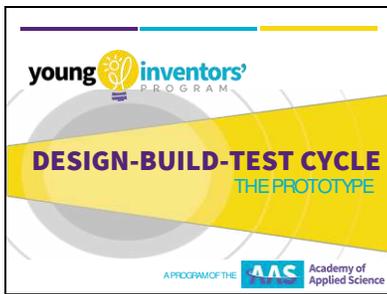


LESSON 7: Design-Build-Test Cycle

Lesson Script

THIS SCRIPT IS TO BE USED AS A GUIDE TO ACCOMPANY THE SLIDE DECK FOR THIS YIP LESSON FOR PRESENTATION IN PERSON OR VIRTUAL (SYNCHRONOUS OR ASYNCHRONOUS-PRE-RECORDED).

TEACHER MAY ADD SPECIFIC GREETINGS AND COMMENTS AS NEEDED AND MAKE CHANGES TO MEET CLASS NEEDS USING THE LESSON PLAN IN THE YIP CURRICULUM.



[TEACHER MAY MODIFY INTRODUCTION TO LESSON AS NEEDED.]

Welcome to our seventh session for our invention unit with the Young Inventors' Program.

Today we are going to cover YIP Lesson Seven: The Design-Test-Build Cycle



By the end of today, you will be able to create a solution to solve the problem you have chosen. You will use your previous research to develop and draw a design of your invention and then you will build a model from this design. Finally, you will put your model to the test. You will then learn if it works and what might need to be changed. This process will repeat and you can build-test- and redesign until you have developed a successful invention. After you've gone through these steps, you will be able to explain the importance of testing and re-designing in the invention process.

LESSON 7: Design-Build-Test Cycle

MATERIALS:

- Pencil or pen
- Notebook paper or other paper for writing and drawing
- YIP Inventor's Journal
- Build materials (such as, but not limited to: recycled materials, tape, glue, scissors, clips, string, fabric, markers...)
- Optional: Wisk or other kitchen utensil

Before we start, you will need the following materials.

- Notebook or other paper for writing and drawing
- YIP Inventor's Journal
- Pens/pencils
- Build materials (such as, but not limited to: recycled materials, tape, glue, scissors, clips, string, fabric, markers...)
- Optional: Kitchen Utensil

IF PRE-RECORDING:

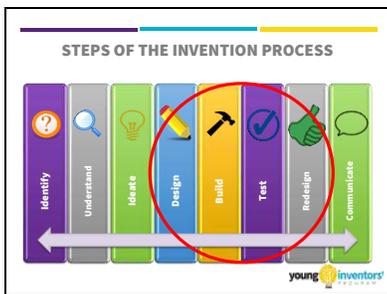
If you want to pause the video while you collect your things, go ahead and press Pause. Then hit Play when you are ready.

As we look at the steps of the invention process, we are getting closer to the end. However, you should think about the design, build and test steps more as a cycle that may continue several or many times before you move to the last step- communication.

NOTE:

IF IN-PERSON OR SYNCHRONOUS RECORDING, STOP SLIDES AND TALK TO STUDENTS ABOUT SPECIFIC PROJECT REQUIREMENTS YOU MAY HAVE; SHARE EXPECTATIONS, DEADLINES AND ANY RUBRICS FOR EVALUATION. BEGIN SLIDES WHEN READY TO RESUME.

IF PRE-RECORDING, TEACHER MAY WISH TO STOP SCREEN SHARE AND TALK TO STUDENTS ABOUT SPECIFIC PROJECT REQUIREMENTS; SHARE EXPECTATIONS, DEADLINES AND ANY RUBRICS FOR EVALUATION. BEGIN SCREEN SHARE WITH SLIDES WHEN READY TO RESUME.



LESSON 7: Design-Build-Test Cycle

LET'S REVISIT THE INVENTION PROCESS

-  **DESIGN**
Draw the design and label the parts and movements.
-  **BUILD**
Build a prototype.
-  **TEST**
Test the prototype to collect feedback and data.
-  **REDESIGN**
Make adjustments and repeat testing.



The most critical component of inventing is testing and re-designing your model until you are confident that it is as good as it can be. Often, inventors find that their first model doesn't work. So inventors have to look carefully at what went wrong and how they might fix it to improve the invention. They go back, re-draw and re-design, then re-build and test again.

All the while, you want to be sure you are recording everything you do- talk about your challenges and how you will overcome them, show any new drawings, take photos of new models, record the data and results from all tests that you do. You should also include any feedback or suggestions you may receive as you talk to others about how to improve your plans.

GUIDED DISCOVERY
You will have time to build and test your prototype. Use the following steps to plan your project.




This cycle may take some time. Inventors do not invent in a single day. So block out some time over the next few days to work on your project. Think about how many test cycles you may need to run. Be sure to anticipate for more challenges to pop up. When you fix one problem, sometimes you may find you've created another one! But don't get frustrated. I am here to support you and you have your classmates and people at home. Ask for help when you feel stuck, find someone you can talk through your ideas with. Sometimes just saying things out loud makes them more clear. Inventions are a work in progress, so don't give up.

LESSON 7: Design-Build-Test Cycle

LET'S TALK

How might you plan your steps?

- How might you test your prototype once you build it?
- How will you know to try something different or that you need to make modifications?
- How will you be able to know what modifications you might want to make?
- Why is testing important to the Invention Process?



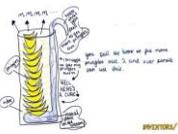

As you approach your design-build-test phase, think about the following. It's always a good idea to anticipate or think about what the process might look like before you even begin. What challenges might you face? Think of plans for how you may address them if they do come up during your design and build.

- How might you go about testing your original design once you build it?
- How will you know to try something different and that you need to make modifications to your first design?
- How will you be able to know what modifications you might want to make to your original design?
- Why is testing important to the invention process?

NOTE:

IF IN-PERSON OR SYNCHRONOUS RECORDING, STOP SLIDES TO HAVE A CLASS DISCUSSION. BEGIN SLIDES WHEN READY TO RESUME.

IF YOU HAVE NOT ALREADY...



Draw a model of your invention design.

Label all parts. Make note of the materials you need, parts that may move, and special features.

Add your drawing to your YIP Inventors Journal.



The first step in the process is to make a drawing, or even several drawings, of what you want your invention to look like. What are the different parts? What materials do you want it to be made of? Draw the invention from different perspectives- what it looks like from the side, what it looks like of you are looking down on it from above. Label everything- all the parts, the materials, how things might move or any special features. And of course, add all of your drawings to your YIP Inventor's Journal or logbook.

LESSON 7: Design-Build-Test Cycle

TIME TO BUILD

Now that you have your drawing, begin building your invention!

STEP 1. Build your prototype based on your drawing. Tinker with materials and how they fit together.



Take photos to show your work and add them to your YIP Inventor Journal.




And now for the fun part. Let's build! Your drawing should serve as your plan – think of someone who builds houses. They use drawings called blueprints to tell them how big to make the rooms and what things go where, like where to put the doors or windows. Your drawings will help you build your invention.

The first step is to find some materials. Play around with them. How can they fit together? What shapes and sizes do you need? What needs to be cut or modified? You'll probably try a few different things as you go, kind of like if you have ever played with clay or Legos. Try something and then work with it until it looks like what you want.

If you can, take some pictures of your progress and your build. You can add these to your YIP Inventor's Journal or logbook to show what you did.

STEP 2. Test your prototype. Does it work? What changes do you need? Record your data in your YIP Inventor Journal.



If you change anything while building and testing, make sure to draw that change in your design and explain the need for the change in your journal.



Once you have built a model, you can try it out and test it to see if it works. Ask someone else to try it too. What happens? Do you need to make any changes? Is the size right? Do things fit together properly? If it moves, does it move fast enough? This is the time to make changes- modifications. What can change? How can you make this change? Remember, that you may make a change and end up going back to what you did before, but that's ok. It's part of this process. You want to play around to see what works best. And take notes, so that if you do have to go back to one of your first models, you know what you did to make that model work.

LESSON 7: Design-Build-Test Cycle



Remember SCAMPER? We SCAMPERed back in Lesson 3 when we talked about brainstorming. This activity may come in handy now as you're working on your model.



Let's review. When we SCAMPER, we can think about changes to make to our invention. S= substitute one thing for another (maybe materials you use, or a part), C= Combine with another object (can you combine anything to work with your model), A= adapt for a new use, M= modify or make a slight change to your model (change the size of the whole thing, or just one component, change the color, change a part), P= put other use, E= eliminate (do you need to take something away?), and R= rearrange (can things be moved in a different order?).

You will not need to make a change using all of these tools, but maybe one or two of them will help you think of what you can do to improve your invention model.



Let's practice again quickly together. Today, we'll use the whisk-something you may have in your kitchen and use for mixing batters and sauces.

NOTE:

IF IN-PERSON OR SYNCHRONOUS RECORDING, STOP SLIDES TO SHOW A WHISK. GO THROUGH THE STEPS OF SCAMPER. BEGIN SLIDES WHEN READY TO RESUME.

IF PRE-RECORDING, TEACHER MAY WISH TO STOP SCREEN SHARE. GO THROUGH THE STEPS OF SCAMPER. OR ASK STUDENTS TO SCAMPER ON THEIR OWN AT HOME WITH A WHISK OR OTHER OBJECT. WHEN READY, BEGIN SCREEN SHARE WITH SLIDES WHEN READY TO RESUME.

LESSON 7: Design-Build-Test Cycle

INSTRUCTIONS:

1. Go through each letter of SCAMPER and think of new uses or ways to make your whisk.
2. If you need help, use the SCAMPER On Your Own Worksheet.



What else could it be used for? How might you change it for another use? How could you make it better for stirring? I find that when I use a whisk, the balloon shape doesn't allow it to mix the sauce near the edges of my pot or pan. Maybe a more flexible material for the tines would allow them to bend to reach into the edges better. Or perhaps some different sizes? There are many possibilities.

You can use the SCAMPER ON YOUR OWN worksheet from our earlier lesson (Lesson 3) if you need it.

THINK ABOUT:

As you build and test, think about these steps. These are the steps of the Invention Process.



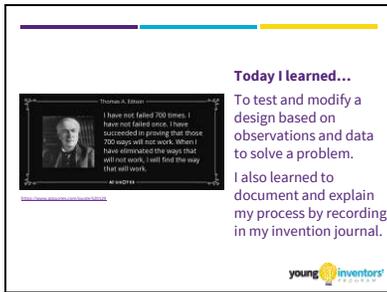
- What is working? What is not?
- How do you know when something works?
- What will you do when something does not work?
- How will your VIP Inventor's Journal help you?



So, let's review our approach to the Design-Build-Test-Redesign process. First, ask yourself, what is working and what is not working? Why? Imagine and brainstorm some new ideas for how to go about your design. Plan. Make drawings and sketches of the entire idea or just certain parts to help you build. Create. Build it and try it out. And then test it. Does it work? Can it be better? Improve it if you can.

You may feel frustrated if your invention does not work the first time, or even the second or third time. But don't worry- this is normal and actually a good thing. Take a deep breath, ask for help, try to figure out what's keeping things from going the way you vision them. Then make some changes. Every inventor faces roadblocks. But those who keep going to find solutions are the ones who are most successful- you can do this!

LESSON 7: Design-Build-Test Cycle



Today I learned...

To test and modify a design based on observations and data to solve a problem.

I also learned to document and explain my process by recording in my invention journal.

Thomas A. Edison
I have not failed 700 times. I have not failed because I have succeeded in proving that those 700 ways will not work. When I have eliminated the ways that will not work, I will find the way that will work.
-AS QUOTE-

young inventors' PROGRAM

Designing, building and testing is the heart of inventing and it can be the most fun too. Take your time and allow yourself to play and to make mistakes. Test and re-test so that you can modify your design and find the one that works best. Use your observations and data from your tests to help you figure out what to change or what to do differently. Keep a good record of each change, why you decided to try it, and what difference it made. Take pictures, draw sketches, make notes as you build and test. And then, add all of these documents to your YIP Inventor's Journal for your logbook.

NOTE:

TEACHER MAY CHOOSE TO CLOSE THE LESSON BY GIVING A RELEVANT ASSIGNMENT OR ASKING STUDENTS TO REFLECT ON THE ACTIVITY. SEE THE YIP LESSON 7 PLAN FOR SUGGESTIONS.