

Problem Solving

Resourcefulness, ingenuity

“Problem solving means weeding out all the things that don’t work until you find something that does. Mistakes need not be failures. They can be steps toward finding solutions.”

Barbara A. Lewis

When my fourth, fifth, and sixth grade students at Jackson Elementary in Salt Lake City discovered a hazardous waste site three blocks from their school, they flew into action, like an army of termites trying to eat the World Trade Center. It was a huge problem. Some 50 thousand barrels had been stockpiled over 40 years. Most of the things the kids tried in the beginning didn’t work. For example, they conducted a survey of the neighborhood looking for ground wells so they could ask health officials to take water samples to test for toxic chemicals—but all the wells had been cemented over. They called the health department—and health officials told them there was nothing the kids could do. They passed a petition around the neighborhood asking for the removal of the barrels—and the petition was threatened with a lawsuit three times.

Was my students’ project doomed to failure? No! Along the way, they learned many things that didn’t work, and some that did. Through a process of problem solving, they eventually got all the barrels removed, and the site was cleaned up. It took 10 years, a lot of mistakes, some failures, and hard work, but they succeeded.

My students were in good company. People who make great contributions or discoveries

always have problems to solve along the way. Alexander Fleming took advantage of an apparent failure in an experiment, and by shrewd observation discovered penicillin. Here are more success stories that started out as failures:

- 💡 Beethoven’s music teacher once proclaimed “As a composer, he is hopeless.”
- 💡 Walt Disney was fired by a newspaper editor because he had “no good ideas.”
- 💡 The legendary tenor Enrico Caruso once had a music teacher who told him “You can’t sing. You have no voice at all.”
- 💡 Madame Schumann-Heink, who later became a famous opera star, was told by the director of the Imperial Opera in Vienna that she would never be a singer and should buy a sewing machine.
- 💡 Leo Tolstoy flunked college.
- 💡 Werner von Braun failed ninth-grade algebra.
- 💡 Louis Pasteur was rated as “mediocre” in chemistry when he was at college.
- 💡 Dr. Seuss’s first book, *And to Think That I Saw It on Mulberry Street*, was rejected by 23 publishers.
- 💡 Abraham Lincoln began the Black Hawk War with a captain’s rank and came out as a lowly private.
- 💡 Louisa May Alcott was told by an editor that she wouldn’t ever be able to write something that would have popular appeal.

💡 During World War II, a scientist named James Wright kept trying to invent artificial rubber, but all he got was a lump of flexible, bouncy stuff. He thought he had failed completely. In fact, he had invented Silly Putty.

💡 At the first TV station that hired her, Oprah Winfrey tried to be a reporter—and failed. But she couldn't be fired because of the terms of her contract, so her producers assigned her to a local morning talk show. That was the beginning of Oprah's incredibly successful career.

"Go ahead and make mistakes. Make all you can. Because remember, that's where you'll find success."

Thomas J. Watson

Successful problem solving requires several good character traits. If you glance at the list of character traits in the Contents, you'll see that any number of these are needed to solve problems. You have to *know yourself* and your own capabilities. It helps to be *optimistic* and have *hope* in your efforts. You need to *care* enough to try your best. Problem solving means making *choices*—and accepting the consequences when your choices don't turn out the way you want them to. And so on down the list. You might even think of problem solving as a "chemical reaction" that combines your best character traits to create a new "solution."

CHECK IT OUT

Mistakes That Worked by Charlotte Foltz Jones (New York: Doubleday, 1991). Explores many inventions—Coca-Cola, Post-it Notes, Frisbees, cheese, chocolate chip cookies, aspirin, and more—that all happened by accident. Ages 9–13.

10 Ways to Fail at Problem Solving

Do you want to know how *not* to solve problems? Here are ten strategies that are almost guaranteed to lead to failure.

1. *Fight against the problem.* Many people think they can solve a problem by swimming upstream against it. That works for salmon, but not for problem solving. Instead, study the problem and try to understand it. Learn about it. Examine it from as many angles as you can. Then you'll know how to approach it.

2. *Deny or ignore the problem.* Do you remember the fable about the ant and the grasshopper? The ant worked hard to prepare for winter, but the grasshopper played. When winter came, the ant was ready, but the grasshopper was cold and hungry. If you deny or ignore a problem, it won't go away. It will just be harder to solve when you're finally forced to face it.

3. *Have a bad attitude about the problem and your own ability to solve it.* Shouting "Having a curfew STINKS!" won't win any points with your parents. Thinking "I can't talk to them, so why bother?" won't help, either.

4. *Don't finish what you start.* Some people are afraid to carry out their solutions for fear that other people will criticize them. Or they procrastinate and don't get around to finishing. Either way, the problem isn't solved.

5. *Be afraid of making mistakes.* Problem solving can be scary. What if you do something wrong? Make a mistake? Goof up? (In fact, doing nothing is usually a *bigger* mistake.)

6. *Give up.* Stop before you reach a solution. Stop before you start working toward a solution.

7. *Be afraid of the competition.* Some people don't solve problems for fear that others might do it better.

8. *Get a false or inaccurate picture of the problem.* If you think it's smaller or less serious than it is, you won't devote enough time and effort to solving it, and you're likely to fail. If you think it's bigger or more serious than it is, you'll devote too much time and effort to solving it—which could cause even more problems.

9. *Rely on luck to solve the problem or make it go away.* What some people call "luck" is really the result of thought, energy, commitment, and the willingness to take advantage of good opportunities.

"I find that the harder I work, the more
luck I seem to have."

Thomas Jefferson

10. Rely on other people to solve problems for you.

If you depend on others to solve problems and make decisions for you, this prevents you from learning and growing. Plus you have to be satisfied with what they come up with, even if it's not what you want.

10 Steps to Successful Problem Solving

As you read through these steps, you might notice some similarities to the scientific method—a procedure scientists have used for centuries to solve problems.

1. See if there's a problem to solve. You can't solve it if you can't see it. Identify it. Describe it. *Example:* "Uh-oh, I'm failing algebra."

2. Research your problem. Find out the history of your problem. What's involved? Who's involved? What's the extent of your problem? Ask questions about it. Talk to experts about it. *Example:* Your test and quiz grades have been slipping for the past few months. You've neglected to turn in several homework assignments, which also affects your grade. You go to your algebra teacher and say "Uh-oh, I'm failing algebra."

3. Get help. See if there's anyone who can work with you to solve your problem. *Example:* Your teacher tells you there's an after-school tutoring club for people who need help with algebra.

4. Make a hypothesis or guess about what you think might solve your problem. *Example:* "Maybe if I start going to the tutoring club, I can bring up my grade and pass the class."

5. Experiment and observe. Try your solution and watch what happens. *Example:* You start attending the tutoring club. You observe yourself to see if your grades improve.

6. Form a theory based on your observations. Think about what you've learned so far. Is it enough

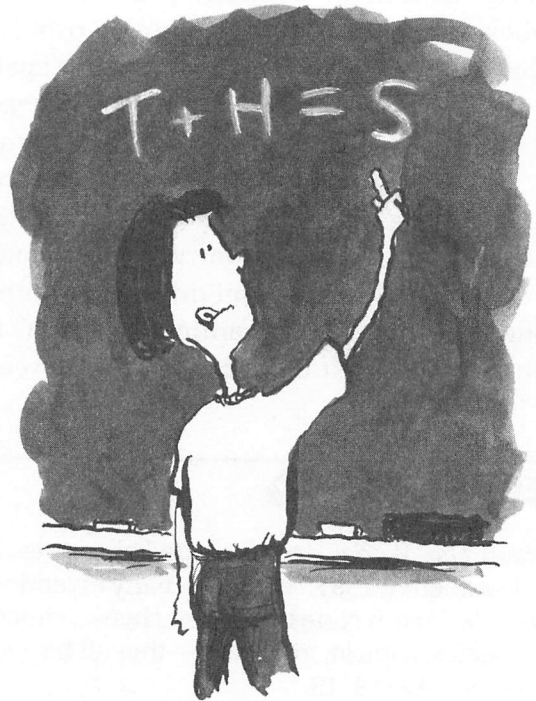
to solve your problem? If not, think *beyond* what you've learned. *Example:* "Attending the tutoring club might not be enough. Maybe I need to start doing my homework."

7. Make a decision based on your theory. *Example:* "I should spend more time studying and complete all of my homework assignments."

8. Make a plan based on your decision. *Example:* "I'll pay more attention in class, write down the homework assignments, go to the tutoring club three times a week, and do my homework every night." Follow your plan.

9. Learn from your mistakes. Mistakes can be good teachers. *Example:* "Now I know that I can't bluff my way through algebra."

10. Revise your theory. *Example:* "Tutoring plus homework equals success in algebra."



BONUS: Successful problem solving can help you to *prevent* future problems. *Example:* "I guess I should start working harder in chemistry *before* that becomes a problem, too."

"Each problem that I solved became
a rule which served afterwards to
solve other problems."

René Descartes

Character Dilemmas

For journaling or writing essays, discussion, debate, role-playing, reflection

Suppose that . . .

1 You want to go to the algebra tutoring club, but you can't stay after school. Both of your parents work outside the home, and you have to take care of your little sister. What might you do to solve your problem?

2 Your parents are divorced. You live with your mother, but you want to live with your father. What might you do?

3 You're the mayor of a town in which two different groups are competing for the same budget money. One group wants a hospital expansion with better facilities for people who are mentally disabled. The other group wants a hospital expansion for children with birth defects. Both groups have urgent needs that can't wait for future funds. If you half-fund both groups, neither will be able to reach its goal. How might you decide which project should have priority? Or is there another way to approach this problem?

4 You're a teacher with 39 students in his class, and because of budget cuts you don't have enough desks and books to go around. Ten of your students have serious behavior problems, and you believe that they would learn better in another school that specializes in teaching kids with behavior problems. But that school is overcrowded, too. You have several problems. What are they? What might you do about each one? Where will you start?

5 You overhear two gang members talking about plans to graffiti the school and neighborhood. You think they know that you overheard them, but you can't be sure. If you tell on them, they might retaliate. If you don't tell, your school and the neighborhood will be defaced. What will you do?

6 You live in a small town that doesn't have a public library. You work to build a team of

people to work on this project, and the town donates a building and books. Just as you're about to begin renovations, you learn that the building is going to be demolished for a new sports park. Your group has no money to buy another building. How might you solve this problem?

Activities

CONNECT WITH STUDENTS FROM OTHER SCHOOLS around your state, country, or world to find out how they solve problems. You might do this over the Internet or join a pen-pal organization.¹ Ask them how they deal with issues like these (or think of your own ideas):

- 3** communicating with parents
- 3** doing homework
- 3** having a job and going to school at the same time
- 3** curfew
- 3** getting along with peers
- 3** handling peer pressure
- 3** reducing crime
- 3** getting school supplies
- 3** getting medical care.

START A PROBLEM-SOLVING NOTEBOOK or journal.² Write about the problems you face in your daily life and how you solve them. Write about what works and what doesn't work.

LEARN ABOUT THE ORIGINS of famous discoveries, inventions, and talents. Each one started out as a problem to be solved. You might want to start by asking yourself something you've always wanted to know. *Examples:* How do they get the lead into a pencil? How did they discover the age of the earth? How do they get music onto a CD? Then visit the library or log on to the Internet and look it up! See if you can figure out the problem-solving steps each discovery required.

¹ See "Peacefulness," page 179, for a list of pen-pal organizations.

² See "Endurance," pages 88, 89, and 92, for journaling resources.

CHECK IT OUT

How Do They Do That? Wonders of the Modern World Explained by Caroline Sutton (New York: Quill Books, 1982). Answers questions including: How do they create spectacular fireworks? How do they splice genes? How do they dig tunnels underwater? Ages 13 & up.

Tricks of the Trade for Kids, edited by Jerry Dunn (Boston: Houghton Mifflin Company, 1994). Learn how to draw cartoons from a Disney animator, how to build mighty biceps from Arnold Schwarzenegger, how to start a successful business from Mrs. Fields of cookie fame, and more. Ages 9–14.

WRITE A NEW ENDING TO A STORY, POEM, or play that ends in a sad or disappointing way. You might have to work backward in the text to discover where the problem started, then rewrite that part, too.

HOLD A SPEECH CONTEST in which the contestants describe problems and propose solutions.³ You might have a theme for the contest, such as a particular school or community problem (tolerance, theft, gangs, drugs and alcohol, sports ethics, etc.). Or you might broaden your theme to include city, state, or national issues (health care, child care, urban development, foreign relations, etc.). Give prizes for Best Speech and Best Solution.

HAVE A CLASS, CLUB, SCHOOL, OR FAMILY debate on this topic: “Be it resolved that from this time forward, all children in our town (city) under 16 years old will be in their homes by 9:00 P.M.” Divide into two teams: *affirmative* (in favor of the statement) and *negative* (against the statement). TIP: Remember that when you debate a topic, you don’t necessarily agree with the side you present. After the debate, switch sides so everyone has the chance to debate both the pros and cons of the topic.

BRAINSTORM A LIST OF SOLUTIONS for these problems (or other problems you’d rather brainstorm about):

- low self-esteem
- acne
- losing your homework

- a sibling who teases you
- making new friends
- finding a boyfriend or girlfriend.

RESEARCH SOLUTIONS TO PROBLEMS caused by natural disasters. What might people do to reduce the impact of tornadoes, hurricanes, floods, earthquakes, fires, and other events? Report your findings to your class or club. *Examples:*

1. Research the Mt. St. Helens volcanic eruption on May 18, 1980. What happened when the volcano erupted? What have people learned from this disaster? Make a chart or poster illustrating what you learn.
2. Research the impact of forest fires. What happens to the local populations of animals, plants, and trees? What happens to the people who live nearby? How do firefighters problem solve during a forest fire? What are the positive aspects of a forest fire? What happens to the forest as it recovers from a fire? Present your findings in an oral report.
3. Investigate earthquake detection. How do scientists know when an earthquake is going to happen? How accurate are their predictions? What kinds of instruments do they use to problem solve? Write a report on your findings.

CHECK IT OUT

Cascades Volcano Observatory

5400 MacArthur Boulevard
Vancouver, WA 98661
(360) 696-7693

<http://vulcan.wr.usgs.gov/home.html>

Part of the U.S. Geological Survey, the Cascades Volcano Observatory keeps a close watch on Mt. St. Helens.

Forest Service

U.S. Department of Agriculture
Auditors Building
2011 4th Street SW
Washington, DC 20250
(202) 205-1760

<http://www.fs.fed.us/>

Contact the Forest Service or visit the Web site to learn about fire management and current or recent fires.

³ See “Communication,” pages 52–53, for tips on public speaking.

4. **Be accountable.** Accept responsibility for your behavior. Don't blame others for your actions and decisions.²

5. **Practice.** New character traits don't form on their own. If you wanted to learn to play hockey, you'd have to practice. At first your skates would refuse to stay beneath your body. With practice, however, you'd slowly gain the skills you need to stand, glide, and control the direction of the puck. Self-discipline is something you can teach yourself. If it's new to you, start slowly. *Example:*

✱ Do something you're supposed to do for one hour each day. Clean your room, do your homework without being told, stop yourself from speaking out in class without raising your hand, and so on.

✱ Increase the time to two hours, then three . . . and eventually most of the day.

6. **Do activities that enhance your self-discipline.** You might try yoga, walking, rock-climbing, practicing a musical instrument, or whatever else interests you.

7. **Eliminate harmful habits.** *Example:* If you spend several hours each week watching violent videos or TV programs, make a conscious decision to spend your time in healthier, more productive ways. You might start by watching different videos or TV programs, then gradually cut back on your TV-watching time.

8. **Start a self-discipline support group.** Tell a few close friends about your decision to develop and strengthen these character traits and ask if they'd like to join you. Talk together about your plans, dreams, mistakes, frustrations, and hopes for the future. Plan and do activities that strengthen your self-discipline.

"There's only one corner of the universe
you can be certain of improving,
and that's your own self."

Aldous Huxley

Character Dilemmas

For journaling or writing essays, discussion, debate, role-playing, reflection

Suppose that . . .

① Someone you know has been calling you names on the way to school each morning. You've tried to ignore him and say nothing, but the verbal abuse keeps coming. How might you use self-restraint and stop the abuse at the same time? Is this even possible?

② You've just moved to a new town, and you'd really like to try out for the football team. To do this, you'll have to spend several hours each day practicing and working out. You'd also like to develop new friendships so you don't feel lonely. You sign up for football practice every night after school . . . and the next day, a group of popular kids invites you to play street hockey with them every night after school. What should you do? How could you handle this?

③ You have strange and uncomfortable thoughts that keep squeezing their way into your brain. You want to do a little "brain housecleaning," but you aren't sure how to discipline your mind. What might you do?

④ You bite your fingernails whenever you're under stress. You're sick of having ragged nails, but just thinking about stopping is enough to cause stress . . . and you start chomping your nails again. How can you discipline yourself to break this habit?

⑤ You suspect that one of your friends has started smoking cigarettes. How might you help her develop the self-discipline to quit—without losing her friendship?

Activities

BRAINSTORM A LIST OF PROBLEMS that might result from a lack of self-discipline. Consider how they might affect some or all of the following:

➤ personal appearance

➤ physical, mental, or emotional health

² See "Choice and Accountability," pages 28–34.

- 🦋 school success
- 🦋 life success
- 🦋 friendships
- 🦋 job performance
- 🦋 talents
- 🦋 participation in family, clubs, community, or faith
- 🦋 marriage
- 🦋 parenting
- 🦋 anything else.

Example: What if a person didn't have the self-discipline to wash or comb her hair? Problems might include a sloppy appearance, poor self-esteem, disapproving teachers, disgusted friends (or no friends), inability to get a job, angry parents, and so on—plus an itchy head.

DO SILLY EXERCISES to strengthen your self-discipline. When you read these, you might laugh out loud or think they're *very* strange. Try them anyway. They really work!

1. Go to a fast-food place and buy the tastiest item on the menu. Keep it wrapped up and nearby while you study, practice, clean your room, etc. See how long you can go without eating it. Try it for five minutes the first time, then increase your resistance to ten minutes the next time, and so on.

2. The next time you get a mosquito bite, don't scratch it. This silly exercise has an added benefit: The less you scratch, the sooner the bite will stop itching.

Make up your own silly exercises—whatever works for you. Just keep in mind that your purpose is to become more self-disciplined. **IMPORTANT:** Don't carry this too far or hurt yourself in any way. If you've just had a long day and a hard soccer practice and you haven't eaten since lunch and you're dizzy with hunger, eat!

ROLE-PLAY HOW YOU MIGHT TALK with a younger brother or sister who's demonstrating a lack of self-discipline (*examples:* always late, doesn't complete chores or tasks, is doing poorly in school, etc.). How might you encourage or help your sibling to develop self-discipline?

WRITE OR TELL A CHAIN STORY about a make-believe prince or princess who has no self-discipline. You might do this with your family, class, club, or

youth group. *Example:* The first person writes (or says) "Princess Miss-apline woke up every morning, stretched in her crisp white sheets and fluffy blankets, and simply couldn't force herself to get out of bed. . . ." The second person writes (or says) "This was a serious problem for the kingdom, because the Princess was the one who opened the palace gates each morning, and until the gates were open, the King's and Queen's advisors couldn't come inside. . . ." Decide in advance if your story will have a happy ending (the Princess learns self-discipline) or an unhappy ending (the Princess never learns self-discipline). Here are a few other characters you might want to write or tell about:

- Willy Won't-power (an athlete)
- Merva No-Nerva (a girl who's afraid of taking charge of her life)
- Ironless-Will Phil (a boy who watches TV 24 hours a day).

IMPORTANT: These and other make-believe names should only be used to stimulate creative thinking. They should not be used to make fun of real people.

INTERVIEW SCIENTISTS, ENGINEERS, and doctors to learn what role self-discipline has played in their lives. Compile your interviews into a booklet and donate it to your school library's biography section.

Variation: Interview any successful people of your choice.

INVESTIGATE DIFFERENT ANIMAL species to learn if they use discipline. Do gorillas, wolves, and lions discipline each other and themselves? Does one animal seem to be in charge of the others, or do they share this responsibility? Do they punish misbehavior? Write your findings in a log or in a chart, showing comparisons if you choose several animals or species. (What about birds? Fish? Insects?)

VISIT WITH A PROFESSIONAL MATHEMATICIAN (you might find one employed in an area industry or business, or teaching at a nearby college or university). Ask him or her to outline for you the self-discipline that's required to train the mind to think analytically. Write an article about what you learn and share it with your class, club, or family.