



## LESSON 5: Researching and Redesigning

### LESSON OVERVIEW

This lesson will further explore how to conduct research to evaluate a solution idea and refine an invention design. This lesson builds off the previous YIPLit Lesson 4. Students will continue to design their solution and be introduced to feedback- giving and receiving constructive criticism as a means of improving it.

This lesson is not designed to be used as a stand-alone lesson. It builds off YIPLit Lesson 4: Defining and Designing and is extended to further incorporate Lessons 1, 2, 3, 4, 6, 7, 8.

### OBJECTIVE

Students will be able to:

- Identify various resources to research a problem.
- Use interviewing skills to give and receive constructive feedback.
- Apply constructive feedback to improve upon original design idea.
- Identify similarities and differences between their invention and inventions already on the market.
- Draw a detailed design plan with labeled parts and features.

### MATERIALS

- Google Slides: YIPLit Lesson 5
- Book: **Walrus in the Bathtub** by Deborah Underwood, illustrated by Matt Hunt; ISBN-10: 0803741014 OR...
- Read-aloud Video: <https://youtu.be/-dIJrpgFoVs> Reading time- 5:33
- Timer (timer countdown included in Google Slides, or use a clock, phone, or other device)
- Computers or devices to access the Internet for research
  - United States Patent and Trade Office website: [www.uspto.org](http://www.uspto.org)
  - Amazon website: [www.Amazon.com](http://www.Amazon.com)
  - Target website: [www.Target.com](http://www.Target.com)
- Invention Design Plan Worksheet (included in the YIPLit Inventor's Journal)
- Invention Research Worksheet (included in the YIP Lit Inventor's Journal)
- Invention Design #2 Worksheet (included in the YIPLit Inventor's Journal).
- YIPLit Inventor's Journals
- Pencils, pens, markers or crayons for writing and drawing
- Video: Mara's Bike Refresh, (optional, included in Google Slides)  
Link: <https://www.youtube.com/watch?v=NTmXw40wmjU>, (Create Something Amazing with Design Thinking, 3:22 minutes)

### NOTES FOR THE TEACHER

Teacher may use slides provided or lead instruction and discussion on their own.

Students will refer to their work from previous YIPLit Lesson 4, the Problem and Solution Worksheet (included in the YIPLit Inventor's Journal), to continue to develop their solution design which solves a problem for a specific character in the book (designing a new umbrella). This is now the topic of their invention project.

It is recommended that once students begin to design a solution (a unique umbrella to help a specific character from **Walrus in the Bathtub**) for their invention project, that they do research (using the skills learned in this lesson and YIPLit Lesson 4). They are encouraged to research if the idea is:

- Relevant- Does it solve a problem? Is it unique in some way?
- Realistic- Is the invention a realistic idea? Is it something that could actually be done or is it more of a wild fantasy?
- Reasonable- Can they build a model using basic supplies around the classroom and/or home? Does the idea already exist? Has it already been invented? Websites such as the US Patent and Trade Office, Amazon, and Target are good websites to search for similar inventions and products.
- Useful- Does it meet a real need for someone/something?

If a product already exists, encourage students to think about how their invention idea is unique from these products- how is it different so that they can highlight these unique features in their invention design and in their presentation at the end of the project?

All research should be recorded in the YIPLit Inventor's Journal. Students may use the Invention Research Worksheet in the journal to help them record their findings.

Time for research may be incorporated into a class period, or you may direct students to do this independently at home. If assigning research for independent work, you may want to give students specific guidelines (include websites or resources to use) and share your expectations with families so that they can help. The Invention Research Worksheet (included in the YIPLit Inventor's Journal) is a good guide that students may complete on their own or in class.

*NOTE: While research is a critical step of the Invention Process, the Young Inventor's Program understands that the youngest inventors are just learning what research is and how to do it. In this curriculum, research can be very basic using resources such as asking an adult for information, doing a quick internet search about a key word, topic, or even browsing an online shopping site such as Amazon or Target to see if an invention idea is already a product on the market. This research can be assisted or guided by the teacher or another adult as a class or individual activity as appropriate for the time available and the level of your students. Any research done as a class or as an individual should be recorded in the YIPLit Inventor's Journal. Students should list any resources and basic key words or information they learned from such research to the best of their ability. Adult support is acceptable.*

#### INSTRUCTION & ACTIVITIES

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

**Teacher Instruction:**

Remind the students of where they are in the Invention Process, or you may ask them to tell you. They have now identified a problem, learned about it, defined it, and they have SCAMPERED to ideate a solution to this problem. They have also begun to document their invention process- it's all in their YIPLit Inventor's Journal.

*NOTE: The following video "Mara's Bike Refresh" is a good way to illustrate the entire Invention Process, but is optional to share. If time is limited, you may choose to move on to Teacher Instruction below. In the video, the Invention Process is called the Design Process. The video outlines the various steps and provides an example of how a group of students took a project from start to finish.*

**Activity: Video (optional- 6 minutes):**

Watch the "Mara's Bike Refresh" video together to review the steps of the Invention Process (referred to as the Design Process in the video.)

(show "Mara's Bike Refresh" video: <https://www.youtube.com/watch?v=NTmXw40wmjU>, 3:22 minutes)

After the video is done, ask the students what steps they recognized? Have they followed several similar steps as they are designing their umbrellas?

Teacher should look for responses such as:

- Identifying the problem- what they want to fix or make better
- Thought about who has the problem and what they need to fix the problem
- Brainstormed all ideas
- Asked questions and looked at PLUSES, POTENTIALS, and CONCERNS
- Made designs

**Teacher Instruction:**

Tell students that the next step is to do more research. Ask students to think back to Lesson 4 when they researched the problems that some of the characters had and the problems with an umbrella. What resources did they use? Who can they ask for help? Using these same skills, now they must research the solution that they have ideated. Who is the solution designed for and how is this person/s affected by the problem and this new solution? Does this solution idea already exist? How can we learn more?

Talk about how ideas should always be researched to find out what has been done before so yours can be improved. Research may also provide inspiration if you are having trouble thinking of an idea.

*NOTE: Research can/should be done at the "defining a problem" step of the invention process too. (See YIPLit Lesson 4: Defining and Designing)*

*NOTE: Teachers may tailor to whatever school rules there are for using the internet as well as mentioning parental rules regarding using the internet. Websites such as the US Patent and Trade Office ([www.uspto.org](http://www.uspto.org)), Amazon ([www.amazon.com](http://www.amazon.com)), and Target ([www.target.com](http://www.target.com)) are good websites to search for similar inventions and products. If a product already exists, encourage students to think about how their invention idea is unique from these products- how is it different so that they can highlight these unique features in their invention design and in their presentation at the end of the project.*

*NOTE: Time for research may be incorporated into a class period, or you may direct students to do this independently at home. If assigning research for independent work, you may want to give students specific guidelines (include websites or resources to use) and share your expectations with families so that they can*

*help. The Invention Research Worksheet (included in the YIPLit Inventor's Journal) is a good guide that students may complete in class or on their own.*

Show students how to do simple research using IMAGES and KEY WORDS. KEY WORDS are the simplest words/terms to describe what you're looking for. Explain to them that if they are searching for information about the PROBLEM (to identify and define the problem and make the problem statement) they could look up "*Improved Umbrellas*", then, clicked on IMAGES (that come up in internet search, usually one of the first hits) and looked for what people have done.

*NOTE: Teacher can do the search "live" on the computer in front of the class, or use the Google Slides: YIPLit Lesson 5 and show the slide of "improved umbrellas" many umbrellas.*

Then, explain that when they are doing research to learn more about the DESIGN (how they can make their design unique), they may want to be more descriptive in their key words, so that maybe they are looking up "*Umbrellas for Animals*" or "*Umbrellas for Firemen*" (words that describe their character and the character's special needs.

*NOTE: Teacher can do the search "live" on the computer in front of the class, or use the Google Slides: YIPLit Lesson 5 and show the slide of umbrellas for animals.*

Explain that they are likely to see some images that are not what they wanted or that some of their ideas may have been done already. First, they can do a more specific search by changing their key words Example: change "animals" to "squirrels" in the search bar. *Show the Google Slides: YIPLit Lesson 5 slide of umbrellas for squirrels.* Or, use this as their opportunity to use the POTENTIALS & CONCERNS raised earlier or to do some more SCAMPERing!

**Activity: Invention Research (optional, 10 minutes):**

Ask students to use their YIPLit Inventor's Journals and complete the Invention Research Worksheet (included in the YIPLit Inventor's Journal). If working in teams, each team member should complete their own worksheet in their Inventor's Journal, but responses may be similar.

Allow the students/teams time to do research and time to complete the Invention Research Worksheet. They can draw or write their findings. Adult support may be necessary.

*NOTE: Computers or devices to allow for internet searches are recommended for this activity. Or you may wish to take students to the library to find books or other materials that may help them.*

*NOTE: Research can be assisted or guided by the teacher or another adult as a class or individual activity as appropriate for the level of your students.*

*NOTE: Time for research may be incorporated into a class period, or you may direct students to do this independently at home. See Notes for the Teacher above.*

**Teacher Instruction:**

Now that you have some great ideas and you've done your research about them, the next step for an inventor is to review the idea and get feedback. Can someone explain what "FEEDBACK" is?

FEEDBACK is essentially the practice of relaying information to someone about their behavior, actions, or performance. The goal should always be to either provide practical and relevant ideas and suggestions for improvement or to validate and affirm a person's behavior, actions, or performance. This is called CONSTRUCTIVE FEEDBACK. Inventors rely on feedback to help them make changes (called "ITERATIONS") to their ideas so they can make them even better.

*NOTE: If you watched the video, "Mara's Bike Refresh", you may refer back to the video and ask the class if Mara received any feedback about her new bike seat? Who did she ask? What did she learn? What did she do?*

Ask the class if anyone designed an umbrella for the family pet. (It is OK if no one has) If a student/team did, then ask them to BRIEFLY show and tell the class about it.

*NOTE: If no one designed for a pet, show and describe the umbrella designed for the family dog- They can draw on the spot or have a drawing handy to show. (You should create this drawing ahead of time!)*

Write down responses to the following on the board or on a large sticky note as a visual aid. Make three column headings: PLUSES, POTENTIALS, CONCERNS and list the student responses under the appropriate heading.

After the idea about the pet umbrella is presented, ask the class to share 3 good things about this idea: PLUSES. Then ask for 3 things that they think this idea might be able to do- something that maybe wasn't thought of yet: POTENTIALS Ask them to state it this way: "It could...", "It might..."  
Finally, ask what CONCERNS the students might have with the idea. Direct them to ask it as a QUESTION so the people presenting can think about how to address the concerns:  
"How can you keep the umbrella on the cat?"  
"How might the umbrella get bigger if they get another cat?"

Explain that this exercise is a way to improve your ideas and is an example of giving and receiving CONSTRUCTIVE CRITICISM and there are guidelines for that too:

Be Deliberate: Take your time and don't make snap decisions (very similar to deferring judgment)

Be Affirmative: First look at what's good and then how the idea may be even "bigger" than you thought (that includes some Divergent Thinking!)

Improve on Your Ideas: This means you can be open to ideas that may come from concerns or suggestions (yes- some more Divergent Thinking!)

**Activity: Idea Gallery Walk (optional, 5 minutes)**

Ask students to display their invention designs (from YIPLit: Lesson 4 and these may be drawn in their YIPLit Invention Journals) around the room. It is ok if students have been making designs in groups. Each group should post their design for the class to see. Then, ask students to find a partner (if they are working in a group, they should try to find a partner who is not in their group). Then, ask them to walk around and view all of the designs. Next, ask the pairs to share with each other their favorite ideas. Give students 5 minutes to walk around. (A timer is included in the Google Slides: YIPLit Lesson 5). Some helpful questions that pairs can discuss include:

- Why did you choose these ideas?
- What do you like best about them?
- Do you think is better than the other?

**Activity: Group/Partner Share (10 minutes)**

Ask students to find another partner (if they are working in teams, a team should find another team or an individual students working alone to be their “partner”). Ask the students to take their designs (individual designs or group designs) and find a place to work with their “partner”. Each partner/team will have 3 minutes to share their idea and receive constructive feedback about their design idea from their partner. Then, have them switch roles, allowing another 3 minutes for the second partner to share. (A timer is included in the Google Slides: YIPLit Lesson 5). Ask students to use the Invention Design Plan Worksheet (included in the YIPLit Inventor’s Journal). Questions they should ask each other include:

- Do you think my idea is relevant (does it solve the problem)?
- Is it something I can actually build? Can I use recycled materials and basic supplies to make it?
- Is it useful?
- Does it already exist? (this question may be answered after some basic research later in the lesson)
- What other suggestions do you have?

Following the peer sharing, give students/teams several minutes to finish answering the questions on the Invention Design Plan Worksheet if needed.

**Teacher Instruction:**

Tell students they are ready to refine their original invention design using the peer feedback and the information they discovered from their research of the solution idea and design. What new information do you have to improve your first idea? Remind students to consider the feasibility of making a prototype of this solution as this will be what they will design and build moving forward.

**Activity: Refine the Invention Design (15 minutes)**

Ask students to complete the Invention Design #2 Worksheet (included in the YIPLit Inventor’s Journal). They will draw a new design with any improvements or new ideas they gained from their research and peer feedback. The design should be clear and parts should be labeled. If working in teams, each team member should draw their own design in their Inventor’s Journal, but the designs should be similar and labeled the same way.

*NOTE: Students are encouraged to make several drafts of a design, especially if working as a team. They may need more scrap paper to sketch ideas. These sketches and drafts can be inserted into the Inventor’s Journal later as a further record of the design process. If working as a team, it is ok if just one member of the team keeps these “drafts” in their journal, as each team member may not have a copy. However, all students should draw the final first version of their invention in their own Inventor’s Journal.*

**Closure/Check for understanding:**

Students will use a Ticket Out the Door or share with the teacher as they leave class their revised invention design and they should highlight one part of the invention that they changed or improved.

**IDEAS FOR VIRTUAL INSTRUCTION**

**Video: “Mara’s Bike Refresh:**

Watch the “Mara’s Bike Refresh” video.

(“Mara’s Bike Refresh” video: <https://www.youtube.com/watch?v=NTmXw40wmjU>, 3:22 minutes)

Ask students to share the steps of the Invention (Design) Process that they recognize and what parts they have already done as they explore **Walrus in the Bathtub**. Students can share their ideas in a chat, using a shared document or breakout rooms.

**Invention Research:**

Explain to students how you wish them to conduct research. Share examples of how to use KEYWORDS in their search and guide them to appropriate websites (such as US Patent and Trade Office, school approved research sites and shopping sites such as Target and Amazon). Have students complete the Invention Research Worksheet (included in the YIPLit Inventor's Journal). Ask students to share their findings in a breakout room, a share board or other virtual platform such as the chat, or a shared document.

**Feedback Sharing:**

Set up a virtual "Gallery Walk" for the class. Ask them to submit their original invention design drawings to you and create a Flip Grip, Power Point or other resource where you can virtually display all designs. Have students view the class invention designs. As they view, ask them to share their favorite ideas. Some helpful questions to help them with a facilitated discuss include:

- Why did you choose these ideas?
- What do you like best about them?
- Do you think is better than the other?

OR

Create breakout rooms with small groups. Have students share their original invention design ideas with their group to give and receive CONSTRUCTIVE FEEDBACK. Have students complete the Invention Design Plan Worksheet (included in the YIPLit Inventor's Journal) as they share. Questions they should ask each other include:

- Do you think my idea is relevant (does it solve the problem)?
- Is it something I can actually build? Can I use recycled materials and basic supplies to make it?
- Is it useful?
- Does it already exist? (this question may be answered after some basic research later in the lesson)
- What other suggestions do you have?

OR

Ask student to share their original invention design idea with a family member or someone at home to receive CONSTRUCTIVE FEEDBACK. Have students complete the Invention Design Plan Worksheet (included in the YIPLit Inventor's Journal) as they share. Questions they should ask each other include:

- Do you think my idea is relevant (does it solve the problem)?
- Is it something I can actually build? Can I use recycled materials and basic supplies to make it?
- Is it useful?
- Does it already exist? (this question may be answered after some basic research later in the lesson)
- What other suggestions do you have?

**Refine the Invention Design**

Ask students to complete the Invention Design #2 Worksheet (included in the YIPLit Inventor's Journal). They will draw a new design with any improvements or new ideas they gained from their research and peer

*feedback. The design should be clear and parts should be labeled. Students can share their ideas in the chat, using a shared document or breakout rooms.*