

Lesson 1: Intro to Problem Solving

45 minutes

Overview

This lesson is a fun introduction to the open-ended, collaborative, and creative problem-solving students will be using over the rest of this unit and course. Students work in groups to design aluminum foil boats that will support as many pennies as possible. Groups have two rounds to work on their boats, with the goal of trying to hold more pennies than they did in round 1. The structure of the activity foreshadows different steps of the problem-solving process that students will be introduced to in more detail in the following lesson. At the end of the lesson, students reflect on their experiences with the activity and make connections to the types of problem-solving they will be doing for the rest of the course.

Question of the Day: What can help us to work together and solve problems as a team?

Alternate versions of this lesson are also available.

- [Newspaper Table](#)
- [Spaghetti Bridge](#)
- [Paper Tower](#)

Standards

Full Course Alignment

CSTA K-12 Computer Science Standards (2017)

- ▶ AP - Algorithms & Programming

Agenda

Tech Setup

Warm Up (5 minutes)

Set the Stage

Activity (35 minutes)

Building an Aluminum Boat

Goal and Rules

Develop a Plan

Test Your Boat

Evaluate and Improve

Wrap Up (5 minutes)

Discuss the Challenge

Reflection

Objectives

Students will be able to:

- Communicate and collaborate with classmates in order to solve a problem
- Identify different strategies used to solve a problem
- Iteratively improve a solution to a problem

Preparation

For each group

- 2 sheets of aluminum foil, 5x5 inches in length each
- 1 container that can hold 3-5 inches of water
- Several paper towels or rags that can be placed under the container
- 15 pennies
- One copy of the activity guide

For the teacher

- 1 container that can hold 3-5 inches of water
- 50 pennies
- Extra paper towels or rags
- Check the "[Teacher's Lounge](#)" forum for verified teachers to find additional strategies or resources shared by fellow teachers
- If you are teaching virtually, consider checking our [Virtual Lesson Modifications](#)

Links

Heads Up! Please make a copy of any documents you plan to share with students.

For the teachers

- [Code.org How-to Videos](#)
- [Intro to Problem Solving](#) - Slides

▼ Make a Copy

For the students

- [Aluminum Boats](#) - Activity Guide

▼ Make a Copy

Teaching Guide

Tech Setup

Throughout the year, in order for you to be able to see student work, and for students to be able to access online tools and resources, all students need to be in the same section on Code Studio. To see assessments and answer keys that Code.org provides, you also need to be a "verified teacher".

💡 Teaching Tip

How-To Videos: The following steps are also covered in a series of [Code.org How-to Videos](#) available on Code.org's Teacher Support website. You may decide to watch these videos before reading the instructions below.

Preparing for the Unit

Getting Started with Code.org: Consider watching our [Getting Started with Code.org](#) video series for an overview of how to navigate lesson plans, setup a classroom section, and other important features of the Code.org platform. Each video also has a support article if you'd prefer to read or print instructions - [click here to learn more](#).

Setup a Classroom Section: You can use a class section in Code.org to manage your students, view their progress, and assign specific curriculum - [click here to learn more](#).

If you are using a learning management system, there may be additional steps to sync your classes with Code.org:

- [Click here](#) for steps to setup your classes with Google Classroom
- [Click Here](#) for steps to setup your classes with Clever

Become a Verified Teacher: Lesson plans and levels have additional resources and answer keys for Verified Teachers, which is quick process that verifies your position at an educational institution. [Click here to complete a form](#) and you should have access to verified teacher resources in ~1 business day. Verified teachers also have access to the ["Teacher's Lounge"](#) section of the forums.

Get Inspired: Consider watching our [Teacher Tips video playlist](#), featuring current CS Discoveries teachers.

Technical Requirements: For the very best experience with all Code.org content, we recommend consulting with your school or district's IT department to *ensure specific sites **are allowed** and **are not blocked***. [Click here to see a list of sites to unblock](#).

You can also find mobile and tablet support details, hardware recommendation information such as minimum Internet connection speed, smallest screen size supported, and other hardware recommendations, as well as a list of supported browsers and platforms at the same [technical requirements website](#).

At the beginning of class

1. Have students create a Code Studio account at <https://studio.code.org> if they don't already have one
2. Share the section Join URL with students and tell them to navigate to it to join your section
 - You can confirm that a student successfully joined your section by having the section progress page on the Teacher Home Page open and hitting refresh as students join. Students should see a small green bar at the top of their page that says 'You've successfully joined ...'
3. From studio.code.org have students locate the Computer Science Discoveries tile and click 'View course', then go to Unit 1.

Warm Up (5 minutes)

Set the Stage

Prompt: What makes someone a good problem solver? Be ready to share three ideas with your group.

Teaching Tip

Journaling: Journaling is a key practice in CS Discoveries. Students can journal on loose leaf paper, in notebooks, or digitally.

Slides: Slides for this unit are available in the "Teacher Resources" section of the lesson plan. You will be prompted to make a copy, which you will only need to do once - after that, you may use the slides for each lesson in the curriculum.

Discuss: Allow students to share answers at their table groups or with a partner, then have those who are comfortable share with the whole class.

Discussion Goal: The goal of this warm-up is to start students thinking about problem-solving in preparation for the day's activity. Highlight answers that reinforce key practices in the class, such as collaboration, persistence, and creativity. This is also a chance to reinforce a positive culture that encourages students to share out and support each other in brainstorming ideas.

Remarks

Those are all great ideas! In computer science, we have to solve problems all of the time, so we'll be looking back at all of these problem solving skills today and for the rest of the course. Most of the problem solving that people do in computer science happens in teams. Today, we're going to work in teams to solve a fun problem that doesn't need computers. While you work on that problem, here's a question that you can think about.

Display: Show students the Question of the Day

Question of the Day: What can help us to work together and solve problems as a team?

Activity (35 minutes)

Building an Aluminum Boat

Group: Put students in groups of 2 or 3.

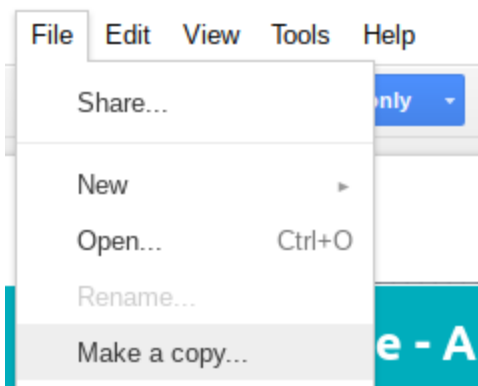
Remarks

Today we're going to be building aluminum boats. You'll have an opportunity to build at least two boats and use your experience with each one to improve your designs. Before we get started, decide as a group what kind of design you'd like to make with your first boat. Record your ideas and any possible weaknesses of this design on your activity guide.

Distribute: One copy of the activity guide to each group.

Teaching Tip

Getting Copies of Google Docs: Activity Guides in this curriculum are available as Google Docs, Word Docs, and PDFs. If you'd like to edit or make your own copy of a Google Doc you may without requesting access. Simply log in with a Google account, click "File" and "Make a copy" from the menu. You may then share your own copy with your students.



Goal and Rules

As a class, read through the Goal and Rules sections of the activity guide and answer questions.

Teaching Tip

This activity can get your room wet! Ideally, each group should have its own bucket/container with water to conduct its own tests. If needed, you can have several groups share one container, but be mindful to set guidelines for sharing that container. Place towel/rag under each container. You may also want to consider teaching this activity in the hallway or some other space if your room is very restrictive, or add in additional rules as necessary.

Develop a Plan

Give students a couple minutes to discuss in groups the approach they will be taking with this first boat. Once groups have recorded their ideas and some possible weaknesses they can come to you to get their aluminum foil and begin building their boats.

Teaching Tip

Hold onto the foil until students submit a plan for their boat. The goal isn't to slow them down too much, but just give them a moment to reflect briefly on the possible approaches they could take. This is one way this activity foreshadows the Planning step of the problem solving process students will see in subsequent lessons.

Test Your Boat

Once groups are ready, have them test their boats by dropping individual pennies into the boat. Remind them of the rules, specifically that they can't touch or adjust the boats once they're in the water. Have them record the total number of pennies held on their activity guides.

Evaluate and Improve

Remarks

This first attempt at building our boats was just to get familiar with the challenge. We're all going to build a second boat and see if we can improve the number of pennies our boats held. Before we get started though, let's see what we can learn from this trial run.

Share: Have students share the results of their first run with neighboring groups. Ask groups to focus particularly on what the eventual failure of their boat was (e.g. it wasn't deep enough, it was unstable, etc.) and brainstorm ways to get around those problems.

Teaching Tip

While some students will view this portion as a competition, emphasize that each group is looking to improve its own design, not competing against others. You are appealing for each student to challenge themselves first, not others.

Develop a Plan

Prompt: Now that you've had a chance to learn from the first round of boat making, let's run the same activity again. First, your group will develop a new plan. Just as before, record it on your activity guide, and once you're ready I'll come around and give you a new piece of foil.

Support: As you circulate from group to group, ask questions about the group's focus in redesign. EX: "What aspect of your boat needed the most improvement?" "What ideas from other groups did you want to incorporate to yours?" "Did you feel the need to completely restructure your boat, or make minor modifications?"

Once groups have prepared their new plans give them a new piece of foil and have them each build a new boat.

Assessment Opportunity

Iteratively improve a solution to a problem

In the Activity Guide, you can check for strengths and weaknesses in students' original design and connections to appropriate changes for the next iteration of the project.

Identify different strategies used to solve a problem

You can also check their activity guide for strategies for overcoming the challenges in the activity. You also may want to check the "strengths" of their designs that students list as part of developing their plan on the second page of the guide.

Test Your Boat

Groups can test their designs just as before and record the results on their activity guides.

Reflect

Transition: Ask class to return to their own seats to reflect on the activity.

Wrap Up (5 minutes)

Discuss the Challenge

Question of the Day: What can help us to work together and solve problems as a team?

Prompt: You worked in teams for this activity. How did working in a team make this activity easier, how did it make the activity more challenging? What helped your group overcome these challenges?

Discuss: Allow students time to share thoughts with the class.

✓ Assessment Opportunity ▲

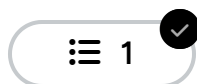
Students may recognize that collaboration allowed them to think through their ideas more thoroughly or that they were able to split up the work that they needed to do. As students list challenges, ensure that they are coming up with ways to overcome those challenges. If you have noticed any issues in group dynamics during the activity, you may want to use this time to bring up these as potential problems in a non-confrontational way and help students to generate strategies for working together more effectively in future activities. These can serve as classroom norms for group work moving forward.

🎤 Remarks

All of your thoughts around these questions were great. We're going to be doing a lot of teamwork in this class. You may be used to thinking about computer science as being all about computers, but first and foremost computer science is about solving problems, and usually that happens in teams. A lot of other parts of this activity like improving designs, and building things is also going to be a big part of this class. I hope you're excited for the year. Tomorrow we'll start digging deeper into problem solving itself.

Reflection

Code Studio: Have students answer 5 quick survey questions at the beginning of this unit. Once at least 5 students have completed the survey you will be able to view the anonymized results in the Teacher Dashboard. Some of these questions will be asked again at the end of the first project, which can be helpful in seeing student growth and shifts in attitudes throughout the unit.



Check-In Survey



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