

# Unit 3: Designing, Building, and Testing Invention Convention

15 Classes

*Rev. September 2023*

## Essential Questions

- How do inventors design and build their inventions?
- How do inventors use data and feedback to test and refine their inventions?

## Enduring Understandings with Unit Goals

**EU 1:** Drawing a model of an invention or prototyping requires critical thinking skills.

- Inventors are expected to articulate how they intend the invention to work and why they chose the materials they did for executing their invention.

**EU 2:** The invention process is iterative and cyclical.

- Inventors use feedback to test and refine their designs.

## Standards

### Common Core State Standards

- **CCSS.ELA-LITERACY.CCRA.W.2:** Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
- **CCSS.ELA-LITERACY.CCRA.W.4:** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
- **CCSS.ELA-LITERACY.CCRA.SL.1:** Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- **CCSS.ELA-LITERACY.SL.8.1:** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
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### Next Generation Science Standards

- **NGSS.MS-ETS1-3:** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

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- **NGSS.MS-ETS1-4:** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- **NGSS.SEP.1:** Asking questions and defining problems
- **NGSS.SEP.2:** Developing and using models
- **NGSS.SEP.3:** Planning and carrying out investigations
- **NGSS.SEP.4:** Analyzing and interpreting data
- **NGSS.SEP.6:** Constructing explanations and designing solutions
- **NGSS.SEP.8:** Obtaining, evaluating, and communicating information

### ISAAC Vision of the Graduate Competencies

**Competency 1:** Write effectively for a variety of purposes.

**Competency 2:** Speak to diverse audiences in an accountable manner.

**Competency 3:** Develop the behaviors needed to interact and contribute with others on a team.

**Competency 4:** Analyze and solve problems independently and collaboratively.

**Competency 5:** Be responsible, creative, and empathetic members of the community.

### Unit Content Overview

- Intent To Invent
- Jungle Survival Challenge
- Nuclear Meltdown
- Music To My Ears
- Reach For The Sky
- Stubborn Elephants
- Take Apart Workshop
- Shifting Gears

### Daily Learning Objectives with Do Now Activities

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### Students will be able to...

- Develop an outline for planning their own inventions.
  - What problems have you found that you want to solve?
- Construct a structure that provides shelter out of limited repurposed resources.
  - Why do engineers use the engineering cycle?
- Test and modify a structure based on observations and data to solve a problem.
  - How do inventors and engineers develop solutions to problems?
- Invent a musical instrument and play a short song. Work collaboratively to design a new product.
  - What is the difference between sound and noise?
- Translate their brainstorming and modeling solutions experiences into formalized ideas with written language.
  - Show gears. Brainstorm- How do gears move together? What role do gears serve in a product? How do gears affect the movement of a bicycle?
- Modify designed structures using peer discussion and feedback.
- Define and explain the process of design revision and its relation to the other parts of the inventing process.
- Communicate with each other verbally and through writing about future inventions.

### Instructional Strategies/Differentiated Instruction

- Daily Warm Up Activities
- Lecture slides with note-taking
- Flexible grouping
- Exit slips
- Graphic Organizers
- Creating authentic connections for students
- Rephrasing and restatement of information and concepts
- Student use of headphones
- Independent reading
- Outlining of text
- Determining central ideas, paraphrasing
- Laboratory Experiences

### Assessments

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### **FORMATIVE ASSESSMENTS:**

- Exit slips
- Do Now Activities
- Intent to Invent Form
- Music to My Ears Reflection
- Stubborn Elephants worksheet
- Shifting Gears Worksheet

### **SUMMATIVE ASSESSMENTS:**

- Log Books
- EU Quizzes
- Unit Task - Invention Process Rubric Designing & Building and Testing & Refining dimensions
- Unit Test
- Tri-fold poster board

### **Unit Task**

**Unit Task Name: Ready, Set, Build!**

**Description:** Give materials and task for build. Reflect on the design/engineering process throughout the process. First block is design (EU 1), second block 15 minutes to build then get feedback on process (EU 2).

### **Unit Resources**

- Chromebook
- Internet Access
- PowerPoint
- Invention Logs for each student
- Connecticut Invention Convention Website
- Kid Inventors Video
- Engineering Design Video