AFTER SCHOOL ACTIVITY PLAN

SESSION 1: Invention Process

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 creating their own invention from a given set of materials. Students will also explore their YIP Inventor's Journal and understand it's value in the invention process. They will understand how to document and record their invention process and learn the importance of keeping accurate details.
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 invent a product using given materials. Students will understand the importance of documenting ideas and research in the design process. Students will understand how to utilize the YIP Inventor's Journal.
MATERIALS
• Video: The Henry Ford's Innovation Nation: Soccer Ball That Generates Energy https://www.youtube.com/watch?v=0gifXci-FUk (3:50) • The Crayon Holder Handout (optional, if using as alternative to video) • Pens/pencils • YIP Inventors' Journal • Invention in a Bag Organizer • Invention in a Bag Challenge Idea Cards (printed and cut into cards for student use as needed) • Paper Bags • Invention Bags- paper bags filled with various items (puff balls, clothes pins, paper cups, paper plates, pipe cleaners, balloons…anything to build an invention) • Tape • Glue • Scissors • YIP Steps of the Invention Process handout (included in YIP Inventor's Journal) **Teacher/Leader Preparation:** • Set up AV/media device for video • Print copies of Crayon Holder Handout for students (only if using as alternative to video) • Print copies of Invention in a Bag worksheet for students • Print and cut Invention in a Bag Challenge Idea Cards

- Make Invention Bags- include one Invention in a Bag Challenge Idea Card as well as various craft/art items in each bag. There should be one bag per student, or you may choose to have students work in groups of 2-3, and each group should have one bag.

TEACHER/LEADER TIPS

This session welcomes students to YIP. Be sure to take time to explain to students that during the program they will create their very own inventions. They will learn the process of inventing and identify a problem, brainstorm ideas for a solution, research the idea, develop a design, and then build and test their invention. Finally, if possible, you will host a showcase/invention fair where students will be able to present their inventions to peers and community members. Share your expectations for students and how they will work on their projects (Can they work on inventions at home? Can they work with partners? Are you planning to host an invention fair and when?)

In this first lesson, you will also give each student their own YIP Inventor's Journal (or ask them to use a notebook throughout the unit.) There is time in the lesson to guide students through the journal. Be sure to let students know of any requirements or expectations you have for journals. You may choose to let students take home their journals or not. If you choose to keep them and students do work on their inventions at home, they may record their notes and activities on separate pages and insert them into the journal later. Younger students (K-2) may need help from adults when writing. Journals should reflect age appropriate documentation.

Most of the worksheets and handouts used in each lesson/activity are already included in the YIP Inventor's Journal so you do not have to make extra copies to distribute. You may choose to highlight specific pages that students must complete, show students where to add their signature and date each day, where and how to draw design sketches and how to label them, etc. Remind students that the journal can be messy (but readable!). They should not erase or tear out pages- everything should be kept as a record of what was done, even if it did not work and had to be changed later. Pages may also be inserted if students have other notes and drawings to include.
**Note: Throughout the course of completing YIP and working on their own invention projects, the students should complete the YIP Inventor's Journal. You should train students to write in their YIP Inventor's Journal or alternative invention logbook whenever they are working on or even thinking about their inventions. They can also write on notebook paper and staple it to the journal later. Students may use the printed or the digital version of the journal. The digital version can be found on the YIP website (*https://www.unh.edu/leitzel-center/young-inventors-program/teach/teacher-resources*). Logbooks of some kind are required for submission to the Northern New England Invention Convention and the Invention Convention US Nationals.*

YIP encourages collaboration and welcomes teams to invent. Students may work in pairs or groups and students do not have be in the same grade (they will compete in the grade level of the highest grade). All team members must participate in the development of the invention and should keep their own YIP Inventors Journal or invention logbook.
**Note: Only teams of two (2) students are allowed to present the Northern New England Invention Convention and the Invention Convention US Nationals. If a team is larger, two students may be selected to represent the teams at these competitions.*

If you would like to send information about the program home with students, you may use the following letter/email templates and adjust information as needed:

- YIP Program Letter to Families
- YIP Invention Fair Letter to Families

INSTRUCTION & ACTIVITIES

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

Teacher Instruction:

What exactly is an invention and how do inventions come to life? Look around you. Everything you see is something that someone invented and then others did a different version of it. For example, if you are sitting in a chair, chairs were invented hundreds of years ago, but other people continue to make different versions of a chair every day.

Can you define invention?
Allow students to respond.

An invention is a new thing that someone has made. And, all inventors follow the same basic process to turn their ideas into something real- a product. This is called the Invention or Design 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, you will become an inventor. You are going to invent something based on a problem that needs a solution. I hope you are feeling excited, but you may be wondering how you will ever be able to invent something.

But before we begin our invention journey, you will need some basic tools. One of the most important is a pen or pencil, and a notebook or journal- you need to keep track of ALL your ideas. As an inventor, it is essential that you document and record all activities you do related to developing your idea and turning it into an invention. Inventors draw design plans, make notes of their tests and evaluations and more notes about changes they can make to future designs. Inventors record everything they do to serve as a record to prove that their ideas are original and belong to them.

Distribute the YIP Inventor's Journals to each student.

This is your journal and we will use it every time we meet to invent and if you are ever thinking about your invention or working on it outside of here, you should take notes and add them to the journal.

Guide students through the YIP Inventor's Journal. See Teacher/Leader Tips for more details on how to prepare students to use the journal. Throughout the course of completing YIP and working on their own invention projects, the students should complete the YIP Inventor's Journal. Teachers should train students to write in their YIP Inventor's Journal or alternative invention logbook whenever they are working on or even thinking about their inventions. They can also write on notebook paper and staple it to the journal later.

Ok, so now that you have your tools, let's get to work.

Jessica Matthews is a great example of a young woman who took risks to turn her fun idea into a device that helps change the world. She 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.

Let's watch this video.
Share video: The Henry Ford's *Innovation Nation*: Soccer Ball That Generates Energy.
Link: https://www.youtube.com/watch?v=0gifXci-FUk, 3:50 minutes

[OPTIONAL/ALTERNATIVE TO VIDEO]
Ask students to read (or read aloud to them) the story of Cassidy Goldstein, inventor of the Crayon Holder. (See The Crayon Holder worksheet)

Teacher Instruction:
Just like Jessica, all inventors follow a process- steps to invent. By following these steps, you will see that inventing is not as hard as you think.

Let's talk about the steps that you will take to invent something of your own. This is called the Invention Process (or Design Process).
Note: The steps of the Invention Process are included in the YIP Inventors' Journal. You may refer to this page with students for a visual and written explanation.

Step 1: IDENTIFY – Ask questions and determine what the problem is
Step 2: UNDERSTAND- Research the problem fully. Who does it affect? What may cause the problem? What might be possible solutions?
Step 3: IDEATE- Use creative problem-solving to turn an idea into a solution.
Step 4: DESIGN- Sketch a drawing of the solution and its design. Label the parts.
Step 5: BUILD- Put your plans in action and build a model (also called a prototype).
Step 6: TEST- Test the model to collect data and receive feedback
Step 7: REDESIGN- Make adjustments and improvements to the prototype. The Test and Re-Design steps may repeat several (or many) times until you are satisfied with the results.
Step 8: COMMUNICATE- Present your idea and your solution.

When inventors set out to solve a problem, their first solution is rarely their best. Instead, they tinker, try different ideas, fail, learn from mistakes, and try again. You can approach almost any problem using the steps of the invention process—it's a great way to come up with lots of ideas, improve a design, and learn from mistakes. In fact, we use the invention process every day— to plan an outing, to write a letter, to make breakfast, or to do any task where you create something that did not exist before.

Activity: Invention in a Bag

1. *Distribute Grab Bags and Invention in a Bag Organizers (worksheets ARE NOT included in the YIP Inventor's Journal)*

You are going to be able to try inventing for yourselves with the materials in this paper bag. You may use everything in the bag and also anything from this materials table (table in classroom with supplies to share such as tape, glue sticks, scissors). You do not have to use everything in the bag or on the materials table unless you want to.

2. First, you need to "Identify". What is the problem you want to solve? How can the items in the bag help you solve that problem? There is a card in each of your bags which gives you a problem to solve if you need an idea. But, if you have your own idea for what to invent, share it with me before you get going.

3. The next step is to brainstorm and design. I know you want to jump right into your bags and build, but just like we saw in the video, inventors have to make plans. So do you. Take a minute to think and plan. You may use your Organizer to take notes and sketch some ideas. You will have 5 minutes to do this. You may not start building just yet.

   Allow students to work independently for 5 minutes. They should not begin "building" anything yet. After five minutes, you can stop.

4. Now, if you have a drawing and are ready, you must show it to me as your ticket to begin to build. I will come around to check you and give you the ok to build. If you want a few more minutes to draw you can keep drawing.

   Allow students to work and build for 15-20 minutes. Circle the room to provide help as needed. Encourage students to collaborate even though they are all working on their own separate designs. Students will want to test and try out their designs as they build to see what changes need to be made. Also remind them to think of a name for their invention.

5. Time to stop inventing. Let's gather together to share what we created. I know that the time is short and you may not be finished building. That's ok. You can take it home, but for now we want to see what you've done.

   In smaller groups or as a class, ask each inventor to share.
   - What is the invention?
   - What is it called?
   - What problem does it solve?
   - How will it work?
   - If you were going to prototype your invention, what materials would you use?
   - Who would be the beneficiary?

Congratulations to all of you! You are now officially an inventor! Today was just practice for what you are going to do for the next few weeks as we do the Young Inventors' Program. This week, you should keep an eye out all around you for problems you see that maybe you can solve. It could be something to you're your life easier, something to improve your school, something to improve a product you use, or you can create something totally new that fills an unmet need. Take notes if you want or talk to your family and friends about problems they have. Next week we will look at problem solving and begin to start your invention.

NOTE: You may wish to give students a copy of the What's the Problem worksheet, or use the one in the YIP Inventor's Journal, and ask students to complete the first page as they talk to parents, relatives, neighbors and friends over the next week and bring their completed sheet to the next class meeting.