

Team problem-solving

Our complex world is continuously challenging us with new problems to solve. These problems are complicated, and a great deal of work must be done to create acceptable and effective solutions for them. Often, teams of people must combine all of their ideas and resources to create useful solutions.

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As students learn to use the *THINK Strategy*, they become more open to looking at a problem from a variety of perspectives to ensure that the final solution is acceptable as well as effective.

Not surprisingly, today's employers are looking for workers who can work effectively with colleagues to solve problems.

As a result, state education standards are being revised, schools are being pressured to teach students how to work together in teams to solve problems, and teachers are asking students to solve problems in a variety of subject areas.

However, as any adult who has tried to solve complex problems with a group of people knows, the group problem-solving process can be challenging because of the varying personalities, opinions, and skills of those in the group.

Nevertheless, if the group follows a sequence of procedures, the problem-solving process can move along efficiently and effectively.

For example, an effective team of adults might approach a problem by first analyzing the situation and clearly identifying the problem. They might next examine solutions that have been tried in the past so resources aren't wasted on solutions that have already failed, and they might then brainstorm new solutions and discuss their advantages and disadvantages.

Then, they can choose the best solution and design a plan to carry it out.

Preparing students for the real world

If students are to learn to be similarly prepared and productive as they work together to solve problems, they need to be explicitly taught a sequence of steps that they can use.

A sequence of steps that has been designed for this purpose is called the *THINK Strategy*, developed by Sue Vernon, Donald Deshler, and Jean Schumaker. The strategy is part of the *Cooperative Thinking Strategies Series**, which was developed to help students think and work with others effectively on a variety of tasks (solving problems, making difficult decisions, studying for tests, and completing large projects). The research and development effort associated with this series was funded through a grant from the National Institute of Mental Health.

Before *THINK* instruction begins

Before *THINK Strategy* instruction begins, students first learn the *SCORE Skills*, five basic social skills that students need to learn to work cooperatively with others:

- Share ideas
- Compliment others
- Offer help or encouragement
- Recommend changes nicely
- Exercise self-control

Mastery of these skills forms the

* Other programs in the *Cooperative Thinking Strategies Series* are the *SCORE Skills: Social Skills for Cooperative Groups*, the *BUILD Strategy*, the *LEARN Strategy*, and the *Teamwork Strategy*.

>>> foundation for instruction in the *THINK Strategy*. Teachers can use *The SCORE Skills: Social Skills for Cooperative Groups* instructor's manual (Vernon, Schumaker, & Deshler, 1993, revised 1996) to guide their instruction in these basic, prerequisite skills. This initial instruction plus extensive practice are mandatory if students are to be ready to work together productively to solve problems.

After students have mastered the *SCORE Skills*, Lesson 1 in the *THINK Strategy* instructor's manual can be used to review the skills. If the *SCORE Skills* have been taught recently, the Lesson 1 review can be brief. A more detailed review may be necessary if students have forgotten the skills.

The steps of the THINK Strategy

After students learn (and review, if necessary) the *SCORE Skills*, instruction in the *THINK Strategy* begins. Each letter of the word "THINK" corresponds to the first letter of one of the strategy steps.

Step 1: Take apart the problem. Instruction on this step focuses on identifying the problem concisely and specifically. This step helps students clearly identify the problem they need to solve and helps them all focus on it. Discussing the facts related to the problem and solutions that have been tried previously not only continues to clarify the problem but also helps problem solvers avoid solutions that have not worked in the past.

Step 2: Hunt for solutions. During this step, students learn how to brainstorm solutions. They focus on how to neutrally generate a list of serious and

The THINK Worksheet

The THINK Worksheet, p. 1

Step 1: The "T" Step

What is the problem? _____

Background facts: _____

Solutions already tried: _____

Step 2: The "H" Step
(New Solutions)

Step 3: The "I" Step
P A S S
(positive) (acceptable) (sensible) (solve it)

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Possible combinations of solutions:

The THINK Worksheet, p. 2

The BEST solution (or combination of solutions) is:

Step 4: The "N" Step

Our plan to solve this problem is:
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Step 5: The "K" Step

Fill out your "Keep Your SCORE Checklist" as you talk about how your team worked together to solve the problem. Think about whether or not everyone:

- participated and shared the work
- was satisfied with the way the team worked together
- used the SCORE Skills
- liked the solution that was chosen
- learned how to solve the problem

reasonable solutions. They are encouraged to stay calm and seriously consider each solution.

First, they independently think of possible solutions and jot down their ideas on scrap paper. Then, they share their ideas with the group, and they

write serious solutions on a *THINK Worksheet* (above). Serious solutions are those that solve the problem, are legal, and are nonviolent.

During guided and independent practice activities, teachers provide close supervision to >>>

>>> ensure that students keep an open mind, listen, and consider and list each serious solution on the worksheet. Keeping an open mind enhances the process of brainstorming, prevents arguments, and allows all students to have a voice in the process.

A zero-tolerance level on the part of the teacher for putdowns, rejections, or other negative behaviors helps these activities proceed smoothly. If a positive atmosphere is created for discussing solutions, students become more willing to take the risk of making a suggestion, feelings do not get hurt, and students have multiple ideas from which they can choose the best solution. Sometimes, a really different or unusual solution provides the key to “unlock” ideas for a great solution.

Keeping in mind that this step may be challenging for some students, teachers often pull these students aside for a quick coaching session before the lesson starts to help them generate one or two ideas for solutions. Being able to participate by providing positive and constructive ideas increases the probability that the self-confidence of these students will grow and, it is hoped, so will group acceptance and regard.

Step 3: Identify the best solution. The lesson for this step is designed to enable students to use a process for evaluating solutions using four standard criteria and then to combine the best options to arrive at the best possible solution.

This step helps students gain a clear picture of the advantages and disadvantages associated with each solution. Students ask themselves the following “PASS”

Keep Your SCORE Checklist

Keep Your SCORE Checklist

Directions: Make a check-mark next to each skill and step that your group used. Then complete the sentences to the right of the lists.

Did we:	For this assignment, our best skill was:
<input type="checkbox"/> Share Ideas?	_____
<input type="checkbox"/> Compliment Others?	_____
<input type="checkbox"/> Offer Help or Encouragement?	_____
<input type="checkbox"/> Recommend Changes Nicely?	_____
<input type="checkbox"/> Exercise Self-Control?	_____

Overall, did everyone remember SEE?	We need to remember to use this skill more often:
<input type="checkbox"/> Sound of our voices was appropriate	_____
<input type="checkbox"/> Expressions were appropriate	_____
<input type="checkbox"/> Eye contact was good	_____

Did we:	The best thing that happened in our group today was:
<input type="checkbox"/> Take apart the problem?	_____
<input type="checkbox"/> Hunt for solutions?	_____
<input type="checkbox"/> Identify the best solution?	_____
<input type="checkbox"/> Note the plan?	_____
<input type="checkbox"/> Keep our SCORE?	_____

Were all members of the group SATISFIED with the solution?	Did all members of the group LIKE the way the team worked together?
Yes No Signature:	Yes No Signature:
_____	_____
_____	_____
_____	_____

questions:

- **Positive:** Is this solution constructive? Is the approach positive rather than negative?
- **Acceptable:** Will most other people understand and cooperate with the solution?
- **Sensible and realistic:** Are time, money, and other necessary resources available to put this solution into effect?
- **Solves the problem:** Will this solution actually solve the problem?

If they answer “yes” to one of these “PASS” questions as they evaluate a given solution, the students put a plus in the appropriate column on the *THINK Worksheet*. If they answer “no” to the question, they place a minus

in the column.

Once all solutions have been rated, students identify the solutions with the most pluses, and they discuss whether or not any of the solutions can be combined. Combination solutions are written on the worksheet as they are created.

Next, the students vote on the solution they think is best, and the solution receiving the majority of votes from members of the group is written on the worksheet.

Teachers have found that they may need to spend extra time explaining the “PASS” rating system. The emphasis needs to be on thinking about each solution and explaining to teammates *why* it should be >>>

>>> given a certain rating.

Too, the concept of combining solutions also can be difficult for students. Sometimes a solution that has received some “minus” ratings can be combined with ones that have mostly “plus” ratings to form a great solution. Thus, modeling how to combine solutions is key.

Step 4: Note the plan. Solutions to problems may sound good until you try to put them into effect.

During this step, students learn how to develop a “plan of action” related to the chosen solution. They name the tasks (or jobs) that need to be completed to carry out the solution. Then, they sequence the tasks and write them on the worksheet.

Whether or not the solution is realistic and can be accomplished with the resources available becomes clear after the tasks have been listed. Then, adjustments can be made in the solution or plan.

Typically, students write each task or job on a different piece of paper. This may seem time consuming to some students; however, the process actually saves time. The notes can be arranged and rearranged in different sequences. Thus, students can organize their thoughts before they write the final list of tasks to be completed on the work-sheet.

Step 5: Keep your SCORE. During this step, students take time to process their teamwork efforts. They review how well they worked together and treated each other, whether they used each step of the strategy, and whether everyone was satisfied with the solution. They discuss what they did well and what they need to improve the next time the team has a problem-

Classroom data

Melynda Rodrigue, a SIM Trainer and teacher in Louisiana, conducted a study of the *THINK Strategy* to determine the effects of *THINK Strategy* instruction on statewide assessment scores (with an emphasis on the Louisiana Science Content Standards within the Science as Inquiry benchmark category). She summarized her results as follows: “I taught science to two classes, but I only did THINK instruction in one of the classes. In Class 1, the THINK group with 20 students (11 were at risk), 95 percent passed the science portion. In Class 2, in which students did not receive THINK instruction, of the 21 students (7 were at risk), 81 percent passed the science portion. The THINK group did better, and they had more at-risk students!”

solving assignment.

Unfortunately, students sometimes forget to complete the *Keep Your SCORE Checklist* (page 3). This is understandable because it is the last step of the *THINK Strategy*, and usually at the end of an activity, students are tired and rushed. Therefore, teachers must leave adequate time and must emphasize that the process of evaluating how well the team worked together is important so that the team will be able to continue doing what worked well and avoid repeating problems.

Application and generalization. After all of the steps of the strategy have been taught, students are ready to apply *all* of the THINK steps to new problem situations. Teachers may create their own situations or use one of the situations provided in the manual.

Teachers have asked students to use the THINK steps to solve a problem that was faced by the pilgrims, that a main character in a story has encountered, or that leaders within their communities are trying to solve. Other teachers have presented social problems that their students are facing in school, such as teasing, cheating, or being disorganized. Students then use the *THINK Strategy* to discuss, brainstorm,

and choose a solution to be tried by the class or to predict how community leaders or others will solve the problem.

The manual

The *THINK Strategy* instructor’s manual contains six lessons and all materials needed for each lesson. The first lesson is a review of the *SCORE Skills*. Lessons 2 through 6 focus on instruction related to each step in the strategy.

Each lesson is presented in two formats: “At-a-Glance” and “Play-by-Play.” The “At-a-Glance” format outlines the major instructional procedures in a one-page lesson guide, while the “Play-by-Play” format provides a more in-depth description of the instructional procedures.

The instructional sequence helps students acquire vocabulary associated with the *THINK Strategy*, learn about the strategy steps, memorize the steps, and practice using the *SCORE Skills* and the *THINK Strategy* in the classroom while working on a variety of problem-solving assignments.

At the end of each lesson, the manual offers several “Take it a Step Further” activities that emphasize the major concepts >>> and skills taught in the

>>> lesson. One of the greatest challenges teachers face is enabling students to understand that the problem-solving skills they are learning are applicable in a wide variety of situations and will be useful throughout their lives. Thus, they need to use a variety of activities to reinforce a concept discussed in the lesson. Helping students to identify situations outside of the classroom where the *THINK Strategy* steps can be applied is also important.

Research results

Twenty teachers and their students participated in the field-test of the *THINK Strategy*. A total of 392 fourth- and fifth-grade students participated in the study:

- 51 percent were female, 49 percent males
- 30 percent represented minority populations (2 percent Native American, 2 percent Asian, 21 percent Black, 4 percent Hispanic)
- 36 percent were students with exceptionalities or at risk for academic failure.

Of the students with exceptionalities, 43 percent were female, 57 percent were male, and 46 percent were minority students.

One of the two major target areas designated for the state accreditation assessment during the time of this study was “problem-solving, reasoning, and communication.”

Teachers in comparison classes developed their own methods for teaching problem-solving, while teachers in the experimental groups used the *THINK Strategy* manual to teach the skills.

Although students in all groups increased behaviors

related to solving problems, students within the experimental classes made more substantial and significant gains in systematically and methodically generating and evaluating constructive solutions, determining the best solution, and developing an implementation plan. Experimental students almost tripled their problem-solving scores while comparison students increased their scores by less than one point.

Significant differences were found between the pretest and posttest performances of students in the classes receiving *THINK Strategy* instruction; significant differences were not found between the pretest and posttest performance scores earned by students in comparison classes.

Pretest and posttest scores related to prosocial behavior (for example, sharing ideas and complimenting others) also were significantly different for both students with and without exceptionalities in experimental classes, but not for students in comparison classes.

Further, the positive opinions (for example, “People help each other when we work in groups”) of experimental students with

exceptionalities were significantly higher after the instruction than before it, and their negative opinions (for example, “Working in groups is unfair because one person does all of the work”) were significantly lower after the instruction than before.

Finally, teachers strongly endorsed the program and provided exceptionally high ratings for each area evaluated.

Students, too, were positive about the program. Eighty-six percent of the students responded that they would recommend the program to other fourth- and fifth-grade students.

In summary

As students learn to use the *THINK Strategy*, they begin to view problems from the perspective of others, as well as from their own perspective. That is, they become more open to looking at a problem from a variety of perspectives to ensure that the final solution is acceptable as well as effective. Once they learn the *THINK Strategy*, they not only have a set of steps for solving problems by themselves and with others, they have a new perspective on dealing with problems altogether. ●

Additional materials

The authors are currently developing and researching professional development packages for each manual in the *Cooperative Thinking Strategies Series* through a grant from the National Institute of Child Health and Human Development. Materials currently available for purchase:

- *The SCORE Skills: Social Skills for Cooperative Groups* manual
- *The SCORE Skills Videotape Program*
- *The THINK Strategy* manual
- *The BUILD Strategy* manual

- *The LEARN Strategy* manual
 - *The Teamwork Strategy* manual
- For more information about purchasing these materials, including current prices, contact Edge Enterprises, Inc., 708 W. 9th Street, #107, Lawrence, KS 66044. Phone: (785) 749-1473; Toll Free: (877) 767-1487; Fax: (785) 749-0207.

In addition, the *THINK Videotape Program* has been successfully field-tested. It will be available in early 2002.

THINKing out of the box

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Problem solving: It is a skill our students need to learn, but it is a difficult instructional challenge in any classroom setting.

Believe it or not, the *THINK Strategy* offers us more opportunities to address this challenge than we might recognize upon initial use of the strategy. It is a matter of “thinking out of the box” as we find creative and authentic ways to apply this important set of skills.

Students need to recognize the universal design of the problem-solving process so they can generalize these skills across settings. Teachers can help students accomplish this by promoting the use of the *THINK Strategy* in diverse situations.

- Don’t just use it at the elementary level; middle and high school students also can benefit from the *THINK Strategy*.
- Encourage use of the *THINK Strategy* to solve authentic issues that students experience. The process can be used to resolve fundraiser issues. It can be used to improve activities from year to year, such as dances, carwashes, how cheerleaders or the band perform at football games, or how team members get along and support the team.
- Use THINK as a way to solve students’ learning issues by having them think about the approaches they use that are or are not working.
- Use the strategy on homework or behavioral issues—sit down

with students and parents to come up with proactive plans that give ownership to students and promote good school/home relationships.

To help ensure successful use of the *THINK Strategy* in varied situations, just modify the terminology to fit the group or need. As long as you have a shared vocabulary or use of terms, the process can be made even more meaningful.

THINK as a set of “mini-strategies”

Each THINK step is beneficial as a skill unto itself. Even in isolation, these steps can be powerful “mini-strategies” to assist students in daily learning processes. For this reason, the steps must be taught thoroughly and explicitly. Additionally, students’ skills should be reassessed

regularly to ensure their accurate and continued use of the steps.

Do we really appreciate what is involved in each step of THINK? The rationale for teaching each step is worth considering.

“T” Step: Take Apart the Problem. Many students do not respond well to reading, writing, and math assessments because they do not accurately or completely address the question that is posed. The T step provides a process that can be generalized across learning tasks to ensure that students meet this requirement.

“H” Step: Hunt for Solutions. The ability to brainstorm as part of a group process is a skill required of anyone working with groups of people. It is a skill our students need in both personal and work relationships throughout life. >>>

Problem of the Week

The “T” Step: Take Apart the Problem

- Identify the exact problem
- Identify all necessary background information
- Eliminate all extraneous information.
- Restate the problem in your own words, with enough information that someone who hasn’t seen the problem could solve it from your restatement. All necessary information is included.

Possible self-questions for this step:

- What do we have to find?
- What do we already know?
- What do we need to know?

The “H” Step: Hunt for Solutions

- First, everyone write down and try one possible solution.
- Second, share ideas with the group; record them on the worksheet and brainstorm new solutions.

Possible self-questions for this step:

- Is this problem like any we’ve done before?
- How will we solve it?
- By guessing, what do we think the answer will be?
- What assumptions did we have to make before we started to solve it?

(Continued on page 7)

In the Classroom

>>> **“I” Step: Identify the Best Solution.** Students often cannot distinguish between or support their reasons for selecting a particular solution to a problem. This step provides concrete rationales for use in their explanations.

“N” Step: Note the Plan. Many assessments require students to develop a plan or explanation that encompasses more than a solution to a problem. This step provides students with specific skill development in supporting a solution.

“K” Step: Keep Your SCORE. The *SCORE Skills* are essential for students to be productive in cooperative groups, learning centers, discussions with adults, or as team members for sports,

committees, and work. Unfortunately, many students have weak skills that create barriers rather than opportunities for learning in cooperative settings.

Modifying THINK

Adaptations can be made to tailor the THINK steps for specific types of problem solving so that the strategy can be used across all subject areas, scenarios, and grade levels. For example, the *THINK Strategy* can be adapted to solve math *Problems of the Week (POWs)*.

POWs are used across elementary and middle school grades to help students become better problem-solvers and to develop their critical thinking skills. One possible format to

adapt the THINK steps is illustrated in the box beginning on page 6. The strategy can be used for groups or can be further modified for individual problem-solving.

Summary

Students can be independent and successful in their use of the *THINK Strategy* if the strategy is applied regularly in class, taught explicitly, and generalized to meet various setting demands.

The adaptations to this strategy are endless if we actively look for opportunities to teach and use THINK whenever a problem-solving approach is warranted.

Be creative and have fun with THINK. It is a lifelong skill that everyone needs to master.

Problem of the Week (cont.)

The “I” Step: Identify the Best Solution

- First, rate the solutions by attempting to solve the problem with each solution.
- Second, decide whether any of the solutions can be combined, and choose a solution.

Possible self-questions for this step:

- What worked?
- What didn't work?
- What did we do when we got stuck?

The “N” Step: Note the Plan

- Explain the strategies used:
 - *Explain how the problem was solved.*
 - *Explain at least three problem-solving strategies used, and a full, detailed description of each strategy used. (Strategies that didn't work also can be listed if they are fully explained, and the reasons they did not work are explained.)*
 - *Include any charts, graphs, pictures, and diagrams used.*
- Show the solution:
 - *Mathematical work is shown.*
 - *Reasons we feel the solution is correct are carefully explained.*

Possible self-questions for this step:

- Does the answer make sense? Why?
- Could there be other answers?
- Did we compare our final answer with our original guess?
- What did we learn from this problem that could help us solve other problems?

The “K” Step: Keep Your SCORE

- Remains the same

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