

Lesson 2: The Problem Solving Process

Overview

Question of the Day: What are some common steps we can use to solve many different types of problems?

This lesson introduces the formal problem solving process that students will use over the course of the year, Define - Prepare - Try - Reflect. The lesson begins by asking students to brainstorm all the different types of problems that they encounter in everyday life. Students are then shown the four steps of the problem solving process and work together to relate these abstract steps to their actual experiences solving problems. First students relate these steps to the problem activities from the previous lesson, then a problem they are good at solving, then a problem they want to improve at solving. At the end of the lesson the class collects a list of generally useful strategies for each step of the process to put on posters that will be used throughout the unit and year.

Purpose

This lesson aims to anchor the formal problem solving process students will use throughout the course in some real-life experiences they already have solving problems. Future units in CS Discoveries will present problems in contexts that may or may not be familiar. A structured problem solving process will be an important tool for helping students move forward in the face of novel and complex challenges.

Assessment Opportunities

1. **Given a problem, identify individual actions that would fall within each step of the problem solving process**

On page 2 of the activity guide, check that students have written down reasonable actions for each of the four steps in the problem they are trying to solve.

2. **Identify useful strategies within each step of the problem solving process**

In the wrap up, check that students are coming up with effective strategies for each step of the process.

Standards

Full Course Alignment

CSTA K-12 Computer Science Standards (2017)

Objectives

Students will be able to:

- Given a problem, identify individual actions that would fall within each step of the problem solving process
- Identify useful strategies within each step of the problem solving process

Preparation

For each student

- Print a copy of Activity Guide

For the class

- Poster paper
- Markers/colored pencils

Links

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

For the teachers

- **CSD Unit 1 - Problem Solving and Computing** - Slides
- **Problem Solving Process**

For the students

- **Problem Solving Process** - Video ([Download](#))
- **The Problem Solving Process** - Activity Guide

Agenda

Lesson Modifications

Warm Up (5 minutes)

Problems Brainstorm

Activity (35 minutes)

The Problem Solving Process

What it Looks Like

A Problem You Are Good at Solving

A Problem You and a Classmate Want to Get

Better at Solving

Create Posters of the Steps

Wrap Up (5 minutes)

Extended Learning

Article Discussion

Teaching Guide

Lesson Modifications



Attention, teachers! If you are teaching virtually or in a socially-distanced

classroom, please **click here** to access modifications that can be used during this lesson.

Warm Up (5 minutes)

Problems Brainstorm

Prompt: We use the term "problem" to refer to lots of different situations. I could say I have a problem for homework, a problem with my brother, and a problem with my car, and all three mean very different things. On a sheet of paper I want you to brainstorm as many different kinds of problems as you can and be ready to share with the class.

Discuss: Students should silently record their ideas in writing for a couple minutes. Afterwards invite them to share what they wrote with a neighbor and then finally bring the whole class together to develop a classwide list. Record all the different kinds of problems students think of on the board or somewhere else that they'll be clearly visible.

💡 Teaching Tip

Make Categories: You may want to group problems into larger categories during this conversation and invite students to help you do so. For example, if two suggestions are "finding my keys" and "finding my homework" suggest a larger category of "finding lost things".

Real World Problems: Try to guide students away from too many homework or subject-area type problems (e.g. math problems, word problems, science problems, etc.) by saying you're more interested in real-life problems like solving disagreements, making big decisions, fixing or finding things, getting from one place to another, etc.

Discussion Goal

Goal: This conversation aims to demonstrate that problems and problem solving are a part of everyday life. Use this brainstorm to list as many different kinds of problems on the board as you can. This will be useful when you later ask students to select one type of problem that you believe they're particularly good at solving.

Remarks

Clearly we encounter problems in lots of different areas of our lives. Depending on the context, this word can have many different meanings. Today, we're going to look at some steps we can use to solve all sorts of problems.

Question of the Day: What are some common steps we can use to solve many different types of problems?

Activity (35 minutes)

Remarks

We solve problems all the time, but we don't often think about how we're solving problems. Having a strategy or process to approach lots of different kinds of problems can make you a more thoughtful, creative, and successful problem solver.

Distribute: Hand out copies of the activity guides.

The Problem Solving Process

Video: Watch the Problem Solving Process Video on Code Studio

Questions to consider with the video:

- How did you follow the problem solving process in the last lesson?
- How could you use this process on a problem in your everyday life?

 1

Video: Problem Solving Process

Discussion Goal

The first discussion question is part of the core activity in the rest of the lesson. Students should take time working in their groups to think of specific things that they did that follow each step of the process. The goal of this discussion is to make the abstract steps more concrete and accessible to students by relating them to a shared activity. The second question gives students a chance to expand their understanding of the process to a different problem, seeing how the different steps may look in different domains. The goal of this discussion is to make sure students have a general enough understanding of the process that they can apply it to a wider variety of problems since the process will be used throughout the course in various domains.

Introduce and as a class review the descriptions of the four steps in the process by reading them aloud. Answer or discuss any questions students have about the process but otherwise move on to completing the first section of the activity guide.

What it Looks Like

Have students complete the first section of the activity guide by filling in the steps of the previous day's activity they think fall within each step of the problem solving process.

Discuss: Once students have completed the first section of the activity guide ask them to share with neighbors and then with the class as a whole.

Discussion Goal

Goal: For this first conversation in particular you're making sure students understand the meaning of the four different steps. While some steps might sometimes be categorized in two ways, use this chance to talk about that ambiguity. Your goal is to use the shared context of the aluminum boats problem to understand this process. Here's a possible set of steps students may come up with.

Define: Understanding the problem when it was assigned, examining available resources, finding problems with their original design before deciding how to fix them, looking at problems with other groups' boats

Prepare: Discussing with team members how to proceed, brainstorming approaches, anticipating possible flaws.

Try: Actually building the boats, running the test

Reflect: Examining the results of their test, comparing their results to their predictions, discussing with group members the reasons the boat sunk eventually.

A Problem You Are Good at Solving

Ask students to select one type of problem that they think they're really good at solving. Use the list of problems already on the board to help students think of their type of problem. Again give them a couple of minutes to quietly record the steps of their process before sharing with a neighbor.

Discuss: Have students share what they wrote with a neighbor and then once again lead a discussion of the conversations they had. Ask students to talk about the individual steps they're using to solve their chosen problem but also point out instances where the same types of strategies are appearing multiple times.

Discussion Goal

Goal: All three of these discussions aim to reinforce the meaning of the 4 steps in the problem solving process. In this discussion you might lean more heavily on other students to ensure that the strategies and steps being offered by students seem to fit the definitions of the 4 steps provided on the activity guide.

A Problem You and a Classmate Want to Get Better at Solving

Place students in pairs and ask them to complete the final section of the activity guide. They will need to choose a type of problem that both members of the group want to get better at solving and then

write the steps they would use within the problem solving process to solve that problem.

Discuss: Lead one final share out in which students present how they would use the problem solving process to approach a less familiar problem.

Create Posters of the Steps

Distribute: Give each group a piece of poster paper.

💡 Teaching Tip

You may also choose to do this activity digitally. Check out the **forum** to see how other teachers have modified this activity for their classrooms, or to share your own modifications.

Prompt: At your tables, choose one of the problems that you worked on today, and create a poster that shows how the problem solving process can be used to help solve it.

Circulate: As students work on their posters, ask them questions about their different problems, and how the steps to solve it relate to the general steps of the problem solving process.

Share: Allow students to share their posters with the rest of the class.

Wrap Up (5 minutes)

Question of the Day: What are some common steps we can use to solve many different types of problems?

Prompt: You saw a lot of different types of problems today, but they all used our Problem Solving Process. For each step of the process, think of one general tip that could be useful no matter what problem someone is trying to solve.

🎯 Assessment Opportunity

Check that students are coming up with effective strategies for each step of the process. These should be general strategies, not specific to the particular problems that they chose to solve.

🗣️ Remarks

I began by saying a formal problem solving process could help us solve all kinds of problems. Today we began to understand what this process looks like in a variety of real life situations. Tomorrow we're going to start putting this process into action to see how it actually works.

Extended Learning

Article Discussion

Read through the article, **You Are Solving the Wrong Problem**

1. What was interesting about this article?
2. What current events do you think we need to look at through this problem solving process? Why?