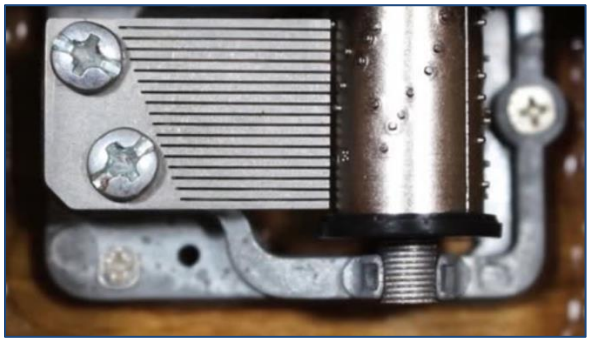
1. Pick up die.
2. Hold in one hand.
3. Cup your other hand over the top of the die.
4. Shake the die so it moves between your hands.
5. Release the die gently onto a flat surface.
6. Wait until the die stops moving.
7. Read the number on the top surface of the die by counting the number of dots showing.

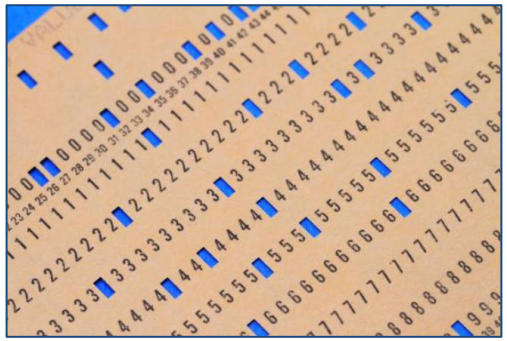


Coding Examples

Mechanical devices, also called “physical computing”

- marble gravity mazes with switches
- punch cards
- music boxes
- thermostats

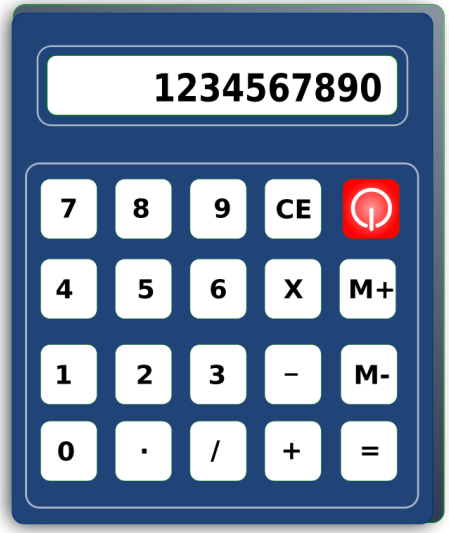


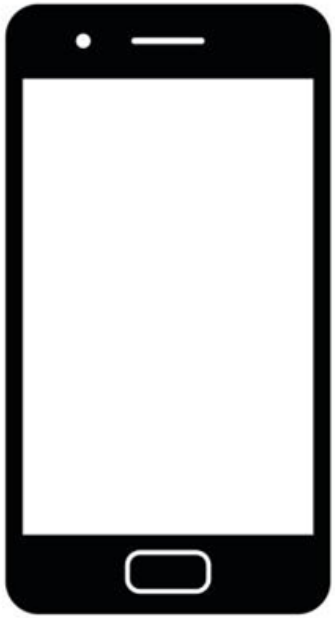


Coding Examples

Computer coding

- games
- programs
- cell phone apps
- car displays
- calculators
- televisions
- microwaves
- vacuum cleaners
- and so on!





Inputs and Outputs

Coding relies on clear instructions to work. Those instructions are made up of ***inputs***, the information put in by the user or machine, and ***outputs***, what the code says to do for that particular input.

Example 1: When flipping a coin, the input is the flip. The output can be either heads or tails.

Example 2: On your calculator, you can input 1+ 2 by pressing those buttons. You tell your calculator to give you the output, which is 3, by pressing the “=” button.

If/Then Statements

Computer coding relies on the coder to create a list of inputs and outputs for the program to follow. Coders frequently use “if/then” statements to create a flowchart showing how their code will work.

IF “1+2=” is pressed on the calculator buttons,

THEN display the answer “3” on the screen.

If/then statements can be used as part of decision-making, as in video games, where you get different results from different actions. They can also be used to give feedback.

Your Turn!

Here is a survey made using Google Forms as the coding tool.

https://docs.google.com/forms/d/1c0PvlAs1FjvvD3kJ625v9nSu44p_LL1kNIMEB4M2VQc/

Answer the questions and click “submit”.

Class Reflections

- What worked well in this code?
- Which type of question did you like?
- What would you change?

Look at the Code

Make your own copy of the survey here:

https://docs.google.com/forms/d/1c0PvlAs1FjvvD3kJ625v9nSu44p_LL1kNIMEB4M2VQc/copy

What do you see in the code that could help you make your own survey?

How can this be used?

It is important to be able to collect and organize data when you are doing research, especially in science and mathematics.

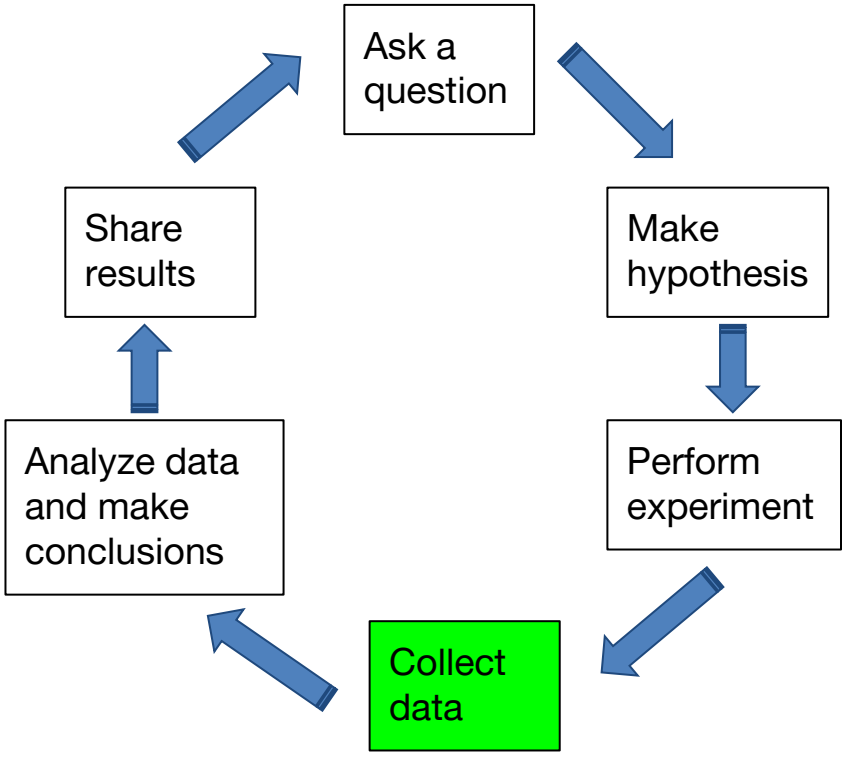
As a researcher, coding gives you the flexibility to **create your own programs** to collect data from your classmates.

Using Google Forms can also help you automatically group and graph your data. This is very useful when looking for results in a large amount of data!

The Scientific Method

The scientific method is a model for inquiry that works in a cycle. It can be started at any point; maybe you are inspired by hearing about the results of others at a science fair, or you make a hypothesis about how to make a certain program and then decide to create it.

Here, we are focusing on how to collect data.



Giving User Feedback

The Google form you just filled out had a variety of questions, but it did not give the user (you) much feedback about your responses.

Feedback can help encourage and support your participants when they are answering questions. You can code your program to include strong “if/then” statements, instead of just “go to the next question”.

Google Form with Feedback

Your turn, part 2. Same questions, but this time look at the feedback that is coded into the form.

https://docs.google.com/forms/d/1UYKPLkqDMUzA4JQw5dszfyfPY7rOthZydoieYlBelE8/

Class Reflections

- What worked well in this code?
- Which type of question did you like?
- What would you change?
- **Did the feedback you received make you more or less likely to complete the form? Why?**

Look at the Code - part 2

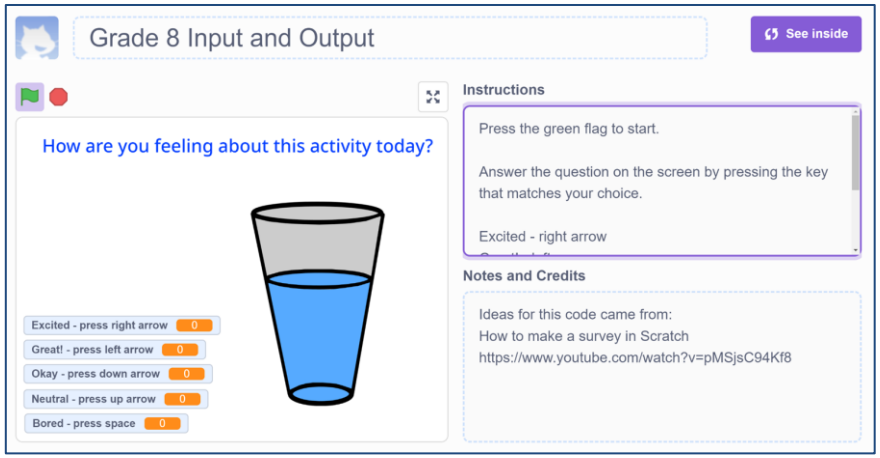
Make your own copy of the survey which includes feedback here:

https://docs.google.com/forms/d/1UYKPLkqDMUzA4JQw5dszfyfPY7rOthZydoieYlBelE8/copy

Yes, the code is longer.
What else do you notice?

Look at the Code - Scratch

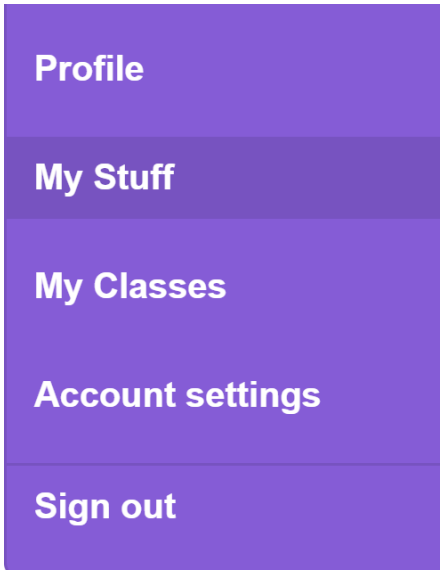
Here's the link to the Scratch code from the beginning of this lesson. https://scratch.mit.edu/projects/882878108/



Scratch Coding

Click “See inside” to explore the code used without an account.

If you have an account you can use at school, click “Remix” to save a copy of the code to your “My Stuff” page. Click your name on the top right, then scroll down.



Class Discussion

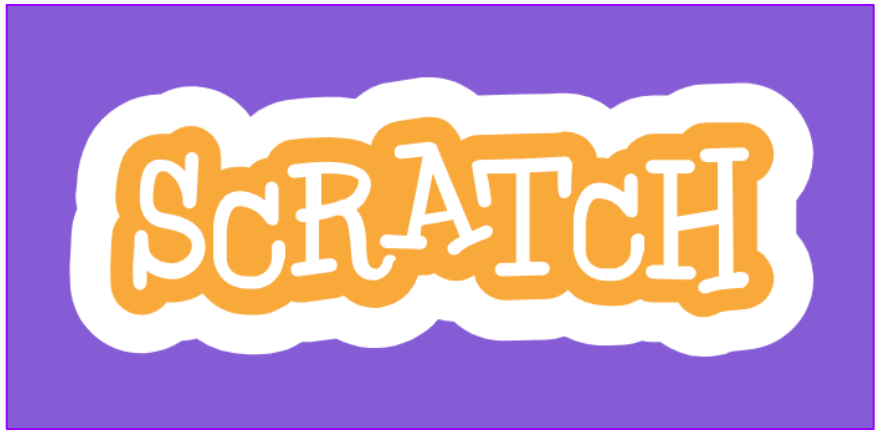
- Which type of question does the Scratch survey answer well?
- Which types of questions are available in Google Forms?
- What sort of feedback helps encourage your participants to complete your survey?

How to code your own program to collect data

1. Choose Your Platform

Now you get to make your own data collection program! Which coding platform will you use? Click either button to start a new project.

https://docs.google.com/forms/



https://scratch.mit.edu/projects/editor/?tutorial=getStarted

Note on Accounts and Privacy

You can code in Scratch without an account. To share or save in Scratch, you will need to have an account. You can download (save to your computer) *without* an account.

To use Google Forms, you will need to have an account.

Ask your teacher which program to use and how to turn in your work, because these are different for each school region.

Step 2: Find a Question

This can be related to work you are doing in Science or Mathematics class, or you can just ask a random question you are curious about.

Add your question to your code. You may add more questions as instructed by your teacher.

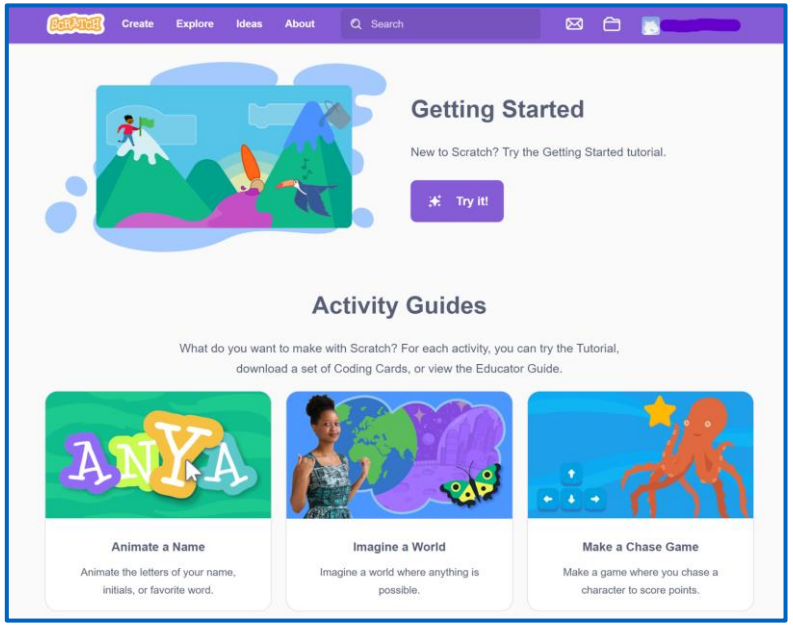
Step 3: Create Your Code

Things to consider as you write your code:

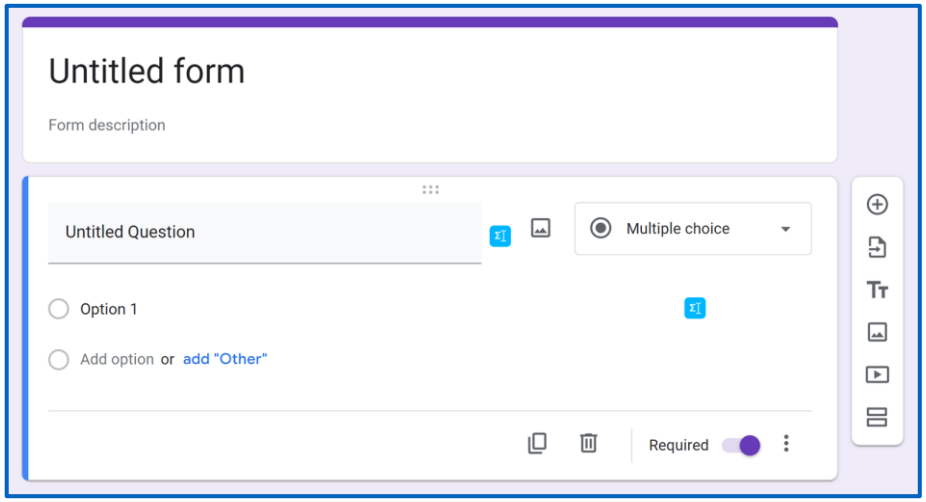
- Is your question clear?
- What sort of feedback you can give to your users to help them?
- What did you want to see in the example codes when you were trying them; things that may have been missing? Can you figure out how to add them to your work?

Scratch Instructions

Tutorials on how to use Scratch https://scratch.mit.edu/ideas and here are printable step by step cards for each skill https://resources.scratch.mit.edu/www/cards/en/scratch-cards-all.pdf



Google Forms Instructions



Written instructions for making and sharing a Google Form https://support.google.com/a/users/answer/9303071?hl=en

Video for creating question in Google Forms https://www.youtube.com/watch?v=sP3lTgz2HkI

Need an advanced tutorial?

You can look at the codes shared in this lesson.
Copy and use any part of those codes that you like to help!

Step by step instructions:

How to make if/then conditions in a Google Form
https://www.youtube.com/watch?v=6110yW7ovD4
How to make a survey in Scratch
https://www.youtube.com/watch?v=pMSjsC94Kf8

Coding Challenges

- Try to give feedback for EVERY answer to your question. What are different ways you can do this?
- Change your background or add pictures.
- Add sound or a video to your survey.
- Create an “if/then” sequence where you can send people to different questions depending on their answers.
- Other ideas from your classmates?

Step 4: Share With Your Class

Ways to share with your classmates:

- Your teacher can create a shared document where each person can add their code
- Email the link to your survey to your group
- Setup a polling station on your device and have people come answer your question

Ask your teacher which way they would like you to share your work.

Important Learning

- Science experiments collect data to help answer questions.
- Coding is an effective way to create tools to collect data.
- Experimenters need to carefully choose or create their coding tools when conducting research and experiments.
- Giving participants feedback as part of your code helps them feel motivated and recognized.

	Level 4 Extending	Level 3 Proficient	Level 1-2 Approaching
Programming with Scratch	Survey code includes a functional score display and feedback message for each option.	Survey code includes a score display and feedback for most of the options. A few small glitches.	Code needs work to become useable as a survey. Time to troubleshoot using the examples from class!
Programming with Google Forms	Code includes clear questions and feedback message for each option on the survey.	Code includes a question and feedback for most of those options. Survey may have an option or two that needs editing.	Code has a question and needs answers added to become useable as a survey. Look at the examples from class for help!
Data Collection: Skill	Code is original, going beyond what is provided in the examples (several questions and answer options). Performs data collection in a way that is clear to the end user.	Code shares some original ideas, building on the examples from class. Performs data collection with a few questions from the end user.	Code uses the examples from class, changing some elements. Some parts of the code need work to make them functional or clear to the end user.