AFTER SCHOOL ACTIVITY PLAN

SESSION 5: Building Your Prototype Part 2

LESSON OVERVIEW
Students will design, build and test the prototypes of their inventions as they apply the steps of the invention process. They will be asked to think about the importance of testing when evaluating their inventions. They must test their inventions to understand the value of testing design and function in order to improve upon their inventions. They will record their activities, data, and observations in their YIP Inventor's Journals as they design, build, test, and then re-design, re-build and re-test their inventions.
OBJECTIVE
Students will be able to create a solution to solve a problem they identified in earlier lessons. Students will build a prototype and test the invention. They will then evaluate how to modify their original design and materials based on testing. Students will continue to modify their design and test to develop a most successful invention. Finally, students will be able to explain the importance of testing and re-designing in the invention process.
MATERIALS
• YIP Inventor's Journals • Build materials (such as, but not limited to: recycled materials, tape, glue, scissors, clips, string, fabric, markers…) • YIP Prototype Requirements and Restrictions (for teacher only) • Clock, watch, phone or other device to keep track of time • Invention Testing Feedback Grid Worksheet (included in the YIP Inventor's Journal) *Make extra copies if students have time to swap prototypes with more than one other peer. • Changes to My Prototype Plan Worksheet (included in the YIP Inventor's Journal) • Pens/pencils • Notebook or other paper for writing and drawing

TEACHER/LEADER TIPS
The more time you can devote to building and testing, the better. Students are encouraged to make at least 2 iterations of their models before completing the project. You may wish to seek additional volunteers to help students with building. School staff and parent and community volunteers are good resources if permitted.

Hot glue guns are recommended for class because they dry quickly and securely so students can maximize their build time in class. If hot glue guns are used, it is recommended that an adult do the gluing.

You may choose to allow students to take their inventions home to work on between sessions. If so, you are encouraged to communicate the requirements and expectations of the project with families, as well as the family's role in this project. An email/take home letter template is provided.

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

- 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:

Today you will continue working on your inventions. You are well into building, so today, if you haven't already, you want to finish your first version of the prototype and test it so you learn what changes you can make to improve it.

Facilitate a short discussion to bring everyone into focus before building.

Before we begin, let's think about the following questions:

- 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?

Today, you want to make sure you allow time to test. Be sure to record your testing process and the results and any feedback in your Inventor's Journal. Then continue to modify your prototype.

Activity: Build Your Prototype

Give students most of the class time to work on their projects independently. Circle the room to check-in and provide support as needed.

After about 15 minutes, ask the class to stop working. Then do a Pair-Share to allow students to test their inventions and get feedback. See below for activity.

If you do not wish to facilitate a sharing session in your class, you may just ask students to ask a friend or family member to try their model and to give feedback. What did they like about your invention? What might

they want to see changed and why? Record all notes and feedback in the Inventor's Journal and draw the modified design on the Changes to My Prototype Worksheet (included in the YIP Inventor's Journal).

Activity: Peer Testing and Sharing

1. Ask students to get into pairs.

2. Students will swap inventions and allow a peer to use, test and review the design model. Allow students 5 minutes to use and test their partner's prototype. Then allow them several minutes to ask questions and share feedback.
   Before beginning, guide students through what is appropriate when giving feedback. This will ensure that students give each other constructive feedback to help students provide useful, positive comments during a peer sharing session YIP recommends using the following feedback models. You may wish to explain these models and what you expect of students as they give feedback.
   - *TAG Model: **T**ell something you like about it, **A**sk a question about it, **G**ive a suggestion to improve it*
   - *Hamburger Model: **Top bun** is a positive comment about it; **Hamburger** is the feedback that will be useful to help improve it; **Bottom bun** is another positive comment about it.*

3. After testing and sharing, have students complete the Invention Testing Feedback Grid (included in the YIP Inventor's Journal) with their partner. The partner will share:
   - What they liked about the invention they tested.
   - What **ONE** suggestion do they have to make it better.
   - What questions they have about the invention.

   Then, the students will also use this feedback to fill in the box on the lower right: What new ideas were introduced?
   Give each student about 3-4 minutes to share. You may wish to use a clock or timer to ensure each student gets equal time for feedback.

4. Ask students to consider this feedback and think about changes they can make to their original prototype to improve it. If possible, have them write down these modification plans or draw a new design for version 2 of the prototype. They should note any changes on the Changes to My Prototype Worksheet (included in the YIP Inventor's Journal).

Note to teacher: If time allows, you may ask students to seek another user's feedback by having a second round of peer sharing. Use another Invention Testing Feedback Grid worksheet (included in the YIP Inventor's Journal) if needed.

Teacher Instruction:

Now that you have some feedback, return to your project to make any modifications. It might be helpful to make a modification plan. Draw a new design where the changes will be and what you are going to do differently. Are you going to use different material? Are you going to change the size of one or more parts? Can you make your model easier to use somehow? Make it lighter, or heavier if needed? Add reinforcements to make it stronger in places? Use the the Changes to My Prototype Worksheet (included in

the YIP Inventor's Journal) to draw any new designs or make note of the changes you plan to make in your second iteration of the prototype.

Activity: Redesign!

Allow students more time to tinker and make modifications to their prototypes. They should continue to test them as they work to evaluate the success of their changes. Did the changes improve the design? Do more changes still need to be made?

Ask students to help clean up at the end of the building session. Give instructions on what to do with their finished projects or what they can do if they are not yet finished (Can they take them home to work on them? Will there be more time for them to finish?).

The next session will be our last one. We will …[*explain what students may expect*]

Depending on your program, if you have more than one week remaining, you can continue to finish building and testing prototypes and begin working on a final presentation using the Session 6 Activity Plan. If the next session is your last, you can choose one of the following:

1. *Finish prototypes and then talk about the final step in the design process, Communication, using the Session 6 Activity Plan. You will help students share their inventions and talk about their process by creating a presentation or pitch, and a display board.*

2. *Host a showcase/invention fair. Students will be asked to prepare a 3-4 minute presentation and a display board to highlight their invention and how it came to life. Students may be instructed to develop the presentation and display at home in order to be prepared to present at the showcase event. You may use the YIP Project Requirements document to explain the showcase and the expectations to your students. You can also send a letter/email home so that families understand what is happening (see resources for a template: YIP Invention Fair Letter to Families). You may want to invite family, friends, and/or the school community to visit the showcase. If you are planning a judged invention fair, you will need to recruit a few judges, such as school staff or other community members, to listen to the students present. YIP provides resources including judge rubrics and score sheets.*