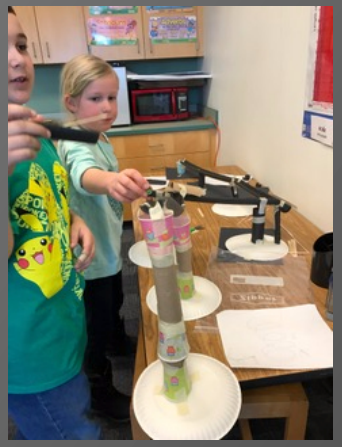
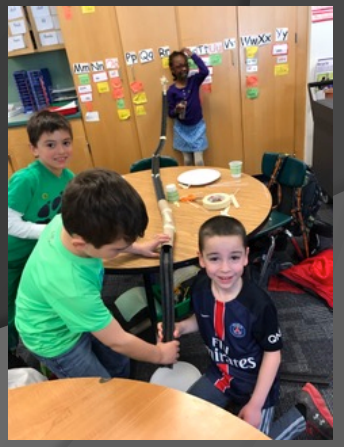
# CREATING A
# STEAM INNOVATION LAB
## FOR CONCORD ELEMENTARY STUDENTS

## Project Proposal to Concord Education Fund

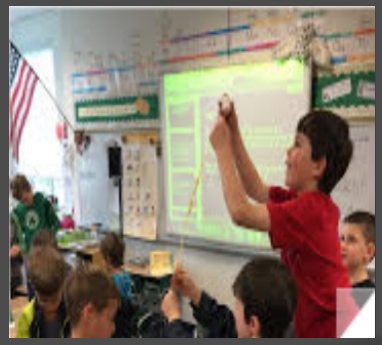
March 20, 2017



# Agenda

1. What is an Innovation Lab? What is the Vision for Use?
2. *Request #1:* Sample Challenges K - 5 & Equipment Needs
3. *Request #2:* Professional Learning for Teachers
4. Architectural Plans for Space
5. Questions

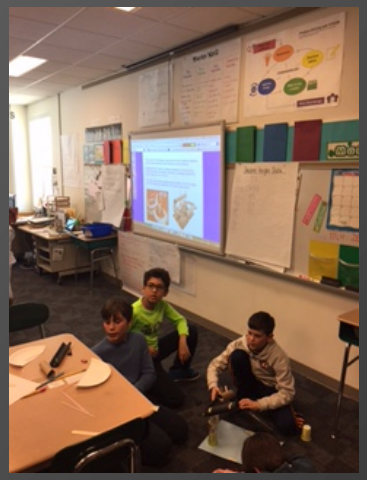



Section 1

# What is an Innovation Lab?
# What is the Vision for Use?

# WHAT IS AN INNOVATION LAB?

The Innovation Lab will be a “maker space” where students can gather to share ideas and use tools and equipment to design, tinker, build, and create solutions to STEAM design challenges.



# VISION FOR USE:

- Open to all CPS students - each class will come to the lab 2 times/year
  24 classes/school x 3 schools = 72 classes total
  72 classes x 2 times/year = 144 days lab in use
  possibility for some classes to come an additional time if appropriate
  (depending on challenge, project, etc.)
- Dedicated Learning Coach
- Traditional Makerspace tools & set – up (minus woodworking tools)
- STEM/STEAM & Engineering Design Process integrated into all curriculum areas
- Work in the Lab is most often driven by the science curriculum
- Embedded Professional Development

# BEFORE THE INNOVATION LAB

- Limited Engineering Design Challenges integrated into various grade levels
- 2015 -2016 Science Review Committee worked to align curriculum to revised MA STE standards
- 2015-2016 Nine K-12 teachers participated in WPI's Stem Integration for District Leaders program. The goal of the committee is to create a strategic STEM/STEAM plan for the district.
- 2016-2017 on-going K - 12 STEM Committee

# NEW SCIENCE UNITS

(Align to Next Generation Science Standards)

| | Life Science | Earth and Space Science | Physical Science | Engineering |
|---|---|---|---|---|
| K | K. Interdependent Relationships in Ecosystems:Animals, Plants, and Their Environment | K. Weather and Climate | K. Forces and Interactions: Pushes and Pulls | K-2 Engineering Design |
| 1 | 1. Structure, Function, and Information Processing | 1. Space Systems: Patterns and Cycles | 1. Waves: Light and Sound | |
| 2 | 2. Interdependent Relationships in Ecosystems | 2. Earth's Systems: Processes That Shape the Earth | 2. Structure and Properties of Matter | |
| 3 | 3. Interdependent Relationships in Ecosystems<br>3. Inheritance and Variation of Traits: Life Cycles and Traits | 3. Weather and Climate | 3. Forces and Interactions | 3-5 Engineering |
| 4 | 4. Structure, Function, and Information Processing | 4. Earth's Systems: Processes that Shape the Earth | 4. Energy 4. Waves: Waves and Information | |
| 5 | 5. Matter and Energy in Organisms and Ecosystems | 5. Earth's Systems<br>5. Space Systems: Stars and the Solar System | 5. Structure and Properties of Matter | |

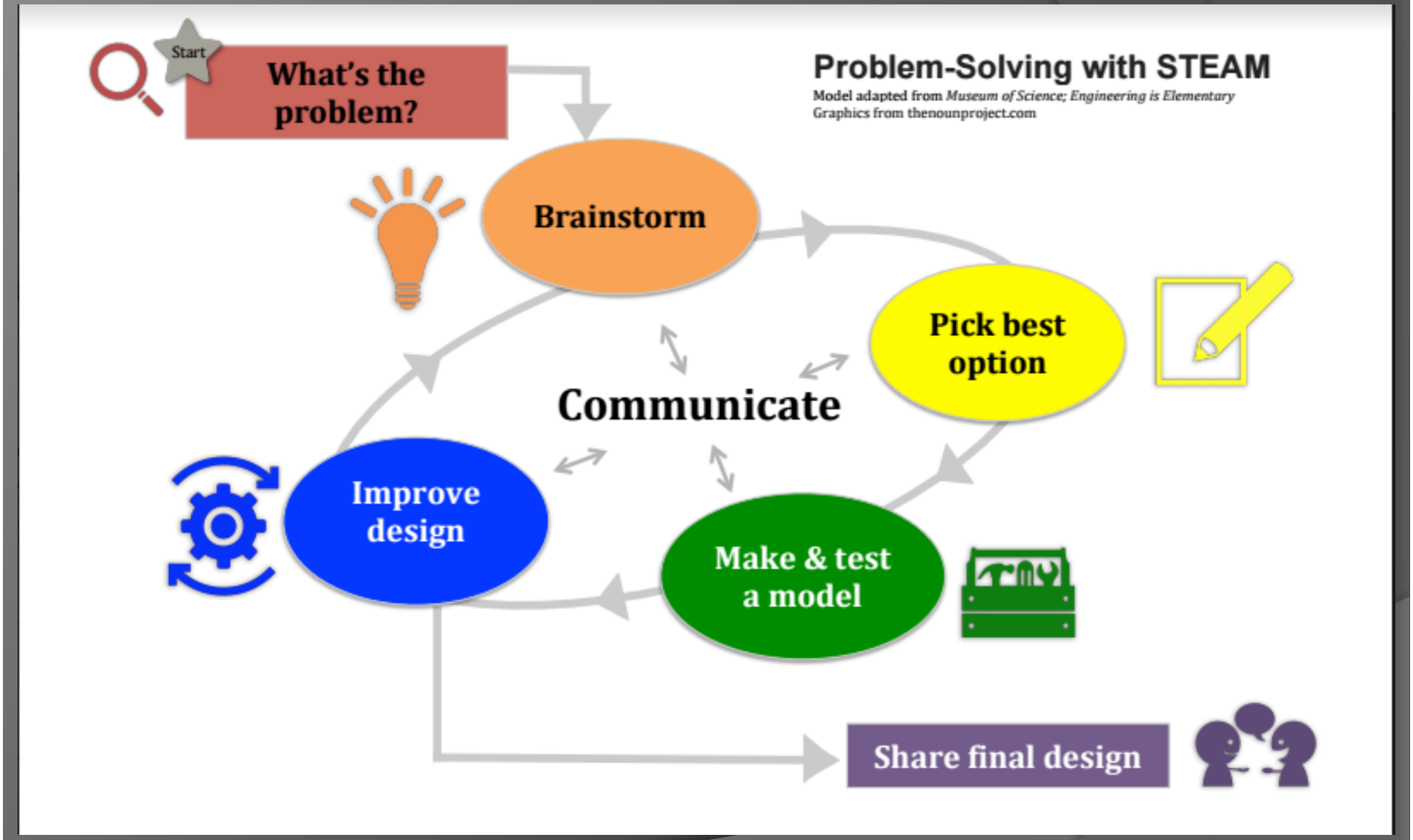
# OUTCOME OF STEM/STEAM COMMITTEE

**CPS/CCHS Vision Statement:**

*Every CPS and CCHS student participates in at least 2 STEAM experiences or design challenges each school year. These experiences reach all learners so that, after years of these experiences, every student feels confident and creative in analyzing and tackling real world problems through a STEAM lens.*




# OUTCOME OF STEM/STEAM COMMITTEE



# OUTCOME OF STEM/STEAM COMMITTEE

**CPS/CCHS Golden Goals**:

1. Students are **interested** and **proficient** in the STEAM approach. Students see the **value** in STEAM education.

2. Teachers are **supported** and therefore **effective** STEAM educators. Teachers see the **value** in STEAM education.

3. Graduates leave with the **critical thinking skills** and STEAM **habits of mind** needed to **analyze** situations and **solve problems** that they will face in life. These skills and habits of mind give all students opportunities to pursue STEAM paths in life.

# INNOVATION LAB BENEFITS

- Short projects/manageable time frame
  - (1.5-4.0 hours/visit)
- Curriculum Connections in Science and other subjects
- Embedded Professional Development
  - MA STE standards (2016)
  - Science & Engineering Practices

Section 2

# *Request #1:*
# Sample Challenges & Equipment Needs

# Sample Challenge per Grade Level - K

## Engineering Challenge

*3 Little Pigs* - Materials Science

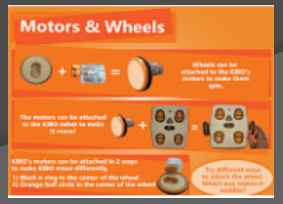

Problem - no more bricks to build house

Can you build a house for the third little pig so that when the wolf comes to visit, he will not huff and puff and blow the house down?

## Robotics challenge

KIBO -designed for 4-7

*Motor & Wheels* How can you make KIBO move?



# Sample Challenge per Grade Level - 1

## Engineering Challenge

Using *Rigamajig* -

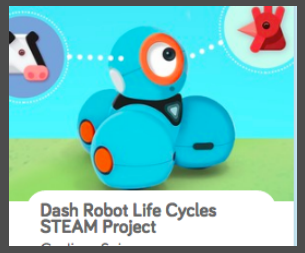
How can you use these materials to make a chair for Goldilocks?

Rigamajig -large scale building kit

## Robotics Challenge

*Dash & Dot Life Cycles*

Challenge: How can you teach Dash & Dot about the life cycle of a frog?




Create a life cycle project

Research life cycle of plants or animals

Write important facts of each stage

Create poster presentation

# Sample Challenge per Grade Level - 2

## Engineering Challenge

**Using assorted materials (cardboard, cups, paper plates) and *Makedo* tools (simple plastic tools for cardboard construction)**


**How can you create** a contraption that can hold a 10 lb. bag of potatoes?

## Robotics Challenge

Cubelets Robot Blocks are a fast and easy way to inspire kids to be better thinkers.


*Light It Up* - How can you create a robot that lights up (night light)?

# Sample Challenge per Grade Level - 3

Engineering Challenge

*Gravity Racers* (force & motion).

Part 1. How can you design a gravity powered vehicle for a new Olympic racing event?

Optional Part 2. Students use Tinkercad to make a 3D model of their gravity powered cars.

Students race/test their cars.

Robotic Challenge

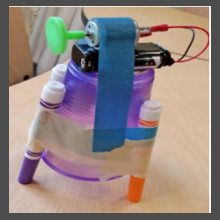
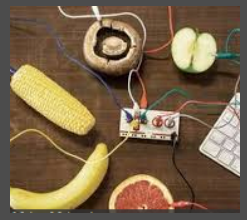
*Dash & Dot Forces of Attraction*

How can Dash & Dot be programed to help Kindergarten students design an experiment to find out which objects are magnetic and which objects are not?

# Sample Challenge per Grade Level - 4

## Engineering Challenge

*Simple Circuit Challenge* -Paper Circuits, Drawbots, Bristle Bots, Makey Makey, Squishy Circuits


How can you use simple materials to: make a banana produce electricity, make a cup that creates art and/or make a greeting card light up?

## Robotic Challenge

*Spheros* -Use *Lightning Lab app*; How can you create a program that powers a robotic Jack-o-Lantern?


# Sample Challenge per Grade Level - 5

## Engineering Challenge

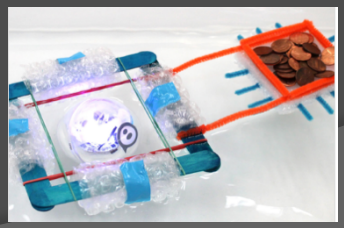
Little Bits -Invent a Launcher (twist on the catapult)

Can you build a launcher that will fling projectiles at a push of a button?

## 3-D Printing Challenge

Challenge combines robotics & 3D printing.

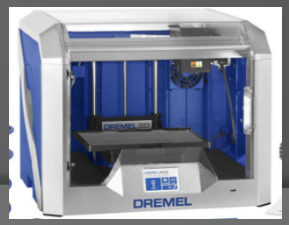
How can you design and test a contraption for Sphero to carry a load of pennies across a small body of water?

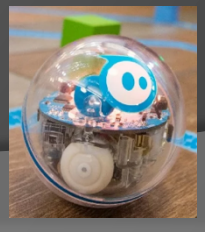


# 1. INNOVATION LAB Equipment, Supplies and Material

- **Fabrication**
  Little Bits, Makey Makey Kits , Squishy Circuits, Rigamajig, Makedo Kit — $8,367.12
- **Robotics**
  KIBO, Spheros, Dot & Dash, Cubelets — $13,200.35
- **Digital Fabrication**
  3D Printers (2), Glowforge Laser Printer, McSquares, MacBook Airs (12), iPads (12), iPad covers (12) — $29,260.00
- **Crafting Supplies**
  Cardboard, clay, scissors, glue, tape (masking, duct, ..), crayons, dry erase markers, pipe cleaners, straws, paper clips, … — $1,283.51
- **Miscellaneous**
  Laminator, projector & whiteboard — $6,500.00

$58,610.98



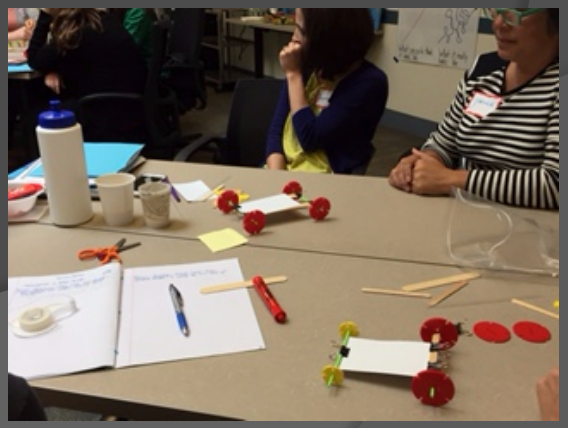
Section 3

# *Request #2:* Professional Learning for Teachers

# Embedded Professional Learning for Teachers

- Teachers come to understand design thinking through hands-on experiences
- Using this information, teachers mine their own curriculum for more design thinking opportunities





# 2. Partnership with Lesley University

***Lesley University launched a Makerspace in their Graduate School of Education to provide a new way for their students and community partners to engage in learning and inquiry-based exploration. Embracing the "maker" way of knowing, this is a place for their community to play, tinker, design, and create.***

**Goal of Partnership:**

**To support student engagement, intrinsic motivation, critical thinking and curiosity through maker and STEAM learning experiences at the Innovation Lab, and develop a model that enhances the efficacy of the Innovation Lab through transfer and adoption of the maker mindset and STEAM competencies into the general education classroom.**

# 2. Partnership with Lesley University

**Proposal:**

**(1) To provide direct support to conceptualize and launch the new Innovation Lab, ensuring its success as a learning environment designed to engage and inspire young learners through Maker/STEAM activities.**

**(2) To work with a cohort of educators who want to infuse the maker mindset into their work through the development of interdisciplinary, standards aligned lessons that support student engagement, critical thinking, and creative problem-solving.**

Professional Development Trainers and Curriculum for Educators 1 year partnership = $20,000

Section 4

# Architectural Plans for Space

# Vision: INNOVATION LAB MADE UP OF 3 AREAS WITH DIFFERENT FUNCTIONS

1. Maker Lab (collaboration area)
2. Creation Lab (digital content lab- 3D printers, ipad cart, laptop cart)
3. Fab Lab (creation of physical products)

# CPS STEAM Lab | **Program**

## 1 Maker Lab (Collaboration Area)

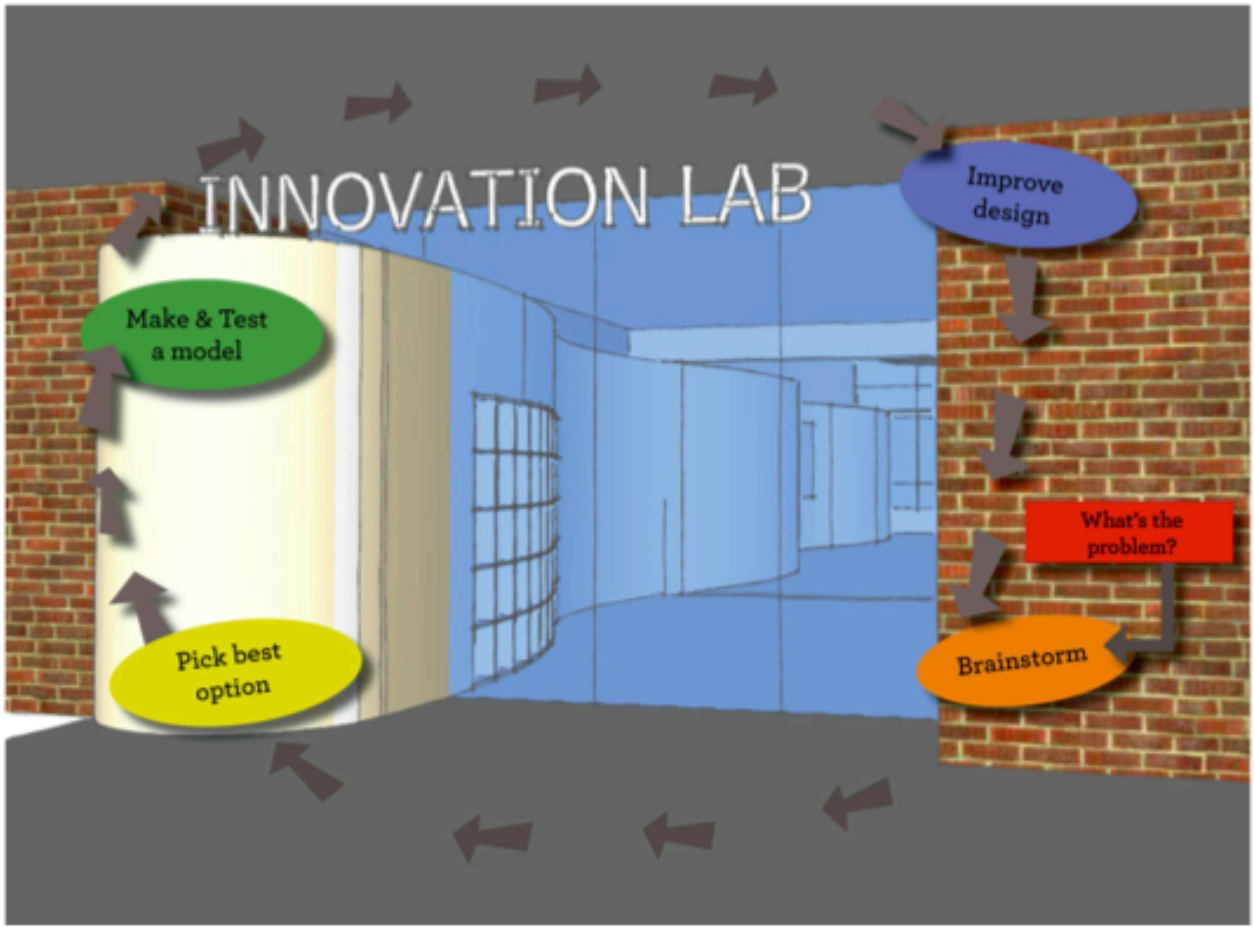
- White board wall or white board on wheels
- Area to gather, may include squishy seats, rug on floor, portable white boards etc (~150-300sf)
- Area for library and sharing board
- Smart Board
- Quiet Area (~100 sf)
- storage

## 2 Creation Lab (Digital Content)

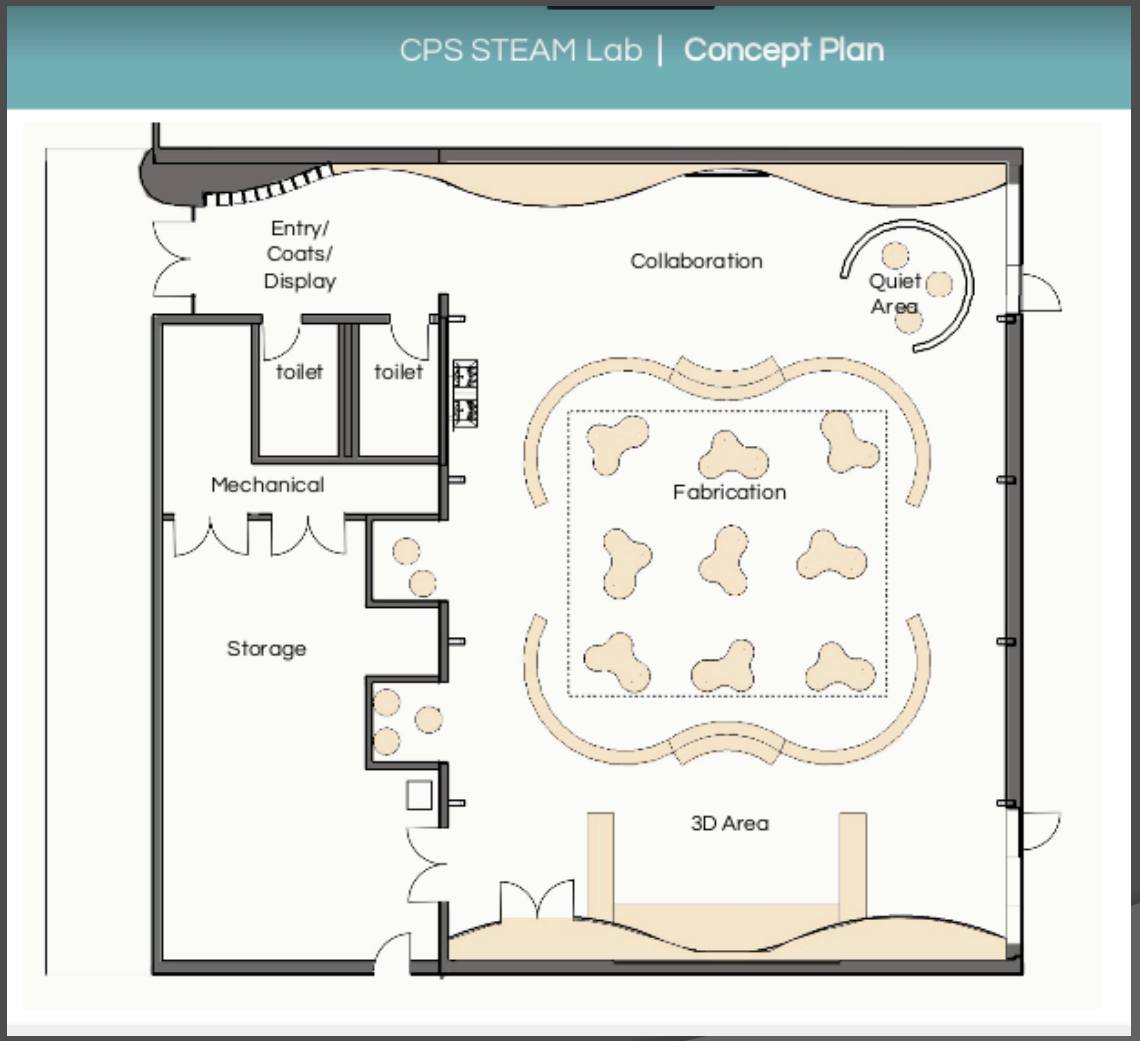
- 3D printers (~25 sf each)
- Laser cutter (~25 sf each)
- IPad cart, Laptop cart (2 total)
- Green screen (possibly portable)
- Space arranged like a kitchen with equipment at perimeter and work counter in middle
- Storage

## 3 Fabrication Lab (Physical)

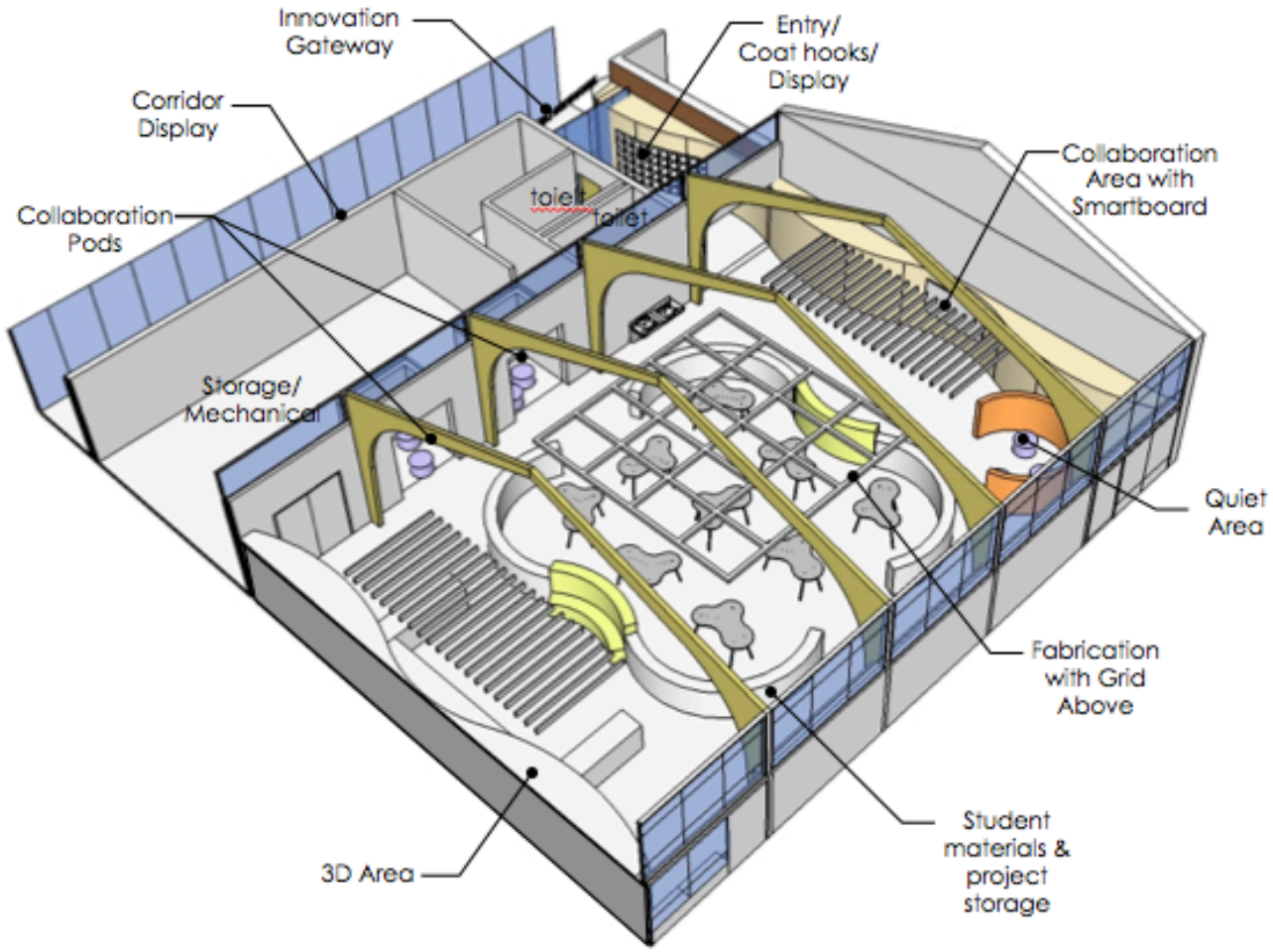
- Seating for 30 students at non rectangular tables, would like some or all tables to be movable, nesting or stacking (~500-700sf)
- Like the "sand box"
- Access to water (2 sinks close to area)
- Utility sink (for teachers)
- Student access to materials
- Varied materials + equipment ranging from card board to makey makey's
- Display
- storage


INNOVATION LAB
Improve design
What's the problem?
Brainstorm
Pick best option
Make & Test a model

# Vision of Innovation Lab



# CPS STEAM Lab | **Axon**



# CPS STEAM Lab | **Concept Design Work Plan**

## Ground work

— Prepare Contract
— Obtain all available/pertinent documents + codes
— Prepare draft schedule + work plan
— Review existing CPS STEAM Innovation Lab documents

## STEP 1 | Kick-Off Meeting / Goals + Values / Programming | **Meeting #1** | **Early** January 2017

Objectives
— Review budget, schedule + process
— Review photos / images / examples of STEAM Labs
— Discuss goals, values priorities, etc.
— Discuss Program
— In-depth walk-thru of existing conditions w/ consultants + CPS

Follow-up
— Prepare existing conditions drawings as appropriate
— Develop organizational ideas
— Identify + prepare option
— Prepare MEP existing conditions narrative

## STEP 2-4 | Review Conceptual Design Options | **Meeting #2** | **Mid** January 2017

Objectives
— Review Goals + Values, Program
— Present / review / evaluates concept options
— Discuss new observations
— Agree on approach and select best option

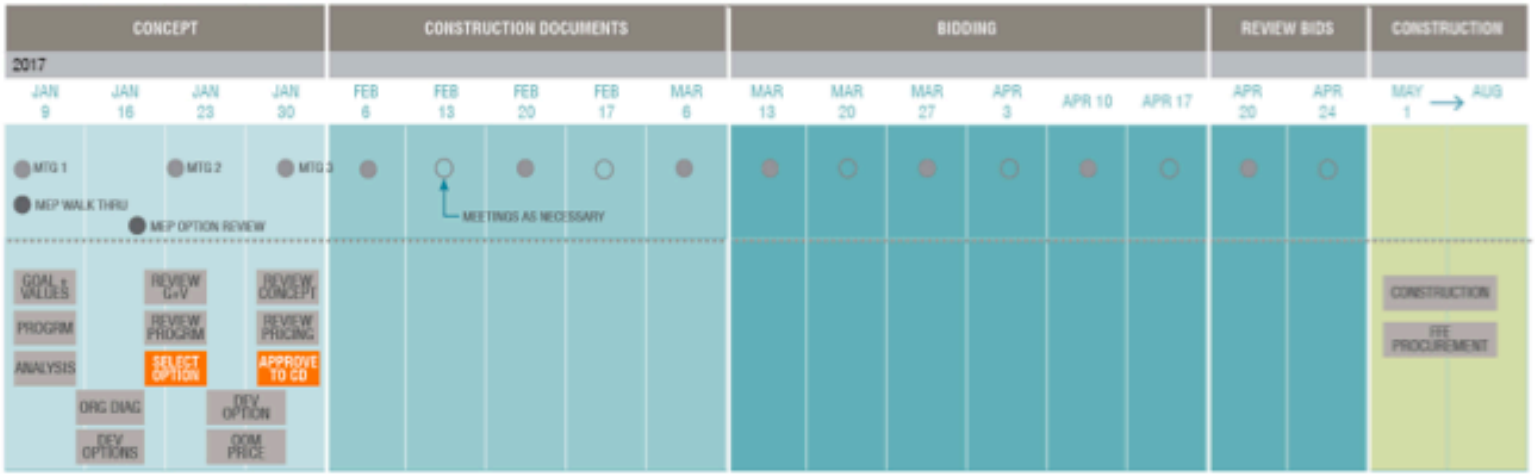
Follow-up
— Develop selected option into final architectural concept / schematic design
— Review MEP systems with Facilities
— Finalize MEP design narratives
— Obtain Concept OoM budgeting

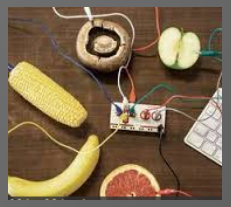
## ★ STEP 5 | Present Conceptual Schematic Design | **Meeting #3** | **Late** January 2017

Objectives
— Review final architectural concept / schematic design
— Review concept budget and implementation strategies

Follow-up
— Discuss next steps for proceeding into Construction Documents

# CPS STEAM Lab | **Schedule**





# QUESTIONS

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