# AFTER SCHOOL SESSION 2: PROBLEM SOLVING

**Base Time:** 45 minutes

## Lesson Overview

In this session, students will understand how inventions solve problems and use this information to identify their own problems. They will apply creative approaches, critical thinking and analysis to develop solutions to solve these problems.

## Objective

Students will be able to:

- Combine techniques of creative and critical thinking
- Approach problems and consider possible solutions

## Materials

**Resources for the Educator**

**Materials**

- YIP Inventor's Journals
- Worksheet: Problems All Around (included in Inventor's Journal)
- Worksheet: Brainstorming Problems (included in Inventor's Journal)
- Worksheet: Will My Idea Work? (included in the Inventor's Journal)
- Chart paper or poster to post "Ground Rules for Brainstorming" (optional)
- Paper Clips (5 for each student/group)
- Pens/pencils
- Notebook or other paper for writing and drawing

## Notes for the Educator

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

Today students will be narrowing down the ideas for their invention project. 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: For the Northern New England Invention Convention and the Invention Convention US Nationals, only teams of two (2) students are allowed to present. If a team is larger, two students may be selected to represent the teams at these competitions.*

Students should begin using an invention journal or logbook (provided by YIP or an alternative) if they did not do so in Session 1. You should also decide if students can take these journals home or if they will be kept in the classroom. The Inventor's Journals should be used in each YIP lesson. YIP provides hard copies

of the YIP Inventor's Journals to all students, or you can download and copy or use the digital version found on the Young Inventor's Program website: https://www.unh.edu/leitzel-center/young-inventors-program/teach/curriculum.

In this session, when introducing the concept of ideating/brainstorming, it is recommended that you establish guidelines and a safe space for class brainstorming session. Suggested ground rules to create a positive and open sharing space include:

- Defer Judgement- accept all ideas without comment in first stage of brainstorming.
- Work for Quantity- all ideas should be recorded and allow ample time for everyone to contribute.
- Piggy-Back- encourage students to combine or improve ideas that may already be on the list.
- Freewheel- encourage crazy ideas. The most creative are often dismissed but should be considered.
- Everyone Participates- all students should be involved in the brainstorming process.

Depending on format of class, you may choose to post a list of "Ground Rules for Brainstorming" where everyone can see them and review them throughout the invention unit.

## Instruction & Activities

***Educator Instruction:***

*NOTE: If not done in Session 1 and or at home, discuss problem identification and allow students time to complete/finish the Problems All Around Worksheet in the YIP Inventor's Journal. (If students are ready, move on to next part of lesson below.)*

Discuss the concept of "ideating", more commonly known as "brainstorming". Ask students if they know what it means to "brainstorm". Allow them to share ideas. Brainstorming requires quick thinking and creativity. Many ideas are produced, but value judgements are avoided in a brainstorming process.

Ideating/Brainstorming is an important step in the Invention Process- it is used both when exploring a problem and also when thinking about and designing a solution.

***Activity: Paper Clip Challenge (10 minutes)***

*Distribute a paperclip to each student. Students should work independently.*

Challenge students to brainstorm new ways to use the paper clip other than holding paper. They can manipulate the paper clip in any way they see fit. Encourage crazy ideas. Have them write down as many different ideas as they can on a piece of paper.

After 2 minutes, students should find a partner to work with and complete the same task. Can they come up with more ideas by working together?

After another 2 minutes, ask for volunteers to share their ideas. Remind students that this is a brainstorming session, so all ideas are valued. No one laughs at anyone's idea. The students might only have a few ideas to share. That's OK.

Still working with a partner, give each duo 5 paper clips. Like last time, they should brainstorm as many ways to use some or all of the paper clips for a purpose other than holding paper. They can be combined in any way.

After 2-3 minutes, encourage students to share their ideas. It is likely they have more ideas now.

Finally lead a reflection and ask them to evaluate their process and share observations of what they have learned. Discuss teamwork, collaboration and brainstorming. When did they struggle and how did they get unstuck? Did they get better at thinking outside the box? Explain that thinking creatively (Take Risks and Stay Curious) takes practice and working with others inspires the best ideas.

***Educator Instruction:***
Now that students have had time to play with "ideation", it is time to apply that same creative thinking to the problems they identified earlier on their Problems All Around Worksheet.

***Activity: Brainstorming Problems (10 minutes)***
*If working in a team, students may do this activity to brainstorm ideas together and then begin to narrow down their project.*

Have students choose 2-4 problems from their Problems All Around Worksheet. Next, ask them to write or draw solutions for the problems they choose on the Brainstorming Problems Worksheet in their journals. They should use the boxes on the worksheet for each of their solution ideas.

***Educator Instruction:***
Now students should have several solution ideas to a few problems narrowed down based on their ideation session. The next step is to select one problem and its solution to become their invention project. How do they do this? When narrowing ideas to a final choice, it is important to think about the following points:

- What problem is most critical?
- What problem might affect the most people?
- What solution idea is most realistic and could exist in real life?
- What solution is most realistic for them to do as a school project?
- What solution can be made from available materials (recycled materials and school/craft supplies)?
- Is the solution something that already exists (you can buy it in stores)? If the solution does exist, is there a way to improve it that could be done as a project instead?
- What problem means the most to them? What do they care about? What idea most excites them when they think about creating an invention?

***Activity: Will My Idea Work? (10 minutes + optional additional time before next class)***
*If working in a team, students should be together as a team to complete this next step of the process so that all ground members are involved in selecting the final project idea. However, they should still record their ideas and drawings in their own journals so that each student has their own record of the project.*

Ask students to complete the Will My Idea Work? Worksheet included in YIP Inventor's Journal. They will choose 2-3 ideas from their Brainstorming Problems Worksheet and for each idea, they will go through the list of questions on the worksheet to determine which invention idea will become their project.

If time is available, after students complete the Will My Idea Work? Worksheet, have students/teams, pair with another student/team to share their ideas and ask for any other feedback about which idea is most realistic and practical. Students may also ask others at home for their feedback before selecting their final invention idea. (Or this may be done as a Take Home Assignment, see below).

## Ideas for Virtual Instruction

***Activity: Paper Clip Challenge***

*Ask students to find some paper clips at home (if they do not have paper clips, they can brainstorm with other common objects they may have such as rubber bands, drinking straws, or chip clips). Students should brainstorm new ways to use the paper clip other than holding paper (or if using another item, the items intended use). They can manipulate the paper clip in any way they see fit. Encourage crazy ideas. Have them write down as many different ideas as they can on a piece of paper. You may ask students to submit or share their work using the virtual platform of choice.*

***Activity: Will My Idea Work?***

*Ask students to complete the Will My Idea Work? Worksheet. They will choose 2-3 ideas from their Brainstorming Problems Worksheet and for each idea, they will go through the list of questions on the worksheet to determine which invention idea will become their project. If possible, they should share their ideas with someone at home and ask for any other feedback about which idea is most realistic and practical before selecting their final invention project idea.*

## Take Home Assignment

***(optional if giving homework)***

*Ask students to share their invention ideas and ask for any other feedback about which idea is most realistic and practical before selecting their final invention project idea.*