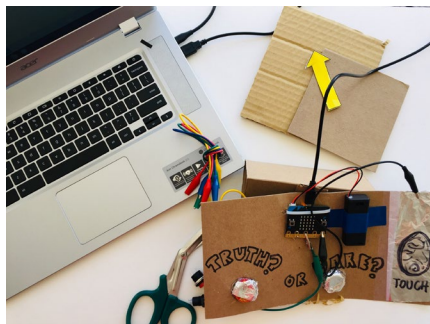


WEEK 9

DAY 1: CYBER ARCADE WORK SESSIONS

**INTRODUCTION**

This week makers continue working on their interactive games with a project-based approach. For the final two weeks, makers are experimenting with and synthesizing concepts explored in past weeks.

**ESSENTIAL QUESTIONS**

- What is a game or interactive project we want to share with our community?
- What changes do we make to our project as we design, make, and discuss?
- How do artists, engineers, and makers solve problems when they're working?

**LEARNING OUTCOMES**

1. Design, plan, and build interactive projects for a community event.
2. Engage in project-based learning through problem-solving and troubleshooting by creating a game using a Micro:bit microcontroller and code.



VOCABULARY

Project planning: Process of clarifying goals and listing the steps and materials required to complete a project

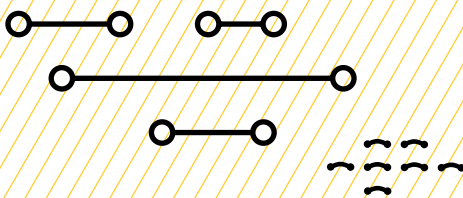
Game mechanics: Basic actions, processes, visuals, and control mechanisms that are used to make a game

Game designer: Person responsible for designing game storylines, plots, objectives, scenarios, the degree of difficulty, and character development

Game engineer: Specialized software engineers who design and program video games

Pseudocode: Detailed, informal description of what a computer program must do

Troubleshooting: Using resources to solve issues as they arise





MATERIALS LIST

EACH PAIR OF MAKERS NEEDS:

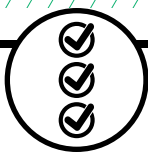
- Micro:bit microcontroller
- External battery pack
- AAA batteries (2)
- Laptop with internet connection
- USB to micro-USB cord
- USB flash drive
- Notebook
- Markers
- Colored pencils
- Scissors
- Cardboard scissors

ALL MAKERS NEED ACCESS TO:

- Alligator clips
 - Alligator-to-pin wires
 - Buttons (momentary and locking)
 - Servos
 - Tape (masking, painters, duct)
 - Aluminum foil
 - Assorted cardboard
 - Assorted paper
 - Pipe cleaners, pom-poms, popsicle sticks
 - Misc bottle caps/recycling (optional)
 - Hot glue gun and glue sticks
- (see Facilitation Tips)

Items can be portioned out per table or set up in an area where students can access them freely.





TEACHER PREP WORK

1. Set up an equitable system for student access of materials (either as a materials area or distributed evenly per table).
2. Set up a hot glue station covered with newspaper or butcher paper.
3. Print the [Troubleshooting Tips](#) and [Safety Agreement](#) at the end of the lesson and post in the classroom.

FACILITATION TIPS

Safety: Using hands-on tools is an empowering part of this curriculum. However, practicing safety when working is crucial when using hot glue and sharp tools. **Box cutters are for teacher use only! If you're comfortable with using one, you can help makers with cardboard cuts they can't do on their own. If you don't feel comfortable with letting makers use hot glue on their own, you can set up an area where you help them.** You know your makers best, so make adjustments and adaptations as necessary. **If makers misuse any tools, have them take a break from the tool and return at your discretion.**

Supporting a maker mindset:

Project-based making and coding is all about learning by making mistakes and encountering challenges. When makers get frustrated that something doesn't work out as planned, remind them that feeling frustrated is normal and that professional game designers, engineers, and artists experience similar challenges every

day. Encourage makers to discuss with their partner and classmates, and redesign as necessary. Remind makers of the cycle of "design, make, discuss." Explain that it's a cycle because often when creating something new, makers need to redesign after learning from things that don't work out the first time.

Managing technology, electronics, and making: Part of the excitement of this project is the combination of using computers, code, electronics, and hands-on making materials together. Remind makers to clean up their work areas as they go. It may be helpful to circulate around the room to remind makers to establish work zones and help clear cardboard and recycling around groups as they work.

Collaboration: Ensure that all makers participate in all aspects of the project (coding, designing, and making). Often makers will stick with an area they're comfortable in. While acknowledging their particular skill in one area, use pair programming as needed to switch roles, or have makers switch roles at least once in the session. Encourage makers to stretch out of their comfort zone to gain more experience with aspects they're less comfortable with.

ADDITIONAL RESOURCES

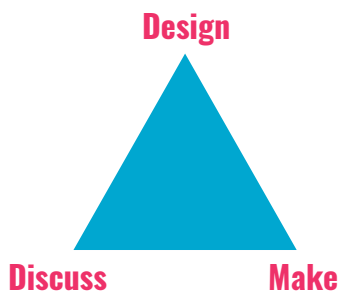
[Micro:bit Game Design with Conditionals](#)

[Wonderful Idea Co: Computational Carnival](#)

CYBER ARCADE WORK SESSIONS

STEP 1

Reflect on the last session



Makers reflect on their journal entry from the last session with their partner. Ask them to revisit what they answered last week, and discuss the changes and goals they want to set for the day.

EXPLAIN

This week you and your partner continue working on your projects as **game designers** and **game engineers**. Next week, we'll be planning and setting up our classroom as a Cyber Arcade. Then we'll invite people from the community to come and play the games we're creating!

Throughout these 9 weeks, we've been asking ourselves, "How do artists, engineers, and makers solve problems when they're working?"

When we invent and create, it's normal to feel challenged and frustrated! Professional artists, engineers, and makers feel exactly how you do every day.

At the end of the last session, we reflected on:

1. Challenges you faced and worked through
2. Changes you and your partner will make to your original plan
3. What you plan to start with today

Take 3 minutes to get out your **project plan** and talk with your partner about what each of you will work on and any changes you plan to make today.

Ask for volunteers to share with the group their responses from their notebooks, pausing to acknowledge and make suggestions for some of the comments they share.

STEP 2

Time to make.



This block of time is for makers to work on their projects. Make sure every group has enough space to safely work on coding and making.

- Circulate through the room and facilitate safe working habits by celebrating safe behaviors and calling attention to any unsafe behaviors (see Facilitation Tips).
- Help groups troubleshoot only after they've tried on their own for some time—and after they've asked classmates.
- Give suggestions to groups on how to improve their engineering, coding, etc., on an organic and 1:1 basis.
- Help students with making cuts on their cardboard if you're comfortable using the box cutter (see Facilitation Tips).
- If makers get frustrated or express conflict, point out when they should stop making to discuss and redesign as needed.

STEP 3



Reflect and discuss.

Before cleaning up for the day, makers pause to reflect. Ask makers to reflect and share about various points of the design, make, discuss cycle. Call out



specific examples of partner groups that you observed working together successfully through problems in both making and programming.

1. **Make:** Were there any challenges or successes you can share about your making and programming today?
2. **Discuss:** How did you and your partner communicate today? Share examples of how you worked together to get through a tough problem.
3. **Design/Redesign:** How did executing your design work out? Did you make any changes to your original design?

Note: Remind makers to save their files onto their USB flash drive before cleaning up.

STEP 4



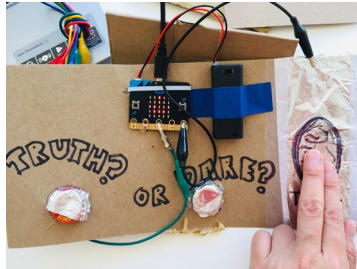
Clean up.

Makers will:

- Disconnect the battery pack.
- Put supplies and technology in their assigned bins.
- Return laptops and plug them in for charging.
- Return tools and materials that can be used again to the right place.
- Clear tables of garbage and recycling.

WEEK 9

DAY 2: CYBER ARCADE BETA TESTING



INTRODUCTION

In this session, makers continue working on project plans for their Cyber Arcade projects.



ESSENTIAL QUESTIONS

- What is a game or interactive project we want to share with our community?
- What changes do we make to our project as we design, make, and discuss?
- How do artists, engineers, and makers solve problems when they're working?



LEARNING OUTCOMES

1. Incorporate user feedback after beta testing their interactive projects.
2. Engage in project-based learning through problem-solving and troubleshooting by creating a game using a Micro:bit microcontroller and code.



VOCABULARY

Project planning: Process of clarifying goals and listing the steps and materials required to complete a project

Beta testing: Opportunity for users to test a product with the goal of uncovering any bugs or issues so they can be fixed

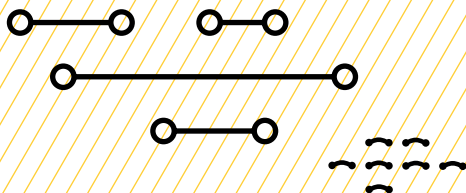
Game mechanics: Basic actions, processes, visuals, and control mechanisms that are used to make a game

Game designer: Person responsible for designing game storylines, plots, objectives, scenarios, the degree of difficulty, and character development

Game engineer: Specialized software engineers who design and program video games

Troubleshooting: Using resources to solve issues as they arise

Pseudocode: Detailed, informal description of what a computer program must do





MATERIALS LIST

EACH PAIR OF MAKERS NEEDS:

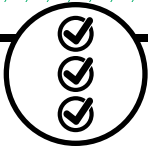
- Micro:bit microcontroller
- External battery pack
- AAA batteries (2)
- Laptop with internet connection
- USB to micro-USB cord
- USB flash drive
- Notebook
- Markers
- Colored pencils
- Scissors
- Cardboard scissors

ALL MAKERS NEED ACCESS TO:

- Alligator clips
 - Alligator-to-pin wires
 - Buttons (momentary and locking)
 - Servos
 - Tape (masking, painters, duct)
 - Aluminum foil
 - Assorted cardboard
 - Assorted paper
 - Pipe cleaners, pom-poms, popsicle sticks
 - Misc bottle caps/recycling (optional)
 - Hot glue gun and glue sticks
- (see Facilitation Tips)

Items can be portioned out per table or set up in an area where students can access them freely.





TEACHER PREP WORK

1. Set up an equitable system for student access of materials (either as a materials area or distributed evenly per table).
2. Set up a hot glue station covered with newspaper or butcher paper.
3. Print the [Troubleshooting Tips](#) and [Safety Agreement](#) at the end of the lesson and post in the classroom.
4. Print out one copy of the [Beta Testing Worksheet](#) for each team, plus a few extras.

FACILITATION TIPS

Beta testing: During beta testing, reassure makers that they aren't expected to have a completed project, but to share their work in progress to give and receive feedback. Makers may be sensitive to feedback, so reassure them that it's up to them if they want to incorporate suggestions or not.

Creative commons: Support a culture of sharing ideas. Makers may get upset or call out another group for "copying" their ideas. Remind makers that professional game designers and game engineers share and remix each other's code all the time. But just as in the professional world, if makers are inspired by another group's idea and incorporate it into their own, they

should change it to make it their own and give credit where credit is due.

Safety: [See Day 1](#)

Managing technology, electronics, and making: Part of the excitement of this project is the combination of using computers, code, electronics, and hands-on making materials together. Remind makers to clean up their work areas as they go. It may be helpful to circulate around the room to remind makers to establish work zones and help clear cardboard and recycling around groups as they work.

Collaboration: Ensure that all makers participate in all aspects of the project (coding, designing, and making). Often makers will stick with an area they're comfortable in. While acknowledging their particular skill in one area, use pair programming as needed to switch roles, or have makers switch roles at least once in the session. Encourage makers to stretch out of their comfort zone to gain more experience with the other aspects they're less comfortable with.

ADDITIONAL RESOURCES

[Micro:bit Game Design with Conditionals](#)

[Wonderful Idea Co: Computational Carnival](#)



CYBER ARCADE BETA TESTING

STEP 1



Revisit project plans and safety.

Design



Discuss

Make

EXPLAIN



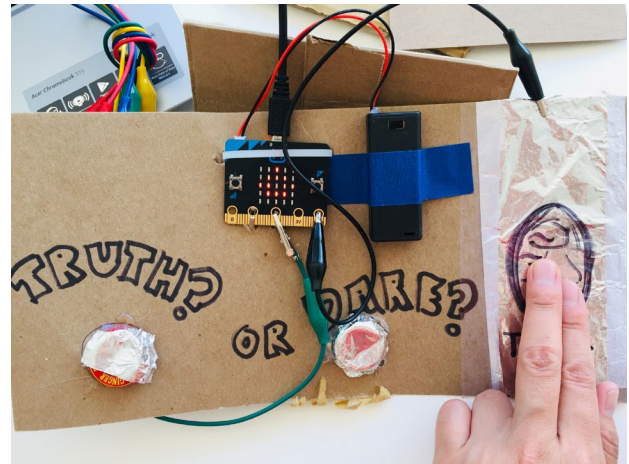
Last session, we started to design a project plan for working on Cyber Arcade projects. Take 5 minutes to revisit that project plan. Discuss with your partner how last session went and if you want to make any changes to your project. Decide on your goals for today. As a reminder, when we're working with many tools, materials, and people, we want to make sure we're working safely when sharing space.

Review the [Safety Agreement](#) with makers before getting started. Make sure this is posted around the room.

STEP 2



Beta test and gain feedback from peers.



This block of time is for makers to test each other's projects and get feedback on their own.

EXPLAIN



Even if your project isn't completely finished, we're going to take time to do some beta testing. Just like our cardboard prototypes from past sessions, beta testing is an opportunity for users to test a product with the goal of uncovering any bugs or issues so they can be fixed. You'll give and receive feedback, and you might even see something other makers have done that inspires you and your partner to bring that element into your project.

Makers set up their projects to be tested. Depending on how many groups you have, you can choose to do this by pairing groups together, doing a whole

group presentation, or by using the gallery walk style.

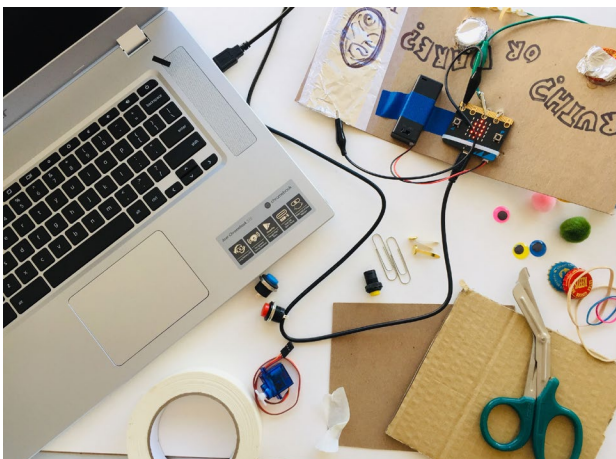
Give each group a printed [Beta Testing Worksheet](#) to have out next to their project. Have them fill out the game title and the explanation of the **game mechanics**. Other makers will fill out each section with comments. Offer extra copies of the worksheet if comments get long and makers run out of space to write.

Once comments have been added to the Beta Testing Worksheet, makers reflect on the beta testing feedback. Makers then discuss with their partners how they want to redesign to incorporate feedback.

STEP 3



Time to make.



This block of time is for makers to work on their projects. Ensure that every group has enough space to safely work on coding and making.

- Circulate through the room and facilitate safe working habits by celebrating safe behaviors and calling attention to any unsafe behaviors (see Facilitation Tips).
- Help groups troubleshoot only after they've tried on their own for some time and after they've asked classmates.
- Give suggestions to groups on how to improve their engineering, coding, etc., on an organic and 1:1 basis.
- Help students with making cuts on their cardboard if you're comfortable using the box cutter (see Facilitation Tips).
- If makers get frustrated or express conflict, point out when they should stop making to discuss and redesign as needed.

STEP 4



Clean up.

Makers will:

- Put any materials they want to keep to use in their partner bin.
- Put away technology and make sure laptops are charging.
- Return tools and materials that can be used again to the right place.
- Clear tables of garbage and recycling.

SAFETY AGREEMENT

1. Take care when walking with scissors or sharp things (hold with point facing down).
2. One maker at a time per tool prevents accidents.
3. Be mindful of space from others when using tools.

GLUE GUN SAFETY

1. Only 1 or 2 makers at the hot glue station at a time.
2. Don't touch the tip of the glue gun.
3. Don't point the glue gun at another person.
4. Work at the protected glue gun station.
5. Keep the glue gun close to your work.
6. If the glue gun jams, ask an adult for support.



TROUBLESHOOTING TIPS

The cardboard is difficult to cut.

- Using the inside of the scissors instead of the tip can make cutting easier.
- Cutting pieces away from the edge of the cardboard is easier than cutting out a shape from the middle of the cardboard.
- If you're really having a hard time, ask a classmate or adult to help you with cuts.

The hot glue isn't holding stuff in place.

- Hot glue dries quickly, so try to apply the glue a little at a time, instead of large amounts.
- After gluing, hold pieces in place for at least 20 seconds before releasing.
- Support two pieces with an L-bracket or bridge, using glue or tape.

The cardboard won't hold the shape.

- Try experimenting with a different joining technique.
- Try different thicknesses of cardboard or layers of cardboard.

The board isn't showing what we coded.

File version check

- Check to see that you uploaded the most recent copy of the code.
- Resave the latest version and drag and drop it onto the Micro:bit.

Our code isn't doing what we expected.

Check for bugs

- Read through the code.
- Read it out to a friend.
- Check to see if there are extra blocks that aren't supposed to be there.

The LED on the Micro:bit isn't flashing when we click Upload.

Bad cable or port

- If the Micro:bit isn't showing up in the computer menu, try a different cable.
- Try a different USB port on the laptop.

Our code isn't uploading correctly to the board. The board feels hotter than usual.

Burnt board

- Try pressing the reset button on the board.
- Try uploading to a new Micro:bit board.

Our board isn't turning on when connected to the battery pack.

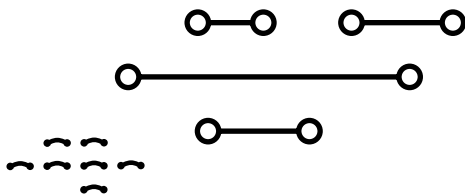
Battery

- Check the batteries to see if they're charged.
- Check to see if the batteries are flipped.

We have alligator clips connected to the board, but the code isn't running.

Alligator clips

- Make sure alligator clips are secure on the correct pins and are touching the metallic parts.
- Try switching alligator clips.



TROUBLESHOOTING TIPS

Print and use the empty rows to fill in with other problems and solutions that can be shared.

BETA TESTING WORKSHEET

Title of Game: _____

Explain how to play the game:

SHOUT-OUTS	What is successful or interesting about the game?
UI/UX AND GAME MECHANICS	<p>Was it fun and easy to interact with the project?</p> <p>Are the rules or game mechanics clear and easy to understand?</p>
SUGGESTIONS	Is there anything you would add or change to make the game better?