

INDEPENDENT INVENTOR ACTIVITY 5: BUILDING, TESTING, REFINING CYCLE

Base Time: 120* minutes (*more time is recommended*)



TODAY I WILL...

Today you will build a prototype of your invention based on your design plans and drawings. You will test it as you build to see where changes may be necessary. The building process should take multiple work sessions, so plan ahead. You are encouraged to tinker and play with your invention many times. Most inventions are not completely successful on the first try. Inventors repeat the process many times, building, testing and re-designing their prototypes after each test to make changes and improvements. Once you have a solid prototype, you will test your invention and continue to refine it until you feel it is the best it can possibly be.

I WILL NEED...

Materials I Need

- [YIP Inventor's Journal](#)
- Video: Dr. Pascha Makes an Invention Box, MIT Lemelson Full Steam Ahead, 2020.
VIDEO LINK: <https://www.youtube.com/watch?v=OZZFDIa1-0U>
- Recycled supplies, art/craft supplies (including scissors, tape of all kinds, and glue)
- [Worksheet: Changes to Prototype](#)
- Pens/pencils

GOOD THINGS TO KNOW BEFORE I BEGIN...

The longer you can take to build, test and refine your invention prototype, the better. All parts of your building process should be recorded in your YIP Inventor's Journal. You may use other paper and insert it into the journal if you need more space or if you use other paper for more notes and design drawings. We encourage you to make at least 2 iterations (improved models) of your prototype before completing the project.

While building and inventing is fun, it can also be frustrating. If things do not go the way you want, that's okay. Inventors encounter challenges and setbacks all the time. Do not give up. Take a break and put your invention aside for a while but come back to it when you are fresh and see what "iterating" you can do to work around your problems. And do not be afraid to ask for help. Others will have more ideas and help you look at things from a new perspective and often give you good suggestions for how to make things work again. Refining and rebuilding are all part of the process, and your invention will be great in the end!

We recommend that you create an Invention Box, a large box or bag filled with materials and supplies to build design models and prototypes. It may include things such as recycled materials (cereal boxes, toilet paper rolls, plastic bottles, yogurt containers, Styrofoam plates, etc.), craft supplies (pipe cleaners, beads, pom poms, popsicle sticks, clothes pins, etc.), yarn and string, construction paper, scissors, tape (duct tape, clear tape, washi tape), rubber bands, glue, markers and more. For more ideas about how to make an Invention Box, you may watch this video, Dr. Pascha Makes an Invention Box, MIT Lemelson Full Steam Ahead, 2020. Link: <https://www.youtube.com/watch?v=OZZFDIa1-0U>.

Hot glue guns are recommended for inventing because they dry quickly and securely. Please ask permission to use a hot glue gun at home and ask for help if needed to avoid getting burned.

A 3-D model or prototype of the invention is strongly recommended, but not required for competition at the regional, national and global levels hosted by the Young Inventors' Program and Invention Convention Worldwide. A detailed, labeled drawing of the design is sufficient for the display and presentation. Prototypes and models may be working or non-working. Inventors are encouraged to build models that are "materials neutral", meaning they can be made of reused and recycled materials and the overall product should not require money to buy materials.

INSTRUCTION & ACTIVITIES

You are ready to build!

Activity: Invention Building

It's time to start to build your invention prototype. Remember to should make note of any changes you make to your original design in the process of building and record these changes in your YIP Inventor's Journal. We also encourage you to take pictures of yourself building and of your prototype at various stages during the building process to show the evolution of the model.

Once you have a solid prototype, you may begin to test it to see if it works. If something isn't the way you want it, make a change and continue to build and refine the invention accordingly.

As you build, use the Changes to Prototype Worksheet to write notes about what changes you want to make and why. Draw a new design to show and label it. This design is Prototype Design #2.

When you are ready, you will need to test your invention by letting others use it. You may want to create a survey for your testers to help collect information on what they think of it and what changes they might suggest. Or you may just decide to interview them after they have tried your prototype.

Activity: User Testing

Share your prototype with at least 2 other people (more testers are better and can provide more feedback and suggestions for improvement). You may use the Peer Testing Feedback Grid to take notes on what testers think about your prototype. Here are some questions you may wish to ask them:

For nonworking prototypes:

- Does the prototype accurately represent the solution idea?

For working prototypes:

- Does the prototype work as intended?
- What improvements could be made?
- What about the prototype works well?

Now that others have tried your invention, consider the feedback you received. What suggestions did testers have? How can you use this information to modify and improve your prototype?

Continue to fill out the Changes to Prototype Worksheet and write notes about what changes you want to make and why. Draw a new design and label it.

Activity: Invention Refining

Continue to make improvements to your model. Each new version of your design is called an “iteration” Inventions often go through many iterations before getting to the final product. Remember to keep testing as you make changes to be sure they are actually improvements. Sometimes a change may not be better and you might have to return to what you had before. Tweak and modify the invention until you are satisfied with the outcome. You may use the Iterations Worksheet as you refine.

This activity ends when you feel confident that your invention prototype is what you want it to be.

NOTE: Invention building will likely take several days or even weeks. The longer you take to build and make changes, the better the end result.