Examples of Basic Problem-Solving Tools

Unless otherwise noted, the following examples of each of the tools are adapted from Treffinger and Nassab (2005) or Treffinger et al. (2006).

Brainstorming

In a class that was preparing to study the countries of North America, the teacher posed the following task for the students to think about, using the Brainstorming tool: List many questions about the countries we will be studying. Try to list some questions that will help us look at the countries in a different way and some unusual or original questions.

In just 10 minutes, the class generated more than 60 questions. Some of the questions might be described as common (for example, Where is the country located? or What is its population?). Other questions were much more original (What are some controversial or highly debated issues in this country? or How has the country's economy been affected by digital technology in the last five years?). The teacher later categorized or clustered the students' questions into groups and used them as starting points for projects in which small groups of students sought information about particular countries and reported their findings.

Force-Fitting

A group of students made Force-Fitting card decks by gluing pictures of everyday objects on large index cards (one picture per card). They used their Force-Fitting cards to generate some new and unusual ideas for improving the furniture in their classroom. They started by exploring ways to improve the room's straight, hard, metal and formed-plastic chairs. The students selected three cards randomly from their deck: a table lamp with a flexible, goose-neck frame; a fancy diamond necklace; and a telescope. Then, they used the three objects to think of new ways to improve their chairs. The telescope led them to consider making the chair's legs adjustable. The flexible lamp immediately led them to think about mounting a similar lamp on the top of the chair's back to provide a convenient and adjustable light source. They also stretched their thinking beyond this first, rather obvious connection and soon turned to the flexible neck of the lamp, which led them to consider modifying the back of the chair so that its position could be moved (from left to right, or from straight to a reclining position). The fancy diamond necklace made them think about decorating the outside of the chair's frame so that each student could personalize his or her own chair. This card also suggested creating a chair that was ornate and fancy and might even be elevated like a throne, which could be used to recognize certain students for special occasions or accomplishments. The students liked the idea of earning the right to use the "Diamond Chair" as a special privilege.

Attribute Listing

Steve used the Attribute Listing tool to explore ways to improve how he presented his science project. He identified three key attributes or parts of his presentation—visual display, oral presentation, and written report. Then, he generated ways to improve or modify each of those parts. Below is Steve's list of possible changes for his task:

- *Visual Display.* Make larger, use a trifold out of cardboard, use bright colors, use computer to make written parts and drawings, add some charts and graphs, use some pictures or cartoons to get attention, include something that moves, use an overhead projector, add lights, add something people can touch or use.

- *Oral Presentation.* Use music in background, use sound effects, use Power Point, dress up in a lab coat, wear a necktie, use props.

- *Written Report.* Put in notebook, make colorful cover, do it on the computer, add some more graphs and charts, include some photographs, use color and highlight parts, use more labels, use more variety in the words, add a glossary of terms.

SCAMPER

Using the acronym SCAMPER, students look for new possibilities by applying the following checklist of action words or phrases:

S - Substitute
C - Combine
A - Adapt
M - Magnify or Minify
P - Put to other uses
E - Eliminate
R - Reverse or Rearrange

One group of students, working on a unit on inventions, chose to study the telephone. They used the SCAMPER tool

to identify many, varied, and unusual ways the telephone might be modified and improved. Then, they searched through many stores and catalogs, located examples of modifications and extensions of the basic idea of the telephone, and considered what SCAMPER words and questions might have led to those modifications. For example, *combine* might have been used to create a telephone that also had a video screen. *Magnify* (or *make larger*) might have stimulated the thinking of the makers of a phone with giant touch-tone buttons on its keypad. *Minify* (or *make smaller*) might have paved the way for many of today's tiny cell phones. *Combine* or *put to other uses* might have led one clever group to a wristwatch that included a cell phone—and a TV remote! The students concluded their project by hypothesizing new changes and developments that might be produced in the future.

Morphological Matrix

In one class studying the elements of character, the teacher provided the following Morphological Matrix:

	Who	Where	What	Why
1	Young Children	Home	Trustworthiness	Peace
2	Elementary Kids	School	Respect	Conflict
3	Middle School	Mall	Responsibility	Order
4	High School	Office	Fairness	Calm
5	College	Internet	Citizenship	Anger
6	Parents	Church	Caring	Flow
7	Teachers	Cafeteria	Participation	Verbal Communication
8	School Staff	Business	Preparation	Writing
9	Business Folks	Media	Promptness	Listening
0	Police	Travel	Love	Nonverbal Communication

The teacher asked students to use the last four digits of their phone numbers to randomly obtain one item from each column. Students then combined the four items to create sentences describing how the basic elements of character are used in everyday life.

For example, the four digits 5881 yielded the following items: col*lege*, *business*, *prepared*, and *peace*. The students combined these items to produce the sentence,

> Most college students are preparing to enter business fields and want to find peace within their lives.

The four digits 4352 yielded the items high school, mall, citizenship, and conflict. The students combined these items to produce the sentence,

> When high school students exhibit good citizenship they will not encounter conflict in the mall.

Students developed the sentences individually and then worked in pairs to combine their sentences or to choose the best one for a presentation to the whole class. Later, they wrote reflections on the activity.

(Example contributed by Jennine Jackson, Teacher of the Gifted, Amphitheater School District, Tucson, Arizona, and Affiliate Director of the Arizona Future Problem Solving Program International)

Hits and Hot Spots

In a high school science class, the students worked on designing appropriate zoo habitats for several endangered species. The students selected an animal, conducted research on the animal, and then generated lists of questions they had about the animal and its habitat. They used Hits and Hot Spots to identify the most important questions and to identify four major clusters to guide their subsequent research and planning.

Another class used the Hits and Hot Spots tool to plan a school party. First, they used generating tools to come up with a list of more than 80 possibilities. Using the Hits and Hot Spots tool, they grouped (or clustered) their Hits into the following five Hot Spots: Activities, Refreshments, Place, Time, and Cost. They decided to host an after-school party in the cafeteria. They could afford soda and popcorn. Dancing was the favorite activity. Several students volunteered to bring in their CDs and supply the music.

ALoU: Refining and Developing

One group of students generated ideas on how to improve communication between the deaf and the hearing members of the school community. The group decided to take a closer look at one of the ideas: Show a 'word-of-the-day' in sign language during the morning TV announcements. Ask teachers and students to use it. They used the ALoU (**A**dvantages, **L**imitations [and ways to **o**vercome them], and **U**nique features) tool to improve and strengthen this idea. Their work is shown below.

Advantages

- Easy to manage and do within our time limits

- Fun for everyone

- People would actually be learning sign language a little at a time

- Seeing and using sign language would become more accepted in school

- No cost involved

- Very visible

Limitations (and how to overcome them)
- *How to ensure that it would get used?*
  - Let teachers know the words ahead of time so they can include ways to use them in daily/weekly plans.
  - Make it a contest, like a spelling bee each month.

- *How to get participants to take it seriously?*
  - Do a "hush day" to help people get a firsthand understanding of the need for all to communicate.
  - Bring in or create a school presentation using words and sign language to demonstrate the importance of diversity.

Unique Features
- Our deaf population might be able to communicate with all others in the school without the need for an interpreter.
- Sign language might be seen as a language just like other foreign languages and be taught as a subject.

PCA: Paired Comparison Analysis

The PCA tool can be used whenever students have a set of appealing options to rank or prioritize. One class used the PCA tool to help decide which of several possible field trips they preferred to take, knowing that time and budget limitations might make only one field trip possible for the group that year. Five options were generally appealing to many of the class members: the zoo, a concert by the local symphony orchestra, the nearby Inventor's Hall of Fame and Invention Center, a local newspaper office, and a theme park.

The class discussed several important criteria to consider in evaluating the options, including cost, time required, personal appeal and interest, relating the trip to other class activities and studies, learning value, and possibility of students visiting the site at another time with friends, family, or other groups. Each student in the class then completed a PCA sheet. The trip to the hall of fame/invention center was the highest ranking option, followed by the concert and the trip to the newspaper office.

The students prepared a proposal about their choices and were rewarded by winning approval for trips to both the invention center *and* the symphony concert!

Sequencing: SML

A group of middle school students decided to plan and conduct a campaign in their school to make students aware of the importance of community service by young people. They wanted to build interest by sharing information about a particular service project in their community for which the students could volunteer. They used the Sequencing (SML) tool to arrange a number of possible action steps in a workable and appropriate order.

- In the short term (and before they contacted any other agencies or the student body), the students needed to understand community service better themselves. They listed questions to ask representatives from one or more community agencies.
  Next, they researched agencies in their community that needed volunteers and would be receptive to middle school students as well as interesting to the students.

- As a medium-range step, the group prepared and rehearsed the kind of interview they would do with representatives from the agencies, contacted one agency, conducted their interviews, and began doing some volunteer work themselves.

- The students' long-term steps involved creating an appealing presentation that incorporated information from their interviews and personal experiences to inform other students and to stimulate their involvement.

The presentation was highly successful, and more than 25 other students in the school became involved in volunteer work in the community.

Evaluation Matrix

Cindy's grandmother lives alone in an apartment. She wanted a pet. The family decided to buy her a dog. However, there were rules about having pets in the apartment building. Also, Grandma didn't have a lot of money to spend on a pet. The family selected the five dogs that they wanted to consider, and writing the name of each breed dog in each row of the matrix under the options column heading. Thinking about Grandma and where she lived, the family decided to use the following criteria:

- Which dog can Grandma best afford?

- Which dog will be the most quiet?

- Which dog will be the easiest for Grandma to care for by herself (walk, bathe, groom, and so on)?

- Which dog will be protective when needed?

- Which dog will be the friendliest companion to grandma?

The family wrote a word or phrase to represent each criterion as column headings in the matrix. They decided to use a 1–5 rating scale, with 1 as the lowest rating and 5 as the highest rating. They evaluated each option against each criterion and totaled the ratings for each option. They looked at the results and noticed that there was little difference among the ratings of the dogs. Each dog had strengths and weaknesses. After talking to Grandma, the family decided to get her a Lab, a quiet and friendly dog.

Options for Breeds	Fits Gram's budget	Most quiet	Ease of care	Protectiveness	Friendliness	Total
Labrador retriever	3	5	3	2	5	18
Toy poodle	3	2	3	3	4	15
Pit bull	4	2	3	5	1	15
Siberian husky	3	3	2	3	3	14
Jack Russell terrier	3	2	4	3	2	14

In another setting, a group of students used the Evaluation Matrix as a tool to help them select books to check out from the library. Some of the criteria they considered included the relevance of the theme or topic to personal interests, usefulness for preparing a report (related to a class assignment), length of book, size of print, number of illustrations, quality of illustrations, and difficulty of the book. With these criteria and an Evaluation Matrix Worksheet, the students went to the library, browsed for a while, selected several possible books to check out, and then used the Evaluation Matrix to help focus their choices. Later, after completing their reading, they discussed how they used the tool and considered the extent to which it helped them make a good choice. Most students found that it was a helpful tool that they would use again when choosing among many possibilities.