Scientific Inquiry - Gathering Data	Grade 7, Scientific Research Process

Lesson Plan	**Coding Tool** Scratch.mit.edu online block-based coding software. CSFirst (https://csfirst.withgoogle.com/login?continue=/project/editor) offers an identical platform which requires teacher and student login.
	Cross-curricular Connections Science - inquiry, data bias, and coding Math - data collection, data bias, and coding

Description

This lesson introduces students to different types of data, ways to collect data, and identifying bias in data collection. It then gives them the opportunity to collect their own primary data using a coding tool created in Scratch.

Learning Outcomes
- Distinguish between primary data and secondary data.
- Understand that the way data is collected can introduce bias.
- Create code which can be used to collect primary data to answer a question.

Specific Expectations

Ontario Science Curriculum, **Scientific Research Proces**s, pp 70-76
Define a problem and its context: consider questions related to the area of investigation. Analyze information and summarize findings: consider bias in the data or on the part of the researcher.
Record data: Record clear and concise data Consider questions related to the area of investigation.

Ontario Mathematics Curriculum, Coding, pp 419-420
C3.1 Coding Skills solve problems and create computational representations of mathematical situations by writing and executing efficient code, including code that involves events influenced by a defined count and/or sub-program and other control structures.

Introduction

In this lesson, students will participate in a full-class data-gathering activity using a Scratch program. Using the results of that activity, as well as three other simulations, the teacher will lead a discussion about the differences between primary and secondary data, qualitative (description) and quantitative (numbers) research, and different forms of bias which can be present when doing science research.

Students will then modify existing code or create unique code to create their own data collection tool using the Scratch block-based coding program.

Action

- Lead the lesson on scientific research, data collection, and bias using the slide show. Reliable secondary data can be found at Statistics Canada https://www12.statcan.gc.ca/census-recensement/index-eng.cfm
- Experiment with the whole class or in small student groups using the Scratch link using code to ask them about preferred colours. https://scratch.mit.edu/projects/874349655/
- There are three different coding projects showing bias.
  - size of option https://scratch.mit.edu/projects/886714658 (bias 1)
  - colour of background https://scratch.mit.edu/projects/886715334 (bias 2)
  - written message and scoring only showing for one colour https://scratch.mit.edu/projects/886715985 (bias 3)
- You can use one of two platforms for student coding. They present the exact same coding experience, with slightly different end-product options.

  - https://scratch.mit.edu/
    - can be used without an account.
    - project can be downloaded, and then sent to others.
    - account allows you to save your work.
  - https://csfirst.withgoogle.com/login?continue=/project/editor or https://csfirst.withgoogle.com/project/editor
    - same as above OR
    - can be used with Google Classroom so the teacher can assign and collect projects.
- Give the students at least one hour to work on coding their own data collection tool. They can start by remixing one of the sample codes or using a blank code template. You can have them do this alone, in partners, or in groups. Individual work is best here to give everyone coding time. Try making a shared group document where students can post their links to be tried and commented on by classmates.

Consolidation/Extension

Main Ideas
- Primary data is data collected directly by the individual(s) doing the research. This is typically the type of data gathered during science experiments.
- Secondary data is data which has been collected and shared by other people. It is important to use secondary data from trusted, reliable sources.
- All individuals have personal biases, opinions, and ideas. These should be identified and reduced as much as possible when doing research.
- Code can be used to create tools to gather primary data in ways which minimize bias.

Accommodations/Modifications

Have students start by "remixing" one of the codes provided during the lesson. Rather than having a blank screen, this lets them change one item at a time. Focusing on single coding skills will build confidence.

Sample prompts:

"Change the background."

"Make the circles different colours."

"Try changing the coloured circles into different animals."

For those students who need a challenge, you can try these extensions.

"Add sound to each selection."

"Create a thank you message that pops up after each person makes their selection."

"Hide the scores and create a final scoreboard that appears after everyone has made their choices."

"Make a version of this that includes *as many biases as you can*."

Assessment

When assessing coding, the following rubric can be used. It is also on the last slide of the lesson materials. Consider the individual learning about code, how creative the product is compared to the example source code, and whether the program works as a data collection tool.

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	Level 4 Extending	Level 3 Proficient	Level 1-2 Approaching
Programming with Scratch	All parts of the code are functional with no missing parts or error messages.	Most parts of the code are functional, with only 1 or 2 dead ends or mis-coded parts.	Code needs work to become playable. Time to troubleshoot!
Data Collection: Creativity and Skill	Code is original, going beyond what is provided in the examples. All parts function as intended by the coder. Performs data collection in a way that is clear to the end user.	Code shares some original ideas, building on the examples. Most parts of the code function as intended. 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.

Additional Resources

Coding tutorials in CS First https://csfirst.withgoogle.com/c/cs-first/en/curriculum.html
Coding tutorials in Scratch https://scratch.mit.edu/projects/editor/?tutorial=all

Extend your block-based learning:
Minecraft Edu (accounts required) https://code.org/minecraft
Code.org https://code.org/student/middle-high

Teacher Resources
Science North Professional Learning: Coding Series
https://schools.sciencenorth.ca/professional-learning-coding-series
Canada Learning Code https://www.canadalearningcode.ca/teaching-code/