

Toy Design

Grade level: 6-12 (Can be adapted for younger learners as well.)

Summary of lesson: The goal of Toy Design and Invention is to cultivate new ways of thinking and to develop technical skills for students with limited access to hands-on STEM enrichment opportunities. Through prescribed activities, students will add to their own “toolkits” of minds-on knowledge and hands-on skills while having fun! Students will learn how to identify a need in their lives or in the world around them and develop their own invention after completing the main activity in each unit. They will pull from their expanding toolkit to come up with solutions.

Students will learn about affordable, open-source technologies that will help them design, iterate on their design, and finally, build a working prototype. Following the overview, students participate in a range of skill-building tutorials to design several example items—providing them the necessary skills to design their own unique products.

In the main part of the project, students work in small teams or individually and are guided by design instructions to develop a novel toy design. The design journey involves human-centered design principles, whereby an individual user from their school community is identified before concepts are developed to address the specific likes and dislikes of the user. Finally, ideas are presented to the rest of the class, as well as the end user.

Time/Duration: Examples of how it has been taught: It has been condensed to 7 afterschool meetings of 90 minutes each via the educator guide. There is also a slide deck adaptation of 11 meetings for 45 minutes each. It can be extended or shortened.

Learning Outcomes:

- Students will be able to go through the Engineering Design Process to design and build a working toy for kids at their school to enjoy.
- Students will use research, design thinking, human-centered design, and sketching skills in teams to develop a concept for a new toy.
- Students will become knowledgeable in prototyping and block programming.
- Students will analyze their work and the work of their peers to suggest improvements to their designs.

Subject areas/Standards:

Breakdown of lessons (From Slide Adaptation):

- **Meeting 1:** Unit Overview, Invention Launch activities
- **Meeting 2:** Innovation basics, Cardboard Prototyping
- **Meeting 3:** Intro to Electronics & Micro:bit
- **Meeting 4:** Electronics (cont.), Scamper, Input & Output / Quiz
- **Meeting 5:** What makes toys fun? Explore toys and do a toy mashup.
- **Meeting 6:** Invention Deep Dive, Meeting of Beneficiaries.
- **Meeting 7:** Designing the toy. Reflection of Beneficiary interviews and drawing the new toy.
- **Meeting 8:** Toy build
- **Meeting 9:** Toy build (cont.) and tips with Micro:bit
- **Meeting 10:** Introduction to marketing, bringing the toy to market. Designing an Ad campaign for the created toy
- **Meeting 11:** Toy and Ad Campaign Presentation

Materials:

- Computers with speakers and mice (and, optionally, microphones and webcams) for the computer-based design activities.
- Projector or interactive whiteboard with speakers for sharing works-in-progress and for demonstrations.
- Network connection for connecting to the MakeCode and Micro:bit online communities.
- Student Guides (physical) for documenting, sketching, and brainstorming ideas and plans. (Alternatively, the slide deck)
- Post-Its, 1 pad per team
- Glue gun or glue sticks, 2+ per team
- A good pile of junk, 1 per class: Cardboard, construction paper, colored tape, pipe cleaners, stickers, feathers, string, playdough, modeling clay, etc.
- Plenty of toys
- [Micro:bit Kit](#)