Physical Computing I

Curriculum Plan

(Work in Progress)

"Understanding" of skills means transfer and application of those skills to a novel situation.

Big idea for the course…
Using electronics, programming, and tools of 3D Design, I can imagine something into existence.

Project I --
Build a Video Game Controller using a Makey Makey board and any materials available to you in the classroom.

Big Idea	Engaging Questions	Important to Know and Do
I can control a computer using something I designed and built. Evidence of Understanding can include but is not limited to: Successful creation of a *well-crafted*, *novelly designed* game controller that contributes to the *enjoyment* of a video game. Student Goal Statement Defines: ● well-crafted ● novel design ● enjoyment	How does the design of a controller make a game more interesting to play? What are some game controllers that have been "revolutionary?" Are there things about your XBox (playstation, etc) controller that you don't like? What would you change? Is a game better, when the controller makes you feel like you are in the game? How can a controller give physical feedback to a player to create a more immersive gaming experience?	All Students will demonstrate proficiency / mastery of the following: ● Design of a circuit ● Use of both conductive and resistive materials in a circuit to control the flow of current --- Some students (depending on project choice) may need to master the following: ● Safely use Hot Glue Gun ● Safely use exacto knife
Formative Assessment & Differentiation		

- Day 1 contact card -- “If you could invent anything, what would it be?”
- Problem Solver survey / self-assessment
- Interviews to discuss problem solver survey (meet with each student by end of week 3)
- Review of student journals and student-designed goal statements.

Mini Lessons

- Challenge Introduction
- Presentation on controller evolution w. Pros & Cons
- Video intro to Makey Makey
- Problem definition modeling
- Definition of excellent solution modeling

Scaffolding for Self-Directed Learning

- demonstration of previous projects / model work
- links to Makey Makey resources & ideas

Project Notes

This project introduces the fundamental concepts of conductivity and resistance. Many students will struggle with these concepts initially. The makey makey website offers some great videos to use as an introduction. Many students will struggle with the concept of a circuit. They won’t understand that they need to connect one of the inputs to Earth, thinking that just by touching an input, they will send a signal to the computer. Others may not understand the importance of separating the circuit with an air gap or resistive material when they don’t want to send a signal. More advanced students may run into the trouble of connecting Earth to multiple inputs simultaneously.

Project II --
What is the most fun way you can imagine to turn on a light bulb?

Big Idea	Engaging Questions	Important to Know and Do
A switch is the simplest, but perhaps most important component of an electrical circuit. With some creativity, students can build switches	How would your experience change if you replaced all of the light switches in your house with roller switches?	All Students will demonstrate proficiency / mastery of the following: ● identify the characteristic

that add functionality and fun to a circuit. Lots of different types of switches exist to serve different purposes. Evidence of Understanding can include but is not limited to: Students design and build a functional, well-crafted replica of their assigned switch from found/recycled materials Student Goal Statement Defines: ● functional ● well-crafted model	What about knife-blade switches?	benefits and drawbacks and mechanical functionality of at least one type of electrical switch --- Some students (depending on project choice) may need to master the following: ● Use 3D Design tool to create an object ● Output 3D object on 3D printer ● Safely use Hot Glue Gun ● Safely use exacto knife

Formative Assessment & Differentiation

- Review of student journals and student-designed goal statements.
- Direct coaching and questioning of groups as they work
- Individual conferences as needed

Mini Lesson Ideas

- Problem definition modeling
- Definition of excellent solution modeling
- Research modeling
- Model reading something hard
    - highlight unfamiliar words
    - articulate what you don't understand
- Reflection / journaling Modeling

Scaffolding Self-Directed Learning

- Give them the names of the switches
- Model Google Search - verbalize questions and confusion

• Model the reading of an appropriate informational text highlighting important ideas and how you identified them. Model comprehension strategies (figuring out from context, looking up unfamiliar words, making a sketch)
Project Notes
Students played with the lightbulb for a while to figure out where the wires have to connect since I did not give them standard bulb sockets. I just gave them some plastic bases that I had 3D printed.I gave each group a switch of a different type: (rocker, push button, knife, etc.). Using recycled material, they had to design a switch of the same type that they were given. Tried to incorporate librarian lessons, but this didn't go so well. Students felt like they knew what the librarian was talking about already. Not sure they came away as more effective researchers. Not sure they were asking the right questions. Need better modeling.

Project III -- Construct a piece of interactive art using the Makey Makey board. Example choices include: musical instrument, kinetic sculpture, interactive storybook/sculpture, or a physical game.

Big Idea	Engaging Questions	Important to Know and Do
With a high standard of excellence and attention to detail, I can design a sophisticated and engaging way to interact with a computer. Evidence of Understanding can include but is not limited to: Student Goal Statement Defines: •		All Students will demonstrate proficiency / mastery of the following: --- Some students (depending on project choice) may need to master the following: • Use 3D Design tool to create an object • Output 3D object on 3D printer • Safely use Hot Glue Gun • Safely use exacto knife
Formative Assessment & Differentiation		
• Review of student journals and student-designed goal statements.		

Mini Lesson Ideas
● Problem definition ● Definition of excellent solution
Scaffolding Self-Directed Learning
● Research lesson ● Links to other Makey Makey project examples
Project Notes
Second Makey Makey project. This pushed the boundary beyond the video game controller. Students have to put to use what they learned about switch design, since this is essentially what the makey makey project is about - completing a circuit.

Project IV --

Big Idea	Engaging Questions	Important to Know and Do
Evidence of Understanding can include but is not limited to: Student Goal Statement Defines: ●		All Students will demonstrate proficiency / mastery of the following: --- Some students (depending on project choice) may need to master the following:
Formative Assessment & Differentiation		
● Review of student journals and student-designed goal statements.		
Mini Lesson Ideas		
● Problem definition ● Definition of excellent solution		

Scaffolding Self-Directed Learning
Project Notes

Hour of Code. In December, we did a (very) little with Hour of Code to fill some time and to commemorate Computer Science week. Next year, I want to devote more time to this. Tynker looks to be a VERY sophisticated but easily accessible language to give kids the scaffolding they need to dive into programming. Also can use Logo or perhaps python.

Project V --

Big Idea	Engaging Questions	Important to Know and Do
Evidence of Understanding can include but is not limited to: Student Goal Statement Defines: ●		All Students will demonstrate proficiency / mastery of the following: --- Some students (depending on project choice) may need to master the following:
Formative Assessment & Differentiation		
● Review of student journals and student-designed goal statements.		
Mini Lesson Ideas		
● Problem definition ● Definition of excellent solution		
Scaffolding Self-Directed Learning		
Project Notes		

Little Bits I gave them a brief intro and a handful of bits. I devised an activity where they had to research what their bit does and arrange themselves and recruit other bits to build something. This didn't work very well. Need to re-do this intro for next year. Quantity of bits is def. a bottleneck. Once they got started on projects, however, interest built.

Project V.i --

Big Idea	Engaging Questions	Important to Know and Do
Evidence of Understanding can include but is not limited to: Student Goal Statement Defines: ●		All Students will demonstrate proficiency / mastery of the following: --- Some students (depending on project choice) may need to master the following:
Formative Assessment & Differentiation		
● Review of student journals and student-designed goal statements.		
Mini Lesson Ideas		
● Problem definition ● Definition of excellent solution		
Scaffolding Self-Directed Learning		
Project Notes		

Introduced 3D design and printing using Tinkercad when some students didn't have the parts they wanted for their project.

Project V.ii --

Big Idea	Engaging Questions	Important to Know and Do
Evidence of Understanding can include but is not limited to: Student Goal Statement Defines: ●		All Students will demonstrate proficiency / mastery of the following: --- Some students (depending on project choice) may need to master the following:
Formative Assessment & Differentiation		
● Review of student journals and student-designed goal statements.		
Mini Lesson Ideas		
● Problem definition ● Definition of excellent solution		
Scaffolding Self-Directed Learning		
Project Notes		

will introduce the Arudino bit for the students who want to keep score on their basketball game and display it on the 7 segment display. For some this will be their first time writing “real” programming code.

Project V.iii -

Big Idea	Engaging Questions	Important to Know and Do
		All Students will demonstrate

Evidence of Understanding can include but is not limited to: Student Goal Statement Defines: ●		proficiency / mastery of the following: --- Some students (depending on project choice) may need to master the following:
Formative Assessment & Differentiation		
● Review of student journals and student-designed goal statements.		
Mini Lesson Ideas		
● Problem definition ● Definition of excellent solution		
Scaffolding Self-Directed Learning		
Project Notes		

Use the Proto Bit (just ordered) to bridge the gap from Little Bits to breadboarding.

Project VI --

Big Idea	Engaging Questions	Important to Know and Do
Evidence of Understanding can include but is not limited to: Student Goal Statement		All Students will demonstrate proficiency / mastery of the following: --- Some students (depending on project choice) may need to master the following:

Defines: ●		
Formative Assessment & Differentiation		
● Review of student journals and student-designed goal statements.		
Mini Lesson Ideas		
● Problem definition ● Definition of excellent solution		
Scaffolding Self-Directed Learning		
Project Notes		

Microcontrollers -- use Light Blue Bean and Bean Loader on iPad to program their new microcontroller -- At this point, they have been introduced to just about all of the basic tools and concepts. They could move on to more sophisticated electronics components and advanced breadboarding.

2nd Semester -- Brainstorm larger projects...