Lesson 12: Loops and Simulations

Adapted from Code.org curriculum

Objectives: you will be able too…

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- Use a while loop in a program to repeatedly call a block of code.
- Use variables, iteration, and conditional logic within a loop to record the results of a repeated process.
- Identify instances where a simulation might be useful to learn more about real-world phenomena.
- Develop a simulation of a simple real-world phenomenon.

Vocab:

ଓ Models and Simulations - a program which replicates or mimics key features of a real world event in order to investigate its behavior without the cost, time, or danger of running an experiment in real life.

Coin Flipping Experiment

ↁ We will use the "Worksheet – Flipping Coins"

ↁ You will need one coin between you and your partner

ↁ "We're going to run two simple experiments. Use your worksheets to keep track of your results (by writing "H" or "T" for each flip) but keep them a secret for now."

ↁ **Experiment 1:** Groups will flip their coins as many times as it takes in order to get 5 heads total

ↁ **Experiment 2:** Groups will flip their coins as many times as it takes to get 3 heads in a row

Coin Flipping Experiment

ଓ "Let's have a little competition. You should have recorded your results for your two experiments. Based on your experiment, predict, among every group in the class the most and fewest flips needed to complete each of the experiments."

ଓ If we want to run this experiments for higher numbers of heads or longer streaks of heads however, we'll quickly find that it's tedious to do once, let alone many times.

ଓ Luckily we know now that we can use loops to repeatedly perform commands, so we're going to simulate these larger experiments instead.

App Lab: Code Studio

Loops and Simulations

Don't forget to record your predictions in Stage 2

Wrap-up: Reflection

ও Update your hypothesis based on the results of your simulation and predict the outcomes of an even larger experiment using the new knowledge you have gained.

ও Share out

Wrap-up:

ᴄᴈ Not all problems are as easy to simulate as a coin flip of course, and we've even seen how some problems we can simulate still take a very long time to run.

ᴄᴈ Simulations are an increasingly important tool for a variety of disciplines.

   ᴄᴈ Weather and traffic predictions are based on computer models that simulate weather patterns or people moving through a city.

   ᴄᴈ Scientific research, whether in physics, chemistry, or biology, increasingly uses simulations to develop new hypotheses and test ideas before spending the time and money to run a live experiment.

Wrap-up:

ဢ Before you use most of your favorite websites and apps, they will be tested by simulating high levels of traffic moving across the server. Simulations take advantage of computers' amazing speed and ability to run repeated tasks, as we've seen through our exploration of the while loop, in order to help us learn more about the world around us.

ဢ As computers get ever faster and models improve, we are able to answer old questions more quickly and start asking new ones.