

Problem-Solving Activity

Setup:

- The students' desks should be arranged into five groups, or they might be working at lab tables. As students enter the classroom, help arrange equal numbers of students in each group.

Goal:

- Students will analyze a problem and evaluate solutions by thinking of multiple or unconventional ways to solve the problem.

***When text is in red, please read it to the students exactly as written.**

Introduce yourself and briefly share your career/education background.

Importance of Problem Solving: (10 minutes)

- Ask students what they think problem solving means.
 1. Problem solving is the process of finding a good way to fix something that's wrong, answer a tough question, or figure out how to reach a goal. It means thinking clearly, trying different ideas, and not giving up until you find a solution that works.
 2. Problem solving is an essential skill for you now in middle school, and employers want employees with problem-solving skills that will help them be successful in the workplace.
- Use the flashcards in your instruction folder (also printed below) to share the 5 reasons problem solving skills are so important. Ask for volunteers to share how they think problem solving does these 5 things BEFORE you share the answers (in red below). Then, each has a common situation that most middle school students face at some point. Use each of these real-life examples to show the importance of using problem solving now, which will benefit them in the future. The first example is for you to read, but the next 4 give students the opportunity to think about and share solutions.
 1. **Improves decision-making:** Problem-solving means looking at a situation, thinking of possible ways to fix it, and picking the best solution.
- Say to students: For example, let's say you need to choose a partner for a big science project. Your best friend is in your class but doesn't usually finish work on time. Another classmate you don't know well seems responsible and gets good grades. Who would you pick to work with? (This is just a rhetorical question for them to think about.) Your initial decision might be to partner with your best friend because it will be fun. But after weighing the pros and cons and thinking about the outcome of your project, you can make the better decision and choose the responsible classmate because it increases your chances of success on the project.

2. **Increases Efficiency**: When you have a problem, finding the main cause and a good solution can help save time and effort.

□ Say to students: Let's think about a problem that some of you may have. You're always running late in the morning and maybe even missing the bus. You need to understand the problem - you're spending too much time looking for your clothes and packing your backpack in the morning. What could you do that would help you be more efficient? Possible answers: Lay out your clothes the night before, pack your backpack and lunch before bed, set an earlier alarm or limit phone time before bed. By identifying what's wasting your time and fixing it, you'll get ready faster and with less stress. That's being more **efficient**—doing the task smarter and more quickly.
3. **Builds Confidence**: When you solve a tough problem, you become more confident and feel stronger about facing future problems.

□ Say to students: Here's another situation some of you may face. You're struggling with a math unit and feel nervous about the upcoming test. What are some things you could do to help yourself? Possible answers: Ask the teacher for extra help, use apps to review, practice with a classmate or do extra problems from the book. You could make a study plan, and hopefully with more practice, you will do well on the test. You faced a challenge, made a plan, and succeeded. Now, you feel more confident in your abilities—not just in math, but in handling other situations as well.
4. **Strengthens Relationships**: Problem-solving often means working and talking with others. By solving problems together, you can build better relationships with your teammates and create a more positive workplace.

□ Say to students: Have you ever had a misunderstanding with a friend? (Another rhetorical question for them to think about.) For example, your friend is upset because they think you ignored them during lunch, but you were actually feeling sick and didn't want to be around anyone. Once you understand the problem - your friend feels hurt, and you didn't mean to upset them - you can think about possible solutions. Any ideas? Possible answers: Ignore it and hope they get over it (not ideal) or talk to them and explain what happened. Hopefully, you will talk to your friend privately and explain that you weren't feeling well and didn't mean to ignore them. By calmly working through the problem and communicating clearly, you rebuild trust and show that you care, and this makes your friendship stronger.

5. **Encourages Innovation:** When you have a problem, you might need to think in new and creative ways to find an answer. This can help you discover smart solutions and fresh ideas.

□ Ask students: **Does anyone have a messy locker or backpack?** Students might raise their hands. **That mess can make it hard or take too long to find things you need before classes start. The problem is stress and wasted time because of disorganization. What are some solutions to this problem?** Possible answers: (Answers will vary depending on whether students use lockers or just carry backpacks.) stack books in a better order, use shelves or bins in the locker, remove unnecessary things and trash, invent something new to keep items separated either in the locker or backpack. **If you're creative, maybe you sketch out a design for a custom cardboard divider system for your locker or backpack. If your organizer works, you find things faster and even help a few friends make their own. By thinking creatively to solve a real problem, you came up with a brand-new idea that didn't exist before—that's innovation.**

- Today, each group will be presented with a problem (in this case a group challenge). Your job is to think about the problem and come up with a solution by working together, thinking clearly, trying different ideas, and not giving up until you find a solution that works.

Activity Pyramid Cup Building: (15 minutes)

- Have 2 students come up front to assist you. Read the following directions to the students:
- For each group, your objective is to build the tallest pyramid using the 21 cups provided (6 rows is the tallest). The pyramid consists of stacked rows of cups where each row will have one less cup than the row below it. (In other words, the top row has 1 cup, the next row has 2 cups, etc.)
- You will start by forming the top row of the pyramid first – one cup.
- To begin, set this one cup down on your table/desks. (Have one student put down 1 cup.)
- Then, anyone in your group can lift this first cup so that two cups can be placed under it by another student, forming the second row of the pyramid. (Have one student lift the 1 cup while the other student places 2 cups side by side underneath it.)
- From this point forward, only one student is allowed to lift the bottom row of your pyramid structure – the row touching the table – while other group members add the next row underneath. (Have one student demonstrate lifting the second row while the other student tries to add the next row of 3 cups. They may or may not be successful.)
- All other cups in the pyramid can only be **lightly** touched or supported by any player's fingers - before, during and after a lift - but the cups may not be held, and upper rows may not be lifted in any way. (While one student is lifting the bottom row, demonstrate lightly supporting the side of the top cup with only your fingers - the proper technique. Then show what they may **not** do by lifting/holding a top cup in a top row while the student lifts the bottom row.)
- Again, only the bottom row of the pyramid can be lifted.
- If any part of your structure falls apart, you must start your building process over from one cup.

- After I answer any questions you have about the directions, you will have 10 minutes of building time to see how high you can get your pyramid.
- Give each group a stack of cups. Success is usually achieved with the first three or four rows. After four rows, it's up to the creativity, focus and tenacity of the group. Cups will be falling. We keep encouraging attempts as long as there is time to build. If a group finishes quickly, make them build while you are watching; they might be "cheating"
- While the groups are working, circulate and encourage working together.
- Rather than immediately starting to rebuild after a collapse, the students should be talking with each other to try to determine a plan. They need to think about what they can do differently (while still following the guidelines) to build their pyramid.
- At the end of 6-8 minutes, tell all groups to **stop working**. Make them talk with each other for a few minutes to think about what's **NOT** working and what they could do differently. Say to them, **You can't solve a problem by trying the same unsuccessful thing over and over again, hoping you will get lucky. Think about different things you could do. What haven't you tried yet?**
- Don't let them start building again until you have seen them talk about the problem. After a few minutes, tell the teams they may begin again.
- Here are some tips to share if they are still "stuck", anything, but give them time to try. We want them to come up with their own solutions if possible, but we also want them to be successful.
 - Even though extra students can only support with their fingers, the "lifting" student can use any part of their body. For example, instead of grabbing the cups on the end with their hands, they could use their arms to lift the whole bottom row of cups.
 - This is easier to do if the cups are near the edge of the table instead of in the center.
 - As one student is lifting the bottom row, students should be on both sides of the pyramid lightly supporting the cups with their fingers. They can also support with one finger lightly touching the top cup.
 - Students should get the next row of cups lined up and ready before lifting the pyramid.
- If a group finishes early and you have seen them build the pyramid "fairly," you can give them 7 cups from your "extras" and see if they can add another row.
- Stop the students when you still have at least 5 minutes remaining in the session and see how many rows each group has in their pyramid (or how many rows they had before the pyramid collapsed). Have students stack the cups back together and lay them down on their table.

RECAP/TALKING POINTS (as time permits):

- **What did you find yourselves doing differently after the pyramid collapsed?**
- **What choices do you have after a "failure"?**
- **What have you learned about problem solving?** Hopefully they will come up with some answers, but here are some things you can share:
 - Work as a group, communicate well, try new things, don't give up