

May 13th, 2022

CAPTURING DIVERSE STUDENT INTERESTS THROUGH THE DIVERSE WORLD OF COMPUTER SCIENCE

Thank you for all of the awesome support and collaboration in the sessions on Friday! Based on some feedback and questions from conversations I had, here's follow up links and resources for you to use in your classes. Please reach out in the future and I hope to collaborate with you again soon!

Useful Links:

- [NJ Student Learning Standards 8.1 and 8.2](#)
- www.mrerdreich.com
- Mr. E's Digital Classroom on [YouTube](#)
- Mr. E on [Twitter](#), [Instagram](#), and [Instructables](#)
- [Slideshow from 5/13/22](#)
- Mr. E's email:
 - erdreichj@madisonnjps.org

Follow up links from the presentation:

- www.openprocessing.org
- p5js.org
- [ColorHexa](#)
- [Mr. E's P5.js Reference Guide](#)
- [Mr. E's Abbreviated Reference Guide](#)
- [Mr. E's P5.js tutorial videos](#)
- [Tinkercad Circuits & Code Blocks](#)
- [Mr. E's Arduino Reference Guide](#)
- [Mr. E's electronics & Arduino Tutorial Videos](#)
- Seriously, instructables.com = greatest resource ever. Check it out for project ideas, lessons, contests, and activities for you and your students!! Here's [Mr. E's account](#) :)
- Everyone should buy a [makeymakey](#), you can program it too!
- [Mr. E's star wars coding challenge lesson \(on instructables\)](#)

More Resources:

- Completed Sample Program - [DVD](#)
 - Mr. E's complete [DVD Screensaver tutorial](#)
- Completed Sample Program - [Pong](#)
 - Mr. E's complete [pong tutorial](#)

- Completed Sample Program - [Brick Breaker](#)
- Completed Sample Program - [Space Invaders](#)
 - Mr. E's complete [Space Invaders tutorial](#)
- Complete Sample Program - [Simple Mario Inspired Game](#)
 - Advance Version - [Mario Inspired Game](#)
 - Mr. E's complete retro [platform game tutorials](#)
- Bonus:
 - [R2D2 Mario Inspired Game](#)
 - [Iron Man Mario Inspired Game](#)
 - [msPaint like program](#)
- **CodeBlocks in Tinkercad** - Instead of being challenged to make a game, app, or program a robot, Tinkercad's CodeBlocks challenges you to create 3D models using coded functions in a block-based manner.
 - <https://www.tinkercad.com/>
- **MakeCode** - Created by Microsoft, MakeCode provides students with methods to learn block-based, python-based, and java-based programming skills in various challenges. Program a robot, make a game, create a minecraft universe, whatever you can imagine!
 - <https://makecode.com/>
- [Code.org](#) is the place to start if you're looking for lessons and content
- **VEX VR** - his online application allows students to write code and then view the results in a simulation in both block and script based coding
 - <https://vr.vex.com/>

Course Sequence / Curriculum:

- Madison's comp sci curriculum is being rewritten this summer to incorporate the new standards, as well as update the topics and themes in our instruction to reflect growth in our program and students' understandings as we've added K-5 comp sci since originally written in 2017. Please feel free to reach out to me in the fall of 2022 for our updated documents, or check the [Madison Curriculum and Instruction website](#).
- Content / Project Sequences for 8th grade Interactive Programming elective (P5.JS + Arduino) - see below.

What is code (1 day)

- What is code
- The big world of cs
- Role of a programmer (airplane pseudo code)

Intro to p5js (2 days)

- making an account

- Basic ide navigation
- What is a function (setup vs draw)
- What are commands
- Basic syntax
- Comments
- Drawing shapes
- Setting colors
- Coordinates

Coded character (2 days)

- students design and program an image/character using at least 4 different shape commands and 4 different color commands on a 500x500 canvas - [example](#) that **does not** meet specifications, but provides a starting point for students as a reference

Variables and motion (4 days)

- what is a variable
- What are the different types of variables and how are they used
- How do objects move (speed * direction)
- **LOGIC** - what is an if statement and how do we use it?
- [Var and Mo #1](#) - we make a ball move across the screen and stop when it hits the wall. Green while moving, red while stopped.
- [Var and Mo #2](#) - we make the classic dvd screen saver by making a square bounce off the walls, changing color each time and learn how to import images (dvd logo)

Inputs (3 days)

- we recreate a classic ms [paint like program](#)
- Learn how to allow mouse input to draw lines, similar to starter code
- Make buttons to change colors
- Keyboard inputs to select things
- == real world app

Video games (4 days)

- combine logic + variables + motion + collision + inputs to recreate the classic [pong](#)
- Start as a group, 2 player pong with a splash screen that has directions
- Challenge students to customize and make their own unique modern version (change at least three aspects)
- Students can change images, add sounds, make a cpu, make difficulties, or other countless things they can imagine, like goals + moving players to make an air hockey-like pong

Electronics (2 days)

- What is electricity?

- What are circuits and how do components connect to allow us to interact with electricity?
- Conductors v insulators
- Polar v nonpolar
- Basic analog project (lights / buzzers / motors with buttons on breadboards)

Intro to arduino (5 days)

- What is a microcontroller?
- What are digital electronics?
- Intro to arduino, making an LED blink
- Inputs v outputs - wiring a button
- Arduino project - make a working traffic light. Start with a single traffic light, then make a whole intersection with sensor that detect cars on cross streets to signal the light change (if time permits)
- Use Tinkercad circuits to simulate / prototype, then build on physical arduino / components

Gravity and advanced collisions (4 days)

- back to p5.js, review previous content
- Revisit speed * direction, how could we code Gravity to make an object fall, make an object jump?
- Create a classic platform like game where a player can move and jump on a platform
- Discuss collisions between objects where one object may disappear or change position
- Introduce libraries for sounds and advanced interactions
- [example](#)

Final project (8 days)

- students may create a real-world prototype product that is either an app or game coded in p5.js, or an autonomous system made using arduino - each with its own set of specifications and constraints.
- all of the p5js programs written as a class in previous projects serve as a reference and starting point for final projects, that may be a unique app or game
- many of the arduino projects are smart-home based, blinds that go up with the sun comes up, lunch box or locker alarms, motion detecting things, smart locks, etc