

STEAM: Design with littleBits (Grades 3-12)

Program Description:

During this design program, students become real engineers and are challenged to create an invention using design thinking strategies to make visitor experience at GRPM even more fun! Using littleBits electronic building blocks to construct their inventions, students take ownership of their own creations while learning how to prototype, iterate, fail, and verbalize their ideas while working in teams. Students will be prompted to reflect on what it means to be an inventor and the importance of collaboration and revision when designing.

What content standards align with this program?

NGSS Disciplinary Core Ideas: ETS1-1 and ETS1-2: Engineering Design

NGSS Science and Engineering Practices: Defining Problems, Developing and Using Models, Designing Solutions

Museum Program Strand:

Empower individuals to use observations and inquiry to understand arguments and design creative solutions

This program is aligned with the following Museum Learner Outcomes:

Holders of Foundational Knowledge	Masters of Fundamental Literacies	Original Thinkers for an Uncertain World	Generous Collaborators for Tough Problems	Learners For Life	
X	X	X	X	X	

What will students know and be able to do after completing this program?

- Students will be able to work within a set of given criteria and constraints to design a solution to a problem
- Students will be able to identify and explain the value of each phase of the engineering design process
- Students will be able to assess their own personal invention process and reflect on what it means to be an inventor

What questions will students answer?

- What is the engineering design process?
- How can you get better at your design process?
- How do you work within a set of criteria and constraints to create a solution to a problem?
- What aspects of your prototype worked very well? What could you improve?

Key Vocabulary

Invention
 Design Cycle
 Prototype
 Criteria
 Constraint

Materials List and Setup:

littleBits

Challenge Cards

Inventor's Guide

Clipboard and pencil

Packets with descriptions of each bit

Miscellaneous craft supplies: rubber bands, tape, construction paper, foam balls, legos, etc

Poster Paper and poster markers

Projector and slideshow for program

Program Activities: 90 minutes

1. Engage:
 - a. Welcome students and cover expectations for behavior and participation
 - b. Discussion of inventors and innovators. Draw out what students associate with these words.
2. Exploration of input/outputs of littleBits. Students familiarize themselves with the materials they will be using to prototype their inventions/designs.
 - a. Instructor will distribute bits to student groups and prompt them to figure out for themselves what order the bits snap together in. The instruction will ask them to explain how it works, record their responses on a large piece of poster paper or on chalkboard. This student-created information will act as a reference guide for the remainder of the program.
 - b. Students will get to learn through play, constructing their own understanding of what each type of bit does through experimentation. Each group will receive a challenge card to work through as a group.
3. Hack your Museum Design Challenge
 - a. Use the graphics on the slideshow to introduce engineering design process to students. They will follow along on their Design Cycle Worksheet and fill in the blanks with the name of each part.
 - b. Challenge: Improve user experience or make the second floor hallway of the museum more interactive or better for kids your age. Use littleBits to prototype this design or solution. Use your expertise to design an invention that makes GRPM extra awesome. Perhaps your new invention will become an essential part of the museum in the future!
 - c. Instructors will guide teams through the engineering design process
 - i. Gather Phase: Students will have time to explore the 2nd floor of the museum to really get ideas about how visitors experience the museum.
 - ii. Generate: Back in the classroom, in their groups, inventors will discuss all of their ideas for their invention.
 - iii. Make: Groups will be pushed to select a design idea that they would like to prototype. They will fill out the design plan portion of their worksheet and then build prototypes
 - iv. Share: Share out designs with the class/pitch their ideas for museum improvement
4. Remix: Ask students to discuss at least one thing they could do to improve their design
5. Reflection and self-evaluation