Mechanisms of a Makespace: Design Thinking and the Maker Movement Space

iSTEM @ NIC
Coeur d’Alene, ID
About Morgen Larsen

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First computer was a Commodore 128
Two wonderful kids - Jackson & Lillian
Teacher-Librarian for over 15 years

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Day 1 Agenda

9:15  Introduction to the Maker Movement & Design Thinking (Lecture and Large Group Discussion)

9:45  Lab: Unplugged Design Thinking | Lesson Plan: How to make toast | Kit Materials: post-it notes, marker, pencils

10:45 Introduction to Micro:Bit (Hands on exploration with lecture)

12:00  Working Lunch Session (SUB – Driftwood Bay) - BBQ Hamburgers & Hotdogs

1:00  Lab:  Installing a program on your Micro:Bit (Hands-on STEM activity)

2:00  Keynote Speaker:  Kevin Young (Driftwood Bay)

3:00  Lab:  Project: Micro:pet | Kit Materials: Micro:Bit, micro-USB cable, laptop, battery pack, paper, tape, scissors, zip ties, anything participants can find in their environment to add character to their pet.

4:14  Maker Plan (Participant Work Time) Use this time to journal and organize your thinking. Reflect on what you have learned today. How you will share this learning with colleagues? Where can these activities fit into your instructional day? What allies do you have or need to make this successful in your school and district? What are three lessons idea you have from today?

4:30  Snack (SUB – Driftwood Bay)

5:00  End of the Day Prize Drawing
DESIGN THINKING PROCESS

Empathize: Learn about the audience for whom you are designing

Define: Construct a point of view that is based on user needs and insights

Ideate: Brainstorm and come up with creative solutions

Prototype: Build a representation of one or more of your ideas to show to others

Test: Return to your original user group and testing your ideas for feedback
Design Thinking

- Empathize
- Define
- Ideate
- Prototype
- Test
How to Make Toast
<table>
<thead>
<tr>
<th>I haven’t heard of this before</th>
<th>I have heard of this word before</th>
<th>I have seen this word before</th>
<th>I know what this word means</th>
<th>I can give a definition of this word</th>
<th>I can give an example of this word</th>
</tr>
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<tbody>
<tr>
<td>Fist</td>
<td>First</td>
<td>Second</td>
<td>Third</td>
<td>Fourth</td>
<td>Fifth</td>
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**Fist to Five – Computational Thinking & Physical Computing**
Computational thinking

- **Decomposition**: The ability to break a larger problem down into smaller parts
- **Pattern recognition**: When you observe similarities and patterns within problems
- **Abstraction**: When you identify what defines the patterns you see and focus on the important information only
- **Algorithmic thinking**: When you develop a step-by-step plan or the rules to follow to solve a problem
Physical Computing

Physical Computing refers to interactive physical systems or devices that can be programmed through software.

Benefits of “Getting Physical”

• Holistic view of Computer Systems – across hardware and software
• Encourages Creativity & Personalization of projects (crafting, music & visual arts)
• Promotes learning by doing, trial & error, and collaboration
• Engages the Whole Learner – mind & body
• Growing Industry IoT trend
• Digital + Physical = Magic
Why Making + Coding?

Learning Activity Formats

Do / Construct (Kinesthetic/Experiential)

Teach / Present

Talk / Discuss (Social)

Write / Draw

Hear (Auditory)

Read

Watch / See (Visual)

Bloom’s Taxonomy of Learning

- Remembering: Student can recognize and recall information
- Understanding: Student can demonstrate meaning from information
- Applying: Student can apply information in a different context
- Analyzing: Student can distinguish parts, relationship, and how they fit into the whole
- Evaluating: Student can make judgments and justify decisions
- Creating: Student can create a new product or point of view

deepest levels of learning

https://en.wikipedia.org/wiki/Bloom%27s_taxonomy
**Micro:Bit - Overview of the board**

**FRONT**

- **Front Button A**
  - Integrated push button

- **5x5 LED Matrix**
  - The display for the Micro:Bit comprising 25 surface mounted red LEDs

- **Front Button B**
  - Integrated push button

- **I/O Connections**
  - 3 input/output 'pin' connections plus a power and ground connection

**BACK**

- **Micro USB Connector**
  - Used for power and programming when connected to a computer

- **Freescale Kinetis KL26 Microcontroller (MCU)**
  - Controls the USB connector

- **Compass & Accelerometer**
  - Integral 3-axis components for direction and movement sensing

- **Program Reset Button**
  - Hard reset control that restarts the board and program

- **Power Connector**
  - Connection for providing battery power via the battery box or other source

- **Nordic Semiconductors nRF51822**
  - Main brain of the board providing CPU, Bluetooth and memory functions
ITS TIME FOR LUNCH!!!
Introducing Microsoft MakeCode

Hands-on Computing Education
Microsoft MakeCode

Just works always, everywhere
- Free, open source, web-based
- Offline capabilities

Real skills
- Block to Text editor progression
- JavaScript language
- VS Code editor

Make CS fun and tangible
- Support for a variety of products
- Simulator for quick iteration

Example Projects

MakeCode.com
Microsoft MakeCode

Hands-on computing education

micro:bit
Circuit Playground Express
Minecraft
Chibi Chip

seeed
sparkfun
wonder

Code
Code
Code
Code
MakeCode micro:bit

- Basic
- Input
- Music
- Led
- Radio
- Loops
- Logic
- Variables
- Math
- Advanced
Projects

Here are some cool projects that you can build with your micro:bit!

Games

Fun games to build with your micro:bit.

- Flashing Heart
- Smiley Buttons
- Coin Flipper
- Love Meter
- Rock Paper Scissors
- Magic Button Trick

Multiplayer Games
Courses
A collection of courses and tutorials built for the micro:bit.

Classroom
Structured courses for teaching computer science in the classroom.

Intro to CS
14 week computer science course for middle school grades 6-8.

Computers and programming
Tutorials, lessons, and mini-courses about programming and computing.
Keynote Speaker: Kevin Young in Driftwood Bay
Make Your Own Micro:Pet
Micro:Pet Build Objective: Tomorrow, participants will evaluate each other’s Mico:Pet.

Micro:Pets will be evaluated on:
- Micro:Bit has input and output
- Program properly downloaded to Micro:Bit
- Micro:Bit supported so the face is showing
- Micro:Bit can be turned on and off without taking critter apart
- Supports the Micro:Bit and its battery pack

Bring a Pair of Headphones tomorrow
Tuesday, June 19 - Day 2

8:15  **Micro:Pet Debrief**: Participants will evaluate each other’s Micro:Pet. Micro:Pets will be evaluated on:
- Program properly downloaded to Micro:Bit
- Pet has input and output
- Micro:Bit supported so the face is showing
- Micro:Bit can be turned on and off without taking critter apart
- Supports the Micro:Bit and its battery pack

8:45  Squishy Circuits with a Buddy | Kit Materials: 9V battery, alligator clips, playdough, LED

9:30  Paper Circuits (simple circuit, 2-LED series circuit, and parallel circuit) | Kit Materials: button battery, copper wire, clip, LED, card stock

10:00  Chibi Chip Paper Circuit Cat

10:45  Paper Circuit Greeting Card

12:00  Working Lunch Session – Chicken/Ground Beef Taco Bar

1:00  Guest Speaker (Angela Hemingway – STEM Action Center)

1:30  **Lab: Happy Face, Sad Face** | Lesson Resources: [https://makecode.microbit.org/courses/csintro/algorithms/activity](https://makecode.microbit.org/courses/csintro/algorithms/activity) | Kit Materials:  laptop, Micro:Bit, Battery pack, USB cord


3:00  **Lab: Hack your Headphone** | Lesson Resources: [https://makecode.microbit.org/projects/hack-your-headphones](https://makecode.microbit.org/projects/hack-your-headphones)  | (Bring your own)

3:30  **Maker Plan** (Participant Work Time) Use this time to journal and organize your thinking. Reflect on what you have learned today. What do you want to learn more about? What barriers exist for you to be successful teaching students this content? How does what you learned today help you in the design of future lesson plan? Who could you reach out to in your community to speak to students about the careers where these skills are utilized?

4:30  Snack:  Guest Speaker: Kelsey Brown from Idaho Office of Emergency Management

5:00  End of the Day Prize Drawing
Micro:Pet Debrief

Micro:Pet evaluation:
- Program properly downloaded to Micro:Bit
- Pet has input and output
- Micro:Bit supported so the face is showing
- Micro:Bit can be turned on and off without taking critter apart
- Supports the Micro:Bit and its battery pack
Squishy Circuits with a Buddy

Materials:
- 2 wires w/Alligator Clips
- Playdough
- LED Diode(s)
- 9V Battery
- Strip of Aluminum Foil
Paper Circuits

Types of Circuits:
• simple circuit
• 2-LED series circuit
• parallel circuit

Kit Materials: button battery, copper wire, clip, LED, worksheets
Chibi Chip Paper Circuit Cat
Paper Circuit Greeting Card
IS IT LUNCH TIME YET?

YES!
See you all back at 1:30
Happy Face-Sad Face

Kit Materials:
• Laptop
• Micro:Bit
• Battery pack
• USB cord

https://makecode.microbit.org/courses/csintro/algorithms/activity
Rock-Paper-Scissors

Kit Materials:
• Micro:Bit
• battery holder
• 2 AA batteries
• duct tape

https://makecode.microbit.org/projects/rock-paper-scissors
Hack your Headphone

Materials
• micro:bit
• battery holder
• 2 AA batteries
• Headphones
• Crocodile clips

https://makecode.microbit.org/projects/hack-your-headphones
iSTEM18 Agenda for THURSDAY, June 21

10:00  **Strand Instruction**
- Access iSTEM Strand Resources in OneNote
- Join MEC
- Join STEM Action Center Mentor Portal
- Participant Work Time

12:00  Working Lunch Session

1:00  **Strand Instruction**
- iSTEM Participant Evaluation
- Participant Work Time
- Gallery Walk of Prototypes & Products

4:00  Snack (SUB – Driftwood Bay)

4:15  Closing Activities

5:00  Daily Wrap Up/ End of the Day Prize Drawing
iSTEM Participant Resources

tinyurl.com/NICiSTEM18
Welcome to the Educator Community!

Connect and collaborate, find training and lessons, and earn badges and certificates on this personalized hub created for educators like you.

Immerse your students into Computer Science!
Join us on December 13th for a live event with Computer Science Professionals

http://aka.ms/educatorcommunity
1. Join now
2. Office 365
3. Set up your profile
4. Promotional code:
5. Join the community!

and/or

1. Sign in
2. Office 365
3. Click your name
4. Redeem code:
Complete the registration process for Mentorship Portal
(https://mentorship.stem.idaho.gov/)
Complete the post-institute survey via the Community Grants Portal
(https://idahostem.force.com/gms/)
Resources

• Try any of the MakeCode editors at https://makecode.com

• Order hardware from https://makecode.com/#hardware

• Download micro:bit curriculum at https://aka.ms/intro2cs
Microsoft Educator Community Offerings

- Microsoft Innovative Educator (MIE) programs
- Badges, points, and certificates
- Courses and resources
- Skype in the Classroom
- Find, create, and share a lesson
- Connect and share with educators
- School Leaders Toolkit
- Higher Education