

## TEACHER DIRECTED LESSON PLAN

### LESSON 1: Understanding Design

#### LESSON OVERVIEW

This lesson will explain the steps needed to invent. The YIP Invention Process establishes a framework to guide students in creating their own inventions. Once learning the steps, the students will practice the process by designing their own paper aircraft.

#### OBJECTIVE

Students will understand the framework of the YIP Invention Process and be able to explain these steps in context. They will practice the steps of the YIP Invention Process on their own as they build a paper aircraft.

#### MATERIALS

##### Resources For the Teacher:

- Slide Deck: Understanding Design (*optional*)
- Script: Understanding Design (*accompanies slide deck, optional*)
- Video: The Henry Ford's Innovation Nation: Soccer Ball That Generates Energy
- <https://www.youtube.com/watch?v=0gifXci-FUk> (3:50)
- Worksheet: Steps of the Invention Process
- Worksheet: Paper Aircraft Activity Guide (*Note: Differentiated worksheets for Grades K-3 and Grades 4-8.*)

##### Materials For Students:

- Pens/pencils
- Paper for notes and drawing designs
- Two types of paper for aircraft (printer, notebook or construction paper)
- Paper clips (large and small) representing passengers
- Tape
- Space for testing aircraft
- Steps of the Invention Process worksheet
- Paper Aircraft Activity Guide worksheet (*Note: Differentiated worksheets for Grades K-3 and Grades 4-8.*)

#### INSTRUCTION & ACTIVITIES

**Teacher may lead the following lesson plan with flexibility to adapt as needed to fit technology and class format:**

##### Teacher Instruction:

1. *Teacher may use slides and script to explain Invention Process or lead instruction and discussion on their own.*

Teacher will share Slide Deck- Understanding Design with the class and use script as needed.

Teacher will begin with discussion that that all ideas have an originator, an inventor, of sorts. And, all of these inventors follow the same basic process to turn their ideas into something real- a product. This is called the Invention Process. Most inventions are the result of the stretch from *what is* to *what might be*. If it doesn't feel easy, that is OK!

Today, the class will practice these steps independently as we design and build our own prototype.

2. Teacher will share video from The Henry Ford's *Innovation Nation: Soccer Ball That Generates Energy*. (Link: <https://www.youtube.com/watch?v=0gifXci-FUk>, 3:50 minutes. Video included in slide deck).

Teacher may add summary- Jessica O. Matthews had a unique idea: turn a soccer ball into a battery that powers lights for people in the developing world. Her story shows how an ordinary object can be transformed to address a need and improve people's quality of life. Facilitate group discussion following video. What steps of the Invention Process were highlighted and how did she approach them? Refer to Worksheet: Steps of the Invention Process.

### **Student Proving Behaviors:**

Recommendations for In-Class Learning (select one or all of the following):

1. Think-Pair-Share: With a partner or in small group, ask students to each share one step of the invention process that Jessica Matthews took as she developed her energy creating soccer ball.
2. Ask students to draw their own icons (pictures) to represent one or all of the steps of the invention process.

### *Ideas for Virtual Instruction:*

1. *Ask students to draw their own icons (pictures) to represent one or all of the steps of the invention process. Students may submit work using teacher's virtual platform of choice. (TIP: Teacher may want to delete any icons from visual presentation so that students do not copy what they have seen.)*
2. *Ask students to write a paragraph on one step of the invention process that Jessica Matthews experienced as she made her energy creating soccer ball. Students may submit work using teacher's virtual platform of choice.*

### **Activity: Paper Airplane**

**Students will need:** *Pen or pencil, Paper for notes and drawing designs, Two types of paper for aircraft (printer, notebook or construction), Paper clips (large and small) representing passengers, Tape, Space for testing aircraft, Steps of the Invention Process Worksheet, and Paper Aircraft Activity Guide (TIP: Teacher may choose to hold all building materials until students draw designs on paper to encourage the design and re-design steps of the invention process.)*

1. Teacher will distribute Paper Aircraft Activity Guide worksheet to students.

*Note: For students in grades K-3 focus on the aircraft's flight distance. Add challenge for grades 4-8 by requiring that aircraft must be able to hold a given number of small objects (paperclips, coins, dried beans.)*

2. Teacher will guide students through the steps of the Invention Process together while building the aircraft. Teacher may choose to break down the activity into the individual steps of the Invention Process and give students time to work on each step before moving to the next one. Teacher may use the Paper Aircraft Activity Guide to help lead this part of the activity. For students in grades K-3, teacher should walk students through each step and provide prompts and visual examples when appropriate. For students grades 4-8, teacher may choose to share the guidelines to help students with each step so they can read along as they go.

Example:

Step 1: Identify- Ask students to identify the qualities of a good paper aircraft. Then ask guided questions: What makes a good paper aircraft? How do you know if you have made a good paper aircraft?

3. Teacher will follow activity with a discussion to integrate students' knowledge about the Invention Process. Possible discussion questions that students may discuss as a class, in small groups, or in pairs:
  - Did they meet their defined criteria for a successful aircraft. Yes or no? How or how not?
  - Was their first prototype a success? How did they decide what to change and improve in their original design?
  - Did they get feedback from anyone in the process? How did they use this feedback? What did it feel like to get feedback?
  - How many times did they test and re-build? Was this enough or did they need more testing?
  - What were their roadblocks during the Invention Process?
  - What was the most challenging step of the Invention Process? Why? How did they work through it?
  - What would they do differently if they were asked to do this activity again?
  - What was their biggest accomplishment?

*Ideas for Virtual Instruction:*

1. *Adjust requirements for aircraft as needed.*
2. *Students may complete work together as a class or at home independently. Ask students to share photos or videos of their aircraft flying.*
3. *Allow students to work virtually in groups to design aircraft using Zoom breakout room or Google classrooms.*

#### **CHECK FOR UNDERSTANDING**

***Teacher may wish to do one of the following to check for understanding:***

1. In the format of the teacher's choice, ask students to name the part of the Invention Process that they feel is most challenging and then to name the step that they are most excited about.
2. In the format of the teacher's choice, ask students to draw an icon to represent one step of the Invention Process that they are most excited about.