Indigenous Trail Trees & Coding a Micro:Bit Compass

Participant's Perspective

Today I learned about Indigenous Trail Trees **by** coding a Micro:Bit compass.

Learning Goal

To raise awareness of Indigenous culture by exploring methods of navigation both ancient and modern by making connections to STEM, particularly coding and geometry.

Logistics

- Group Size: Partners
- Material List:
  - Images of Trail Trees
  - History of Marker Trees
  - Micro:bit kits (with USB cables and batteries)
  - Laptops or iPads (laptops recommended) - with Internet connectivity
- Suggested Length: 45 minutes
- Age range: Grade 5 and up

Safety Considerations

- Tripping/falling: any outdoor walks always pose a tripping hazard.
- Collisions: between participants or between participants and structures.
- Be aware of the risk of participants leaving the group without warning.

Best Practices for Safety:
- Explore the outdoor space in advance of the activity, determine safe boundaries, and communicate these boundaries to participants in advance of outdoor activities.
- Supervise outdoor activities and maintain a 10:1 participant to adult ratio if possible. Establish strong ground rules around safe outdoor conduct (no pushing, tripping, etc.) prior to starting any activities.

Framework Connections

Toolsets	Skillsets	Mindsets
Knowledge Coding and hardware design.	**Digital Skills** Block programming, use of a microcontroller.	**Digital Intelligence** Building appreciation and awareness of indigenous ways of knowing. Fosters cultural connections.
Resources Use of a microcontroller.	**STEM Skills** Use of geometry to understand cardinal directions	**Computational Thinking** Decomposition, logical reasoning.
Experiences Creation of a useful navigation tool.	**Essential Employability and Life Skills** Critical thinking, creative thinking, problem solving, risk taking.	**Digital Action** Using technology to enable exploration of your surroundings.

Nuts and Bolts

1. As a group, have a discussion around navigation on foot and by vehicle. *This is to lay the contextual foundation for the links between the project and the tools which participants already use for navigation.*
   a. Ask "Do you use Google Maps?"
   b. Ask "Have you ever seen a paper map?"
   c. Ask "What could you use if you didn't have an iPhone or paper map?"

2. Provide participants with images of Trail Trees and have a group discussion around their use. *This starts to build links to traditional knowledge and methods of navigation that predate the participant's experience.*

3. Provide pairs of participants with a laptop and Micro:Bit kit. If necessary, see Getting Started with Micro:Bit. *In order to help build participant's comfort with microcontrollers, provide an overview of what a microcontroller is and how it is different than a computer.*

4. Introduce parts of a compass and discuss the notion of 360 degrees being a circle. Discuss with participants how to split a circle into quadrants and make reference to cardinal signs. *Link these concepts to math topics participants may have come across in school.*
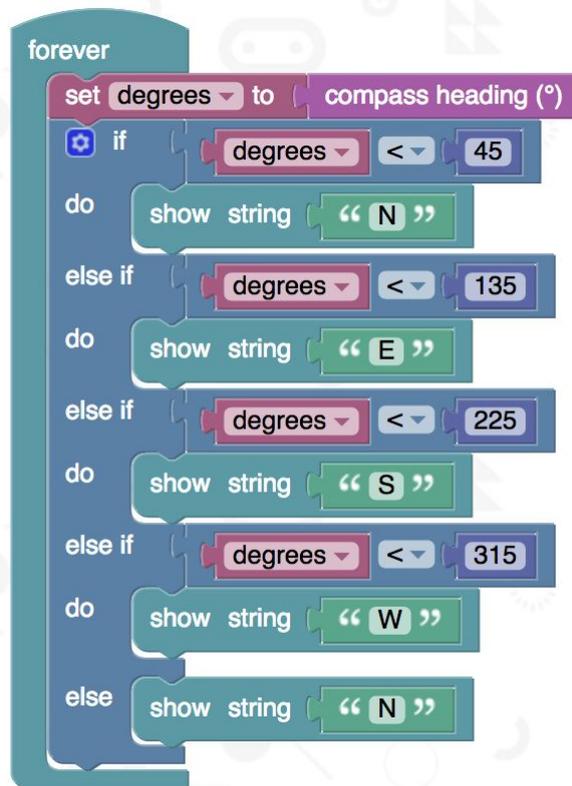
5. If participants are not familiar with block programming, provide a brief overview including forever loops and if/else conditional statement. *These logical concepts are essential underpinnings of computational thinking and will result in the creation of a compass algorithm.*

6. Provide students with the challenge of the Micro:Bit Compass Activity; participants must create a block program that turns the Micro:Bit into a functional compass.

7. Start by brainstorming how to do this and if the group is advanced, let them try and complete it themselves. If the group is struggling, walk them through the following steps as needed:
   a. Place all code inside a forever loop to ensure it runs continuously
   b. Create a variable called "degrees" and set this to the compass heading of the microbit
   c. As a class, decide where the boundaries between directions should be on a 360º circle, should the compass only show four directions or eight? Or more?
   d. Create a conditional statement that decides which string to show on the LED screen depending on the angle value of the degrees variable.

8. Walk the group through the process of loading the script to the Micro:Bit. *This reinforces the link between software and hardware, as well as the function of a microcontroller and how it differs from a full computer.*

9. Once the compass activity has been completed and the Micro:Bit has been synced, have pairs of students navigate the surroundings as a group.

10. As a group, ask participants to reflect on the activity. *Try and reinforce the connections to traditional methods of navigation at this point.*
    a. Ask "Imagine having to navigate without a compass?"
    b. Ask "Can you think of other ways to navigate without technology?" (i.e: the sun)

Modifications and Extensions

Ways to make this activity more approachable:
- Walk through each step of the block programming as a group.
- Pre-load Micro:bit battery packs prior to the activity.

Ways to make this activity more challenging:
- Have specific pairs of participants use Python rather than block programming.
- Create a geocaching challenge for the group to complete using a paper map and their compass.

Assessment and Evaluation

- Refer to the Toolsets/Skillsets/Mindsets table.
- Make anecdotal observations for each category.
- Observe participants' discussions as necessary.

Credits, Kudos, Shout Outs

Getting Started with Micro:Bit
Micro:Bit Compass Activity
Images of Trail Trees
History of Marker Trees

Terms of use

Prior to using this activity or parts thereof, you agree and understand that:
- It is your responsibility to review all aspects of this activity and ensure safety measures are in place for the protection of all involved parties.
- Any safety precautions contained in the "Safety Considerations" section of this write-up are not intended as a complete list or to replace your own safety review process.
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