

Lesson Plan-Micro:bits on the Fly with Lego Cars

Lesson Topic: Micro:bits

Grade Level: 6-8

Subject Area(s): Computer science

Lesson Description (Abstract): Students will build Lego cars and measure the speed for a measured distance using a microbit.

Learning goals/outcomes:

- Students will learn how to use the micro:bit sensor (accelerometer) to measure speed and collect data.
- Students will build a Lego car to hold the micro:bit to measure acceleration.

Wyoming Standards:

Computing Systems-Devices 6.CS.D.01

Computing Systems-Troubleshooting 6.CS.T.01

Algorithms & Programming-Algorithms 6.AP.A.01

Algorithms & Programming-Control 6.AP.C.01

Algorithms & Programming-Program Development L1.AP.PD.03

Impacts of Computing-Social Interactions 6.IC.SI.01

Teacher Planning

Equipment/materials needed:

- 1 microbit per student
- Recommended-a storage tray(or something similar) for the students to keep their devices more accessible and organized
- Device to use the online coding site, makecode.org
- Materials to build the final product (Legos) and track depending on the parameters the teacher sets. This could include Legos, cardboard, tape, markers, LEDs, sensors.)

Time required for lesson:

5-7 hours depending on the amount of time dedicated concurrently, the amount of tutorials needed and expectations for the final project. 1-2 weeks for an elective class.

Setup required:

- The teacher will need to be familiar with the microbit and coding, particularly with the accelerometer sensor.
- Set up a microbit with accessories needed for the selected lessons.

Technology

Materials

- Device with the browser to create and download the code
- 1 microbit/student is preferable
- Microbit battery pack and batteries

Instructional Plan

Prior Knowledge Needed

- Foundational knowledge of block coding
- Foundational knowledge of building a car
- Experience with micro:bits would be beneficial.

Benefits/Explanation/Real-World Connection:

Students will apply their knowledge of micro:bits to create a car that can record and measure its speed. Students can make connections of how similar technology is currently in use in vehicles or with other tools (speed radar, etc)

Activity (Activities may need to be adjusted depending on student background and familiarity with micro:bits and computers)

1. Class discussion: What technology do we have to monitor actions in our world (temperature, lights, speed, etc). How does this technology benefit our society? Does it keep us safer? Lead the discussion to how we can use the micro:bits to measure speed.
2. Review micro:bits parts and explain their use and purpose.
3. Develop and class guidelines for using the micro:bits (organization, power, cleaning, etc).
4. Present a basic lesson on how to use the micro:bits. Use the videos and information from this [link](#). Overview user [guide](#). Include the vocabulary and terms needed to complete the lessons (LED, micro USB, hex file, file management).
5. Demonstrate and check for understanding on how to save, download and transfer program files.
6. Introduce how we will use the battery pack to power the microbit and collect data for this project.
7. Show a model of what will be needed to complete this project for students to build a car that will hold the micro:bit and battery pack. There may be discussion on how the microbit needs to be placed in the car depending on the code that will be written (up, down, sideways, etc.)
8. Set constraints for the car model (size, materials, number of wheels, micro:bit placement, etc).
9. Prepare a track model for students to plan on how to build the fastest car.
10. Students will build a car model according to set guidelines including easy access to the micro:bit, but still protect it.

11. Program the micro:bits to measure speed. Depending on experience with coding microbits, this code may need to be modeling to begin. Using the same code would keep consistency in the data collection. Click [here](#) to see an example of code that could be used. Alternative: Show the code to the students and discuss the elements, but just download the code to one or two microbits that everyone shares to keep results consistent.
12. Set up a document to collect data (spreadsheet).
13. Students take turns running their car down the track and recording results.
14. Optional: Students can have 2-3 attempts to compare their data. Students could analyze their data, compare to other student data and cars and have a set time to make revisions to their car. Students could complete more rounds of races to measure data to see if their revisions improved their performance based on their data.
15. Revisit the first question. How have student views changed on how computers are used and where.
16. Optional. Brainstorm how this similar technology is being used in our society or how it could be used in the future.

Closure

Reflection on the final project on what they learned and what would they change if they had more time.

Assessment

This project can be assessed in a variety of ways and can include assessments from other content if you include written narratives, summaries or instructions.

Supplemental Information

Modifications:

- This lesson could be adapted to grades 3-5 with guidance and experience.
- This lesson could also be adapted to be used with the Makey Makey kits.
- Students could be paired to complete the lessons together.
- This lesson can be shortened, changed or adapted to meet the learning level of the students.

Resources:

Getting started-[links](#) to videos and information.

LEDS and Buttons information [link](#)

Sensors information [link](#)

Radio and pins [link](#)

Coding blocks [reference](#)

Using CS standards with microbits [link](#)

Additional Information

Lesson plan was developed using lessons from <https://makecode.microbit.org/#>
Micro:bit provides numerous resources, guides and videos, this is just one way to use their information and put it in an organizational format for students.