QualityCore

Professional Development

Educator's Toolbox

Version 2.0
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Introduction

The Educator's Toolbox defines instructional strategies that can be found in ACT's educator's resources. A reference for planning instruction and assessment, it is influenced by the work of Robert Marzano (1998), whose meta-analysis of research on instruction identified nine categories of instructional strategies that were shown to positively affect student achievement. Adopting strategies such as those defined here will help teachers create a rigorous classroom.

Distinguishing features of a rigorous classroom are interconnected. The school promotes rigor by providing a climate of support and respect and by inspiring all students to achieve their potential. The teacher has content expertise, knows his or her students and how they learn, and helps students to expand their thinking and to apply the content. The students are actively engaged in constructing meaning from the content. The content requires deep understanding of essential concepts. Finally, pedagogy incorporates effective instructional strategies. (Figure 1 illustrates the environment of a rigorous classroom.)

![Diagram showing the environment of a rigorous classroom](image)

**Figure 1. The environment of a rigorous classroom**

The strategies in the Educator's Toolbox are arranged alphabetically beginning on page 9, with each strategy assigned a category, a title, and a definition, as illustrated in Figure 2.
Introduction

**3-2-1 Assessment**

A 3-2-1 assessment (Tweed, 2009) is a strategy in which students take stock of their own learning by separating what they know from what they have yet to master. It can be used to quickly assess student understanding any time new information has been presented.

In a 3-2-1 assessment, each student writes on separate slips of paper three things learned, two things not yet understood, and one question still outstanding. When finished, students affix the slips to a bulletin board, poster, or piece of chart paper divided into columns labeled “3,” “2,” and “1.” The teacher can review the notes to construct a portrait of a class’s understanding. The results can serve as a jumping-off point for further class discussion, redirect a planned course of instruction, or alert the teacher to a topic that requires reteaching.

**Figure 2. Illustration of an instructional strategy**

There are four categories:

- Engaging in Inquiry
- Learning Independently
- Monitoring Progress
- Sharing Ideas

The section in this introduction headed Categories lists the strategies by category and briefly describes each category.

There are also four times:

- **Short:** Strategies that can be completed in 15 minutes or less
- **Medium:** Strategies that can take up to a class period or that might require significant effort for students to complete
- **Extended:** Strategies that require more than a class period to complete or that require substantial scaffolding to prepare students to actively engage in the strategy or to master the content or skills taught
- **Ongoing:** Strategies that are used continuously in a classroom and are open-ended with regard to time

Table 1 in the appendix lists the strategies by time.
Neither the categories nor the times should be thought of as rigid. Strategies can be flexible; Journals can be used for Monitoring Progress as well as for Learning Independently; Brainstorming can be used for Sharing Ideas as well as for Engaging in Inquiry; and so forth. And times can be adjusted to particular circumstances. A rigorous classroom sometimes requires adaptable pedagogy.

ACT recognizes that many of the strategies defined here have been used in classrooms for many years. Strategies are adapted and sometimes revised entirely, according to the needs of ever-changing classrooms. In that process, some strategies are given new names and more elaborate definitions. It has not been ACT's aim to provide an exhaustive survey of all strategy variations. Rather, the aim has been to define each strategy accurately and clearly, with sufficient detail such that it might be reproduced in the classroom. ACT recognizes that teachers will build upon this work, adopting the strategies defined here and adapting them to best suit the dynamic environment of the classroom and the needs of their students.

Categories

Engaging in Inquiry

Strategies for engaging in inquiry help students learn to identify and solve problems, formulate and investigate questions, and reach consensus about their findings. The strategies include:

- Activities for generating ideas, such as Brainstorming
- Strategies for solving problems, such as the IDEAL Problem-Solving Model
- Strategies for extended exploration, such as WebQuest
- Strategies for forming consensus, such as Multivoting

For Harvey and Daniels (2009), inquiry consists of three essential strands: student-generated questions that are shaped by student interest and information, student-led or student-driven investigations that encourage work resembling that of professionals, and higher-order thinking that moves students toward the evaluation of information and creation of knowledge (pp. 56–57). One type of inquiry is not necessarily better than another; rather, the level of inquiry that students engage in should be determined by instructional goals and student experience. Inquiry activities fall along a continuum, depending on the amount of information the teacher provides and the level of complexity the activity requires.

Inquiry has been shown to have a significant impact on student achievement and engagement (Newmann, 1996). Smith and Wilhelm (2006) point to the ability of inquiry to meet students' needs by actively involving them in the learning process and the creation of products that show deep learning and mastery of subject matter. In addition, Wilhelm and Wilhelm (2010) found inquiry instruction to
have an almost unanimously positive effect on student achievement scores, process skills, and attitudes.

Strategies
7E Learning Cycle and Instructional Model
Brainstorming
Brainwriting
Carousel Brainstorming
Coupled-Inquiry Cycle
Critical Thinking Verbs
Decision Making
Fist-to-Five
Four-Resource Model
IDEAL Problem-Solving Model
Multivoting
Round-Robin Brainstorming
Socratic Seminar
Team-Pair-Solo
WebQuest

Learning Independently
Strategies for learning independently support students as they approach challenging tasks, take stock of what they know, and learn to modify or adjust their own thinking. The strategies include:

- Discrete reading strategies, such as Annotation
- Visual representations, such as Mind Map
- Cognitive monitoring strategies, such as Learning Log
- Self-assessment strategies, such as Self-Questioning

Because they support a learner’s knowledge, monitoring, and regulation of his or her own cognitive processes, the strategies for learning independently are metacognitive. This means they help students develop the following kinds of knowledge:

- **Strategic knowledge**, which introduces students to general thinking, learning, and problem-solving strategies
- **Task knowledge**, which builds upon students’ strategic knowledge, matching different cognitive tasks to appropriate and useful learning strategies
- **Self-knowledge**, which, by building on students’ experience with task knowledge, helps students develop an accurate understanding of their own cognitive strengths and weaknesses
Introduction

Practice with independent learning strategies also helps students develop metacognitive control, which involves monitoring—the ability to accurately judge their cognitive processes—and regulation—the ability to improve cognition by shifting or changing their metacognitive strategies. Metacognitive control is applicable across a range of cognitive processes, including the simple task of recalling information and the more complex tasks of analyzing and evaluating information and creating new knowledge.

Metacognitive ability contributes significantly to student learning (Veenman, Wilhelm, & Beishuizen, 2004). Classroom instruction should therefore work to develop students' self-awareness as learners. Classroom instruction should also include multiple opportunities for reflection (Desautel, 2009). When embedded into a range of classroom activities, the strategies for learning independently provide students with ongoing training and practice.

Strategies
Advance Organizers
Annotation
The Cornell Note-Taking and Q Systems
Double-Entry Journal
Frayer Model
Graphic Organizers
Journals
Learning Log
Mind Map
Question-Answer Relationships (QAR)
Scientific Terminology Inventory Probe (STIP)
Self-Questioning
Survey, Question, Read, Recite, and Review (SQ3R)
Visualization
Word Wall
Introduction

Monitoring Progress

Strategies for monitoring progress support ongoing student improvement by creating a constant stream of information about where students are in the learning process. This helps teachers adjust their instruction to meet students’ needs. It also gives students opportunities to reflect on their learning throughout the course of a unit or academic year. Strategies for monitoring progress include:

- Simple checks of understanding, such as Muddiest Point
- Teacher-generated observations, such as Anecdotal Notes
- Student-to-student assessments, such as Praise-Question-Polish
- Ongoing assessments, such as Portfolios

Because they occur throughout the learning process, help teachers adjust instruction, and provide feedback to students about how they might improve their performance, the strategies for monitoring progress function as assessments for learning. That is, they are fluid assessments that function primarily to further student progress, not simply to measure achievement at a predetermined point in the learning cycle. According to Stiggins (2002, p. 5), teachers use assessments for learning to support, among others, the following goals:

- *Developing student confidence:* Through continuous communication of student progress, assessments for learning help students become more confident learners, which ultimately helps them take responsibility for their own learning.

- *Providing descriptive feedback:* Assessments for learning can be translated into descriptive feedback for students. Such feedback can help guide students’ work and future learning.

- *Encouraging student self-assessment:* Assessments for learning help students monitor their own progress and take ownership of their academic challenges and successes.

The benefits of monitoring progress are well documented by scholars such as Black and Wiliam (1998), whose study indicated a significant relationship between formative assessment and student achievement. From another perspective, the positive effects of assessment for learning are estimated to be four to five times greater than reduced class size (Elhrenberg, Brewer, Gamoran, & Willms, 2001). When incorporated into everyday instruction, then, strategies for monitoring progress can become powerful tools for teaching and learning.
Strategies
3-2-1 Assessment
Anecdotal Notes
Asking Questions
Background Knowledge Probe
Cloze Passage
Commit and Toss
Designing Exam Questions
Empty Outline
Entrance and Exit Slips
Exposition and Questioning
Focused Listing
Gallery Walk
Hand Signals
Index Card Assessment
K-W-L
Memory Matrix
Misconception Check
Muddiest Point
Plus/Delta
Portfolio
Praise-Question-Polish (PQP)
Question Box
Quick Write
Star-and-a-Wish
Think-Aloud
Traffic Light Icons

Sharing Ideas
Strategies for sharing ideas support students as they practice communicating their thoughts in a variety of contexts. The category thus serves as an umbrella for a broad range of strategies, including:

- Whole-class activities, such as Line-Up
- Small-group strategies, such as Think-Pair-Share
- Collaborative performance strategies, such as Reader’s Theater

Giving students opportunities to share ideas engages them in cooperative learning. Successful cooperative learning requires that group members rely upon each other, communicate clearly, work together productively, and reflect upon and adjust their performance as necessary to maintain group effectiveness (Johnson, Johnson, & Holubec, 1993). This means that, to be successful in small-group work, students must learn to communicate their ideas effectively.
Effective cooperative learning takes effort, but the effort is worthwhile: the benefits of cooperative learning in areas such as academic achievement, time on task, interpersonal relationships, and critical reasoning are well documented (see Cohen, 1994; Gillies, 2003; Johnson & Johnson, 1999; Johnson, Johnson, & Stanne, 2000; Johnson & Johnson, 2007; Lou et al., 1996). The strategies for sharing ideas support cooperative learning by developing students' abilities to work together and contribute to group conversations and tasks.

**Strategies**
- Active Listening
- Circle of Interviews
- Fishbowl
- Four Corners
- Jigsaw
- Line-Up
- Pass the Whiteboard
- Rally Coach
- Reader's Theater
- Reciprocal Teaching
- Say Something
- Tableau Drama
- Team-Then-Teacher (TTT)
- Think-Pair-Share
- Three-Minute Review
- Three-Stage Scaffolding Process
- Whiteboard Presentations
Instructional Strategies

3-2-1 Assessment

<table>
<thead>
<tr>
<th>Monitoring Progress</th>
<th>Short</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 3-2-1 assessment (Tweed, 2009) is a strategy in which students take stock of their own learning by separating what they know from what they have yet to master. It can be used to quickly assess student understanding any time new information has been presented.</td>
<td></td>
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</tbody>
</table>

In a 3-2-1 assessment, each student writes on separate slips of paper three things learned, two things not yet understood, and one question still outstanding. When finished, students affix the slips to a bulletin board, poster, or piece of chart paper divided into columns labeled “3,” “2,” and “1.” The teacher can review the notes to construct a portrait of a class’s understanding. The results can serve as a jumping-off point for further class discussion, redirect a planned course of instruction, or alert the teacher to a topic that requires reteaching.

7E Learning Cycle and Instructional Model

<table>
<thead>
<tr>
<th>Engaging in Inquiry</th>
<th>Extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Built on the 5E Model developed by Bybee (1997), the 7E Learning Cycle and Instructional Model (Eisenkraft, 2003) is a progressive series of steps designed to support students during inquiry-based classroom activities. The strategy consists of the following stages:</td>
<td></td>
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</tbody>
</table>

1. **Elicit:** Recognizing that students construct knowledge from the knowledge they already have, this stage involves discovering and assessing students’ prior knowledge. Failure to elicit prior knowledge may result in students’ retaining or developing misconceptions of the material to be learned.

2. **Engage:** Engaging students involves generating excitement for what is to come in the learning cycle through an interesting question, an engaging story, or a surprising demonstration.

3. **Explore:** In this stage, students observe phenomena, record observations, design and plan investigations or experiments, and compile the results of their investigations or experiments. It is a good time for the teacher to interact with groups, provide feedback, ask questions, and further probe students’ understanding.

4. **Explain:** Students learn about models, laws, and theories that help to explain what they have found. Afterward, students present their findings in terms of the overarching ideas they have just learned. The teacher assists by ensuring that students understand major concepts and are using new terminology correctly.
Instructional Strategies

5. *Elaborate*: Students apply what they have just learned to the situation at hand. This stage can include generating further questions or crafting hypotheses.

6. *Evaluate*: Evaluating includes using both formative and summative assessments to monitor students’ progress. This stage can also include student self-assessment.

7. *Extend*: The final stage engages students in transferring knowledge. Its purpose is to make sure that students can apply what they have learned to new contexts.

Active Listening

<table>
<thead>
<tr>
<th>Sharing Ideas</th>
<th>Ongoing</th>
</tr>
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</table>

Active listening requires several interconnected skills: demonstrating careful attention to both verbal and nonverbal communications; clarifying a speaker’s message by asking questions or paraphrasing; giving thoughtful, empathetic feedback; and sharing. It is an essential element of productive group work and a foundational building block for students as they work together to engage in inquiry. The following advice can be used to coach students to improve their active listening skills:

- Use "I" statements to demonstrate understanding (e.g., "Let me see if I understand. I heard you say . . .").
- Ask questions to gather additional information, refine ideas, resolve misperceptions, and/or extend the conversation.
- Restate or reframe ideas to affirm understanding, avoid wrong assumptions, and foster dialogue.
- Provide feedback using a tone that demonstrates openness, empathy, and support (e.g., answer the speaker’s questions; make nonjudgmental comments like “That’s an interesting point”).
- Recognize your own values and biases, and understand how they may interfere with listening.
- Know how to conclude a conversation (e.g., be reflective, indicate appreciation, apply information to a new situation).
- Prepare for listening (e.g., review what you already know about the topic).
- Use your body to demonstrate attention or support (e.g., face the speaker; make eye contact; use appropriate facial expressions, body movements, and posture).
- Use silence or lulls in the conversation to think through points made and/or to encourage more disclosure.

Active listening is a skill that requires ongoing practice. Whether students are listening to a lecture, working in pairs, or sharing ideas in a group, they should continually work on this skill.
Advance Organizers

As defined by Ausbel (1960), advance organizers are introductory materials that help students approach, make connections to, and master new content. They support students' metacognitive growth by providing a frame to use when encountering new concepts or ideas.

Advance organizers reflect Ausbel's theory that we organize information in an orderly fashion, placing new ideas into larger categories of knowledge that allow us to make sense of what we are learning (Ivie, 1998, p. 37). Advance organizers do this by encouraging students to recall relevant prior knowledge they might have, calling students' attention to what will be important in an upcoming lesson or unit, and highlighting relationships between ideas that will be presented (Woolfolk, 2003, p. 282).

There are two common types of advance organizers:

- **Expository organizers** are used when material is completely unfamiliar to students. They provide new, often contextual information that will help students understand what they are about to learn. When students receive biographical information about the author of a text they are about to read, they are receiving an expository advance organizer.

- **Comparative organizers** are used when material is somewhat unfamiliar. They highlight ways in which the material to be learned can be compared to what has already been learned. A comparison/contrast exercise that helps students draw connections between what they have learned in a previous unit and what they will learn in the next is a comparative advance organizer.

Mayer (1979) has constructed a checklist that can be used to determine whether an advance organizer supports student learning. His checklist includes the following questions:

- Does the advance organizer allow students to make connections or draw relationships between concepts to be learned?
- Does the organizer support students as they make connections between what they already know and what they will learn?
- Is the organizer "learnable," or is it easy for students to use?
- Does the organizer provide students a way to relate to new material that they would not already have or think to use? (p. 382)

Because advance organizers are a strategy for learning new content, they should be used at the beginning of a lesson or unit.
Instructional Strategies

Anecdotal Notes

<table>
<thead>
<tr>
<th>Monitoring Progress</th>
<th>Ongoing</th>
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Lampert (2001) writes that there is a balancing act in managing “the tension between working with individuals and working with the whole class” and “the conflict between leaving students alone to see what they can do on their own and guiding their activity to make it productive” (p. 121). Taking **anecdotal notes** about students’ work during class can help create that balance. Bomer (1995) recommends taking notes on a clipboard, keeping a record of students’ strengths and struggles throughout each class period. Notes should be reviewed frequently and used as a guide for adjusting instruction. The notes will always be imperfect and incomplete, but over time they will construct a running history of students’ effort, classroom experiences, and learning.

Anecdotal notes may also be used to communicate information to parents. The teacher may choose to send a note home describing a student’s accomplishment, or notes may be used in a more formal setting to describe a student’s overall progress (Helm, Benecke, & Steinheimer, 1998).

Annotation

<table>
<thead>
<tr>
<th>Learning Independently</th>
<th>Medium</th>
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**Annotation** is a way for students to “enter into a conversation with the text they are reading” (Brown, 2007, p. 73). It can include brief comments on a sticky note or in the margin of a book as well as symbols that denote agreed-upon meanings.

Teachers often annotate students’ writing, but students also gain by annotating their own work. Teaching students how to annotate as they read helps them become active readers because they learn to read more carefully and to see reading as a process. Most importantly, teaching annotation improves students’ reading comprehension (Porter-O’Donnell, 2004).

Brown (2007) introduces his students to annotation with the following series of conversations:

- In small groups, students review a text that has been annotated. They take notes on the annotations, paying special attention to the types of information the annotations provide.

- As a class, students discuss what good annotations can do for the reader. Their suggestions might include defining unfamiliar words, providing background information, pointing out connections to other texts, and helping to explain what is going on in the text.
Instructional Strategies

• Students discuss ways that a reader can connect to a text. They might suggest ideas that remind the reader of a childhood experience, provide a different perspective on a common experience, or teach the reader something new.

From these conversations, students are ready to create their own annotations. Working independently with a short passage, they note their own annotations. To guide their work, Brown provides the following guidelines:

• Look at vocabulary words. Define them and think about how the author uses them.

• Try to connect what you are reading to what you have already read.

• Think about connections you can make to other media such as movies or websites. Think about photos that come to mind.

• If you are struggling with a difficult part of the text, try to rewrite or summarize it in your own words.

• Think of and list connections between the text and your own life.

• List background knowledge, such as historical context, that helps to clarify what is happening in the text.

• After reading, analyze the text, such as by restating its thesis and examining how the author uses evidence to substantiate his or her point.

When students begin annotating, it may help to use commonly generated and agreed-upon symbols, such as the following two-mark system:

• Question marks represent text the student does not understand or has questions about.

• Stars represent text the student is confident about.

After students complete an annotation, they should be given time to compare their interpretations with a partner and to reflect on their work. This can help them think about and improve upon their annotations.
Instructional Strategies

Asking Questions

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<th>Monitoring Progress</th>
<th>Ongoing</th>
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Asking questions is essential to every effective classroom discussion, whether class-wide or in small groups. As Brualdi (1998) says, questions

- promote active student involvement;
- invite students to express their thoughts and ideas, giving voice to multiple perspectives on a given topic; and
- help to clarify students’ questions or possible misunderstandings.

Questions exist on a range from lower to higher order (Gayle, Preiss, & Allen, 2006). Lower-order questions prompt group members to recall what they have already learned, while higher-order questions encourage them to move beyond rote knowledge to apply, analyze, evaluate, and ultimately create knowledge. The following guidelines, suggested by Brualdi (1998), can help teachers model how to ask questions and respond to answers effectively:

- Use clear language, and ask questions that are primarily academic in nature.
- Provide three to five seconds of wait time before asking other group members to respond.
- Give some sort of response to every question asked.
- Encourage both volunteers and nonvolunteers to respond.
- Work toward deeper understanding by asking for responses to be clarified, positions to be supported, and/or ideas to be expanded upon.
- Help students who answer incorrectly; use specific feedback and/or praise to acknowledge correct answers.
- Avoid trick, vague, and overly abstract questions.

Studies suggest that exposure to higher-order questions can improve students’ thinking capacity and overall academic achievement (Dornisch & Sperling, 2004; Gayle, Preiss, & Allen, 2006). As students learn to answer higher-order questions, they are able to think more critically about the content they are learning. Research suggests that students’ answers can match the cognitive level of questions they are asked (Gayle, Preiss, & Allen, 2006).
Background Knowledge Probe

A background knowledge probe (Angelo & Cross, 1993) is a short questionnaire used to determine students' prior knowledge about and readiness to begin a new course or unit. Students are asked to respond to a few short-answer or multiple-choice questions that probe their understanding of the skills and knowledge they will need to succeed in the course or unit. The questionnaire highlights the concepts that will be important to students' learning.

Teachers can use student responses to a background knowledge probe to assess gaps in student preparedness and to adjust their instructional plans for maximum effectiveness. Because the questionnaires are usually ungraded, teachers can share with students how their responses may have changed the syllabus. Teachers can also use the questionnaires to point out how students can build upon their prior knowledge.

Brainstorming

Brainstorming is a strategy aimed at generating the maximum number of creative ideas possible in a given period of time. Brainstorming is important because generating ideas is a critical first step in many inquiry activities.

First outlined by Osborn (1953), an advertising executive who wanted to formalize a way for his colleagues to share ideas, the original brainstorming method included four guidelines:

- Criticism of others' ideas is not allowed.
- All ideas are welcome.
- The more ideas generated, the better.
- Combining and improving upon ideas is encouraged.

Brainstorming as it was presented in the 1950s has come under fire from researchers who recognize that the strategy invites problems of social loafing, pressures to conform, and production blocking, which occurs when participants...
Instructional Strategies

must wait to share their ideas (Isaksen, 1998). Attempts to overcome these challenges have resulted in the following suggestions by Isaksen and Gaulin (2005):

- Provide students with reflection time before and after a brainstorming session. This can help to ensure that brainstorming supplements rather than replaces individual thinking.
- Appoint a student in each group to serve as a facilitator. The facilitator can help to promote a continuous flow of ideas, encourage everyone to participate, and ensure all ideas are heard and recorded.
- Avoid relying on the strategy too heavily. Brainstorming is one of many different and effective ways to generate ideas.

After a brainstorming session, students can also be stymied by the question of what to do with so many new ideas. To help them overcome this problem, consider showing them how to construct an affinity diagram or other visual representation for organizing ideas. To create an affinity diagram, students should first write each idea on an index card or sticky note. Second, they should spread the ideas out so everyone can see them. Third, they should sort the ideas into like groups. Students should label each group according to the larger issue or topic that emerges, and they should discuss the completed diagram to reach a final consensus. This should help students understand their ideas enough to act upon them.

When used correctly, brainstorming can be a powerful tool for generating creative ideas. Although students may not have experience sharing their ideas in such a freewheeling manner, it should take no more than a class period for them to gain a sense of what a brainstorming session should entail. However, students who serve as facilitators may need more time to practice their roles.

Brainwriting

| Engaging in Inquiry | Medium |

Brainwriting is an alternative to brainstorming that involves having group members interact via reading and writing rather than speaking and listening (Brown & Paulus, 2002). Brainwriting typically includes the following steps:

1. Identify a topic or subject that students will be studying.
2. Assign students to groups of no more than four students each.
3. Have students record what they know or think they know about the topic or subject for a given period of time.
4. When time is up, have students pass their writing to another group member.

5. Assign a period of time for students to review each other's writing, adding more and/or asking questions, in writing.

6. Repeat steps 4 and 5 until all students in a group have reviewed each other's writing. Each group should then review all the ideas generated through the process.

Brainwriting can be particularly effective with students who are not used to working with one another or contributing ideas verbally. In fact, a study by Paulus and Yang (2000) found that participants who wrote down and shared their ideas using a process similar to brainwriting generated more ideas than groups who used traditional brainstorming.

**Carousel Brainstorming**

First developed by Kagan (1994), carousel brainstorming is a group strategy that engages every student in generating new ideas. A variation of traditional brainstorming, this strategy involves small groups who begin their work at assigned stations (home stations). For a set period of time, students brainstorm ideas about a given topic or question, recording their ideas on a large piece of paper or whiteboard. When time elapses, groups rotate among the stations. At each new station, students read the new question and the previous group's responses, and then they add their ideas to the list generated by the previous group(s). The activity ends when groups arrive at their home stations and review and comment on what other groups have written.

Nessel and Graham (2007) elaborate on the process of carousel brainstorming. They recommend the following guidelines:

- Keep groups small and focused. Carousel brainstorming works best when groups comprise no more than four students.

- Assign a responsibility to each student in a group. One student might serve as a timekeeper, another might be the writer, and another might speak for the group when it is time to share thoughts with the whole class.

- Choose a thought-provoking topic or subject for the brainstorming session. This might serve as a review of what students have already learned, or it might prepare students to learn new material.

- Equip each group with a marker of a unique color. The marker color will distinguish one group's comments from another's.
Instructional Strategies

- Give groups at least five minutes to generate and record their responses to the topic or subject at hand. Ideas should be recorded as fully as possible to ensure they are well represented.

- After a home group has reviewed and commented upon the other groups’ additions, invite a representative of the group to share with the class what the group found to be most interesting. Group members should also ask questions generated from the review.

- Give students time for reflection at the conclusion of the activity. Groups should reflect on the process as a whole, and individuals should reflect on what they contributed to the group’s efforts. (pp. 28–30)

Because carousel brainstorming involves coordinated movement and timed responses, it may take students a few sessions before they participate in the strategy effectively. Carousel brainstorming is worth the time investment however, because of the many skills it requires of students, including reading, generating ideas, asking questions, and sharing ideas with the entire class.

Circle of Interviews

<table>
<thead>
<tr>
<th>Sharing Ideas</th>
<th>Medium</th>
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</table>

Circle of interviews is a strategy for cooperative learning that promotes team building in groups of four students each. It creates a structured medium for students to introduce themselves and encourages students to rely upon each other to complete a task successfully.

Jacobs, Power, and Loh (2002) recommend the following steps for conducting a circle of interviews:

1. Assign a topic or task for discussion. The teacher may construct the topic or task prior to the beginning of class.

2. Student A interviews student B. At the same time, student C interviews student D.

3. Reverse the roles: student B interviews student A, and student D interviews student C.

4. In turn, each student reports to the other group members what he or she learned (e.g., “Let me tell you what Marcos said about his summer job at the convenience store”).

5. If time permits, group members ask each other follow-up questions.

In addition to being a good icebreaker, circle of interviews can serve as a tool for previewing or discussing learning. For example, students might use circle of interviews prior to instruction to share prior knowledge about the day’s topic. Similarly, they might use the strategy at the end of the class period to review what they have learned and clarify points of confusion. Circle of interviews works best when students explore open-ended questions that can be answered in multiple ways.
Cloze Passage

First developed by Wilson Taylor in the early 1950s, cloze passages contain systematically deleted words that the reader supplies as he or she works through the text. Cloze passages differ from traditional fill-in-the-blank exercises in that the procedure is applied to a passage rather than to an isolated sentence (Steinman, 2002). Because they allow the reader to rely on context to make meaning, cloze passages are a useful tool for diagnosing reading comprehension; they can also be used to introduce new content in the classroom. Cloze passages require that students draw on their background knowledge of a subject. Cloze passages also can help develop students' critical reading skills, and they can sharpen students' awareness of their reading process (Chatel, 2001). While traditional cloze passages delete every nth word from a passage, newer models either delete a specific type of word, or they delete certain content words (Steinman, 2002). In some cases, students are given a list of words to choose their answers from (Palumbo & Loiacono, 2009).

When administering a cloze passage, advise students to read the entire passage before they begin to fill in the blanks. Encourage students to fill in each blank to the best of their ability, and then ask them to reread the entire passage once they have completed their work (Chatel, 2001). Newer cloze passages are typically untimed, and synonyms or related words can be considered correct.

Commit and Toss

Commit and toss (Keeley, 2008) is a peer evaluation and writing strategy structured to discourage students from evaluating each other and encourage them to evaluate each other's effort. In a commit and toss, students first respond in writing to a question or prompt. Second, they wash up the paper and toss it across the room. Each student then collects a nearby paper wash to read aloud in a guided class discussion. The discussion, led by the teacher, promotes an environment in which all students participate in evaluating and revising the writing to make it better. Because commit and toss involves the entire class, it lends itself to brief writing exercises. For that reason, the strategy can be especially effective when students are learning to ask questions or write thesis statements and hypotheses.
Instructional Strategies

The Cornell Note-Taking and Q Systems

The Cornell Note-Taking System is a strategy for organizing notes. For this system, students should create note-taking pages with wide left and bottom margins. Pauk and Owens (2005) outline the following steps for preparing and taking Cornell Notes:

- Students should draw a vertical line down the left side of the paper, two-and-one-half inches from the edge. This wide left margin is the cue column.
- Students should then draw a line two inches from the bottom of the paper. This space is the summary area.
- The space to the right of the cue column and above the summary area is space for taking notes. Because classes have different lecture formats and because students have individual note-taking styles, the form the notes take does not matter. Students should write legibly and try to express their thoughts as clearly as possible. (This will make working with the notes easier.)
- When students review their notes, they should use the cue column to clarify meanings and show connections between concepts. They should also write statements that prompt them to remember important information.
- Students should use the summary area to write a one- to two-sentence overview of the notes on the page. (pp. 207–208)

Cornell Note-Taking can also be used for Pauk and Owens's Q System, which encourages students to target the key ideas in their notes. As they review their notes, instead of writing cues, students should write questions that require important information to answer.
Coupled-Inquiry Cycle

Dunkhase (2003) developed the coupled-inquiry cycle to ease students into a collaborative, inquiry-based classroom. Coupled inquiry pairs an initial, teacher-guided investigation with a second, student-directed investigation.

There are six steps to the cycle:

1. *Invitation to Inquiry*: A hook to pique students' curiosity about the concept being explored
2. *Guided Inquiry*: An investigation into the concept that is more-or-less teacher-led
3. *Explore on Your Own*: A chance for students to explore and ask questions about the materials for the investigation
4. *Open Inquiry*: A student-directed investigation exploring questions raised during "Explore on Your Own"
5. *Inquiry Resolution*: An exploration and evaluation of the conclusions reached after the students' investigation
6. *Assessment*: Formative and summative assessments of students' learning

Figure 3 illustrates the interrelationship of the steps. The coupled-inquiry cycle is a process, Dunkhase says, that gives teachers and students the structure necessary to realize the possibility of inquiry-based learning.
**Critical Thinking Verbs**

<table>
<thead>
<tr>
<th>Engaging in Inquiry</th>
<th>Ongoing</th>
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</table>

The following verbs correlate with the six levels of thinking in the revised Bloom's Taxonomy (Anderson & Krathwohl, 2001):

- **Remember**: recognize, recall, identify, retrieve, define, memorize, repeat, label, tell
- **Understand**: interpret, clarify, paraphrase, translate, give an example of, illustrate, classify, summarize, predict, infer, compare, contrast, map, match, explain, demonstrate, restate, rewrite, identify, locate
- **Apply**: execute, carry out, implement, use, proceed, employ, solve, simulate, demonstrate, dramatize, calculate, experiment
- **Analyze**: differentiate, discriminate, distinguish, select, organize, integrate, parse, structure, compare, contrast, deconstruct, classify, select, subdivide
- **Evaluate**: check, detect, monitor, test, critique, judge, defend
- **Create**: generate, hypothesize, plan, design, produce, construct

Posting these verbs in a prominent place in the classroom calls attention to the difference between lower- and higher-level tasks, and it helps raise the level of classroom discussion (Lindsay et al., 2006). Students can reference the verbs to determine what sorts of questions to ask to complete an assigned task, or they can use the verbs as a check to analyze the effectiveness or appropriateness of their questions. This supports students as they work to develop self-questioning skills and as they engage with each other in inquiry activities.

**Decision Making**

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<tr>
<th>Engaging in Inquiry</th>
<th>Extended</th>
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**Decision making** can be complicated, especially when more than one person is involved. The following process can be used to help small groups make sound and thoughtful decisions.

1. **Define the decision to be made.** Agreeing on the decision to be made will focus a group's discussion and clarify its ultimate goal. Students should discuss questions, such as “What is the assignment asking us to do?” and “What problem are we trying to solve?” The group should then write a one-sentence description of the decision to be made.

2. **Generate possible options.** The goal here is to think of as many different decisions as possible. To ensure that everyone in the group has a chance to contribute ideas, the group might try brainstorming, brainwriting, or carousel brainstorming.
3. *Establish criteria.* Criteria are a way of determining whether a possible option might work. To be most effective, the criteria should focus on whether a decision is doable or realistic, whether it will help the group do its work effectively, and whether it will meet everyone’s needs. Students should list five criteria that they will use to choose the best decision, and then they should evaluate which criteria are most important and which are least important.

4. *Evaluate the options and choose the best.* A group should review the options generated in step 2 against the criteria established in step 3. Students should consider the pros and cons of each option to make their choice. To examine each option in depth, they might try the “Six Thinking Hats” strategy (de Bono, 1999). In this strategy, every group member approaches a possible option from a different angle:
   - **White Hat:** This person contemplates each option from a data-based point of view. The person wearing this hat might ask: “Are there enough people in our group to complete the work?” and “Will this option let us complete our assignment on time?”
   - **Red Hat:** This person judges each option by intuition. This person might ask: “Does this option feel right?” “How does this option sit in my gut?” and “How will others react emotionally to this option?”
   - **Black Hat:** This is the devil’s advocate of the group, assigned to think of why each option might not work. This person’s job is to point out weaknesses and ask tough questions about each option.
   - **Yellow Hat:** This is the positive person in the group, assigned to think of the benefits and positive aspects of each option.
   - **Green Hat:** This person evaluates each option from a creative standpoint. This person is assigned to contribute new ideas and explore new possibilities.
   - **Blue Hat:** This person manages the whole process. The person with this role is responsible for keeping the group’s discussion on track and moving forward.

5. *Monitor the effects of the option chosen.* Once students have made their choice, they should keep track of how it is working for the group. Sometimes there may be unexpected obstacles or roadblocks. Groups should not be afraid to revisit decisions and revise their thinking.
**Instructional Strategies**

**Designing Exam Questions**

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<th>Monitoring Progress</th>
<th>Medium</th>
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Students' learning may be assessed by asking them to **design exam questions** (Tweed, 2009). To use this strategy, ask students to craft a predetermined number of exam questions—two should suffice. After writing their questions, students should also write explanations of the correct and at least one incorrect answer. (In mathematics, writing an explanation should include showing all work.) Finally, students should submit their questions and answers to the teacher for review.

The exam questions students design are good representations of students' understanding at any given time. After all, designing the questions requires that students have a solid grasp of the materials that have been presented—put simply, students must know what to ask a question about. Requiring students to explore their own understanding by answering and explaining their answers takes students' learning one step further. Finally, asking students to provide and explain an incorrect answer can reveal possible misconceptions that students may have.

The exam questions students design can help them assess their own learning. The questions can also serve as a jumping-off point for further class discussion. Finally, a teacher might want to use the questions in a specially crafted exam at the end of a unit.

**Double-Entry Journal**

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<th>Learning Independently</th>
<th>Ongoing</th>
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A **double-entry journal** is a writing strategy that emphasizes reflection (Hughes, Kooy, & Kanevsky, 1997). As such, it helps students develop metacognitive monitoring skills. A double-entry journal is typically used for exploring ideas presented through readings (Brewster & Klump, 2004), lectures, presentations, class discussions (Hughes et al., 1997), or anything that might be thought-provoking.

An entry in a double-entry journal can take up facing notebook pages, halves of a sheet of paper divided vertically down the center, or even adjacent columns of a table (L’Allier & Elish-Piper, 2007). On the left, a student transcribes or summarizes an important, intriguing, or confusing point from the text. On the right, the student reflects upon what he or she transcribed or summarized. Taken together, the pair of entries forms a conversation between the source and the student. This is why the strategy is sometimes called a “dialogic” or “dialogue” journal: its form represents a kind of dialogue (Kuzma, 1994).

When asking students to keep a double-entry journal in class, Hughes et al. (1997) recommend planning time after a reading, discussion, or lecture for students to write their reflections. To encourage students’ thinking and shared exploration.
the journal entries can then be used as jumping-off points for small-group
discussions (Hughes et al., 1997; L’Allier & Elish-Piper, 2007).

**Empty Outline**

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<th><strong>Monitoring Progress</strong></th>
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An empty outline is best used when a great deal of structured content must be presented, such as in a lecture (Angelo & Cross, 1993). It can help students develop skills of listening, note taking, and, with clear and supportive feedback, organization.

Beginning with a detailed outline of a lecture, decide whether students should pay most attention to its topics, subtopics, or supporting details. Then, prepare a partial outline, omitting the topics, subtopics, or supporting details from it. After the lecture, ask students to fill in the blanks in the partial outline. Completing the outline demonstrates students' mastery of the material and shows students how topics, subtopics, or supporting details relate to one another.

It is important to be judicious when choosing what to omit. Angelo and Cross (1993) recommend limiting the empty outline to at most half of the lecture.

**Entrance and Exit Slips**

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<th><strong>Monitoring Progress</strong></th>
<th><strong>Short</strong></th>
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Entrance and exit slips (Brewster & Klump, 2004) are quick in-class writing exercises frequently used to discover what students know about the day's topic. It is a good idea to limit students' writing by taking the term slips to heart and limiting the size of the paper on which they write, so the responses can be reviewed quickly and easily in or after class.

In a classroom where every student has a laptop or tablet computer or in a classroom where students are adept at text messaging, consider using a classroom response system, online poll, survey application, or messaging service as the medium for the entrance or exit slip. In keeping with the idea of brevity, such services and applications can be set up to restrict the length of students' responses. Moreover, because they are online, they can be delivered and collated instantly and analyzed nearly as fast.
Instructional Strategies

Exposition and Questioning

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<th>Monitoring Progress</th>
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<tr>
<td>One way to make teaching flexible and responsive is to practice exposition and questioning (ACT &amp; The Education Trust, 2005). During a lecture or an extended explanation, a teacher engages in reciprocal questioning by asking questions to check for student understanding and answering student questions as they arise. Cues and questions (Marzano, Norford, Pavneter, Pickering, &amp; Gaddy, 2001), in which a teacher uses cues to prompt students' engagement with important information, is a similar strategy. In practice, the questions a teacher asks range from simple questions meant to clarify information to complex questions aimed at identifying perspectives and exploring the implications and consequences of student responses. In addition, students are encouraged to take notes during class. Teachers review these to help ensure understanding. This ongoing communication between teacher and student allows the teacher to continually monitor student progress and adjust his or her teaching to meet students' needs.</td>
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Fishbowl

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<th>Sharing Ideas</th>
<th>Extended</th>
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<tr>
<td>The fishbowl is a strategy in which a small group of students holds a discussion while the remainder of the class observes. The strategy tends to be most successful when students are well prepared and the subjects they discuss invite controversy or multiple interpretations (Dutt, 1997; Pries, 1993; see also Young, 2007). It has been shown to have a positive effect on collaboration (Miller &amp; Benz, 2008). To prepare for a fishbowl, assign a discussion-worthy reading. After students read it—several times, if possible—ask them to write higher-order questions that move beyond simple knowledge-based or comprehension questions. Then, students should set criteria to guide the discussion they will have. For example, Pries (1993) expected her students to support what they said with evidence, be actively involved in the discussion, use appropriate language for the discussion, and speak clearly and appropriately (p. 50). To conduct a fishbowl discussion, first make space in the center of the classroom for a group of four or five students to sit—these students are in the fishbowl. The rest of the class should sit in a ring around them. The small group in the center then begins to discuss the subject at hand, trying to meet the criteria set for the discussion. Meanwhile, students in the outer circle observe the discussion, listening to the arguments presented, taking notes, and paying close attention to the discussants' adherence to the criteria. After the students in the fishbowl have wrapped up their discussion, the entire class reconvenes to debrief, reviewing the process of the discussion (Dutt, 1997; White, 1974) and acknowledging good ideas and strong points (Baloche, Mauger, Willis, Filhiku, &amp; Michalsky, 1993).</td>
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</table>
Instructional Strategies

Variants on the fishbowl strategy often aim to invite greater participation from students sitting outside the fishbowl. For example, Pries (1993) and Dutt (1997) each set up two empty chairs with the group in the fishbowl. From these seats any student or the teacher could join the discussion, interjecting to make a point or ask a question. Dutt, requiring everyone to participate, further allowed students to move from the inner circle to the outer after contributing to the conversation. Regardless of the form the strategy takes, to ensure full participation all students should expect to be inside the fishbowl at some point.

Student-centered discussions like the fishbowl take time to master. Debriefings of early discussions will necessarily emphasize process as students learn what is expected of them. With time and guidance, students will become comfortable, even enthusiastic, about participating in the fishbowl.

**Fist-to-Five**

**Engaging in Inquiry**

Fist-to-five is a strategy that students can use to build consensus as they work together in small groups (Fletcher, 2002). By encouraging students to express varying levels of support for a given idea, the strategy teaches them that not every decision involves a simple yes or no decision. Through fist-to-five, students learn to compromise, which is a key to making progress in a group setting.

In practice, fist-to-five is a set of hand signals that indicate a level of agreement with a decision. After a group member states a possible group decision, the remaining students in the group respond with one of the following signals:

- **Fist**: “No, I do not support this choice.” If there are mostly fists in the group, it is time to suggest an alternative decision.

- **One finger**: “I want to discuss big issues and suggest changes.”

- **Two fingers**: “I am fairly comfortable with this decision, although there are still a few significant issues I think we should discuss.”

- **Three fingers**: “While I might still disagree on a few small points, I am comfortable enough to support the decision.”

- **Four fingers**: “I think this is a good decision, and I think it will benefit our group.”

- **Five fingers**: “This idea is great! I want to lead the group as we move forward!”

The group may move forward on a decision once all members are showing at least three fingers. Optimally, most will show four or five fingers.
# Instructional Strategies

## Focused Listing

<table>
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<th>Monitoring Progress</th>
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<tr>
<td><strong>Focused listing</strong> (Angelo &amp; Cross. 1993) is a strategy for assessing students' recall of the most important points on a given topic. It is best used to take quick stock of what students know. The name of the strategy suggests its use in the classroom: given a topic, students list as many related ideas or facts as they can, usually in a limited amount of time.</td>
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To ensure the topic is appropriate, Angelo and Cross (1993) recommend that teachers write their own focused lists before asking students to create theirs (p. 129). If students generate focused lists on the same topic over the course of a unit, both they and the teacher can track learning from one list to the next, both through an increasing number of relevant and appropriate items and improving relevance and appropriateness of individual items. |

## Four Corners

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<tr>
<th>Sharing Ideas</th>
<th>Extended</th>
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<tr>
<td><strong>The four corners</strong> strategy (Garmston &amp; Wellman, 1999) helps to develop listening, verbal communication, critical thinking, and decision-making skills. It can be used to reinforce course content, clarify students’ values, and develop an understanding of differences in values and opinions. Follow these steps to conduct a four corners exercise:</td>
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<tr>
<td>1. Create four signs with titles such as <em>Strongly Agree, Agree, Disagree, and Strongly Disagree</em> that will help students identify where their opinions fall. Place the signs in the corners of the classroom. Move all chairs and tables to the center of the room to clear the corners.</td>
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<td>2. Propose a statement of value that students can take a position on, such as &quot;Knowing how much waste we create is an important scientific problem&quot; or &quot;Icarus should have listened to his father instead of flying near the sun.&quot;</td>
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<td>3. Ask students to take a position on the statement by moving to the corner that best signifies their response to it.</td>
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<td>4. Once students have selected their corners, call on them to give simple, one-sentence statements justifying their positions. Students may change corners at any time as their thinking changes.</td>
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Four-Resource Model

The four-resource model is based on the premise that reading requires four interrelated roles: code breaker, meaning maker, text user, and text analyst (Anstey & Bull, 2006). By placing students in a situation in which they depend on one another to master a particular reading, the four-resource model encourages cooperative learning. It also supports students’ engagement in inquiry because they learn to ask appropriate questions while reading a text.

To use the four-resource model, students should work in groups of four, with each student assuming one of the following roles:

- **Code Breaker:** The code breaker’s main question should be “How do I crack this code?” (Hall, Larson, & Marsh, 2003, p. 357). The code breaker is responsible for making sure that other group members understand the conventions of the text, including its vocabulary, grammar, and structure. The code breaker should also clarify the purpose of nontextual elements such as graphs and illustrations.

- **Meaning Maker:** The meaning maker’s main question should be “What does this reading mean?” (Hall et al., 2003, p. 357). After drawing on the code breaker’s work to make sure the group understands the literal meaning of the text, the meaning maker is responsible for moving further, working to understand the text’s purposes. At this point, the meaning maker should ask questions such as “Who wrote the text?” “How does the author’s identity shape her writing?” and “Why did the author choose to write in this style?”

- **Text User:** The text user’s main question should be “What do I do with this text, in the here and now?” (Hall et al., 2003, p. 357). The text user’s job is to make connections with what is being read. Connections might come from already completed readings or from real-life experiences. The text user may need to draw upon the knowledge and experiences of other group members.

- **Text Analyst:** The text analyst’s main question should be “What does this reading mean to me?” (Hall et al., 2003, p. 357). The text analyst is responsible for being a critical reader. Other questions the text analyst might ask include “Whose interests does this reading serve?” and “How does this text compare to what the group has read previously?”

While groups will necessarily begin with the work of the code breaker, they may need each group member’s expertise multiple times in order to fully analyze a reading. For example, the text user may need the code breaker to clarify the meaning of a phrase before a meaningful textual connection can be made. For this reason, the four-resource model can be a powerful illustration of the principle that reading involves many levels of inquiry.
Instructional Strategies

Frayer Model

A Frayer model is a strategy for learning a new concept, such as a vocabulary word, relationally. The strategy has been adapted substantially since it was first proposed by Frayer, Fredrick, and Klausmeier (1969), settling into the form of a graphic organizer (Billmeyer & Barton, 1998; Buehl, 2008). (See Fig. 4.) There are two common versions:

- Students write a term in a center oval, then in the surrounding boxes they write a definition of the term and list characteristics, examples, and nonexamples of it (Barton & Jordan, 2001).

- Students write a term in a center oval, then in the surrounding boxes list essential characteristics, nonessential characteristics, examples, and nonexamples of it (Barton & Jordan, 2001; Buehl, 2008).

The purpose of listing examples and nonexamples and essential and nonessential characteristics is to help students construct categorical knowledge about the concept they are learning. After all, explain Billmeyer and Barton (1998), “in order to understand completely what a concept is, one must also know what it isn’t” (p. 74).

Frayer models can be especially useful when conducting direct, in-class vocabulary instruction (Rekrut, 1996). In addition, given sufficient introduction, individual students can also use Frayer models for taking notes and monitoring their own learning about the concepts covered.

![Frayer Model Diagram](image)

Figure 4. A Frayer model
Gallery Walk

In a gallery walk, students visit a collection of displays connected to the day's activities or the unit's goals. A gallery walk can have many purposes, such as to promote evaluative discussion, preview students' learning, develop students' analytic skills, and reveal diverse perspectives about the unit's subject (Francek, 2006). A gallery walk is a good way to assess what students know about a topic before it is taught. Similarly, the displays in a gallery walk can be anything relevant to the unit's or day's objectives, such as open-ended questions about the subject at hand, artwork suggesting themes or central ideas, photographs depicting historical figures, structures illustrating geometric concepts, or demonstrations modeling scientific processes.

A gallery walk can be conducted in class with students participating in groups. In a given amount of time, each group visits each display. As students read, observe, and interact with the display, they take notes on what they discover. When time is up, students spend time reflecting on what they discovered. The teacher, too, may take anecdotal notes as students progress through the displays.

A gallery walk can promote even more meaningful assessment when students post their notes around the displays. Over the course of the gallery walk, students can then respond both to the displays and their peer's posted notes. The strategy thus invites student-to-student feedback about the ideas being presented.
Instructional Strategies

Graphic Organizers

Visual representations are tools to display information that can help students understand, remember, and represent their learning (Bellanca, 2007; Bustle, 2004; Marzano, Pickering, & Pollack, 2001). Graphic organizers are among the most effective visual representations (Bellanca, 2007, p. viii).

Graphic organizers have a wide variety of uses in the classroom. For example, they can encourage active and strategic reading by helping students construct a set of questions that they expect a particular text to answer and prioritize information gained from a reading (Buehl, 2008). Bellanca (2007) lists five other ways that graphic organizers can be used in the classroom:

- To organize classroom discussions, such as with discussion webs and inquiry charts
- To help students complete a task within a single lesson, such as with Venn diagrams
- To help students learn individually, such as with homework charts
- To help students learn cooperatively, such as with ranking ladders and classification grids
- To develop students' thinking, problem solving, and metacognition, such as with K-W-L charts

Given the number of potential uses for graphic organizers, they can be very helpful for students, especially if they are used strategically and explained carefully. To introduce and develop students' use of graphic organizers, Barton and Jordan (2001) recommend the following process:

1. Explain why graphic organizers are valuable in general.
2. Introduce the specific graphic organizer that you want students to use.
3. Model how the graphic organizer should be used.
4. Give students ample chances to use the graphic organizer.
5. Invite students to create graphic organizers of their own. (p. 81)

Hand Signals

Hand signals can be an effective kinesthetic tool for monitoring student understanding of a particular concept, process, or skill (Tweed, 2009). To use hand signals, ask a question with a simple yes-or-no answer or an answer that can be represented by a scale. Invite the class to respond to the question by showing signals, such as thumbs-up and thumbs-down or one to five fingers as a rating scale. If, based upon the hand signals students show, it seems most students misunderstand the concept, further elaboration or reteaching may be necessary.
IDEAL Problem-Solving Model

The IDEAL problem-solving model (Bransford & Stein, 1993) can be used to introduce students to the process of working systematically through a problem with their peers. Working through the five steps of the model gives students practice thinking about complex issues. Because working systematically may not come naturally, students may need an extended amount of time to master the strategy.

Working in small groups, students follow the five steps of the IDEAL system:

1. Identify the problem: Students may be given a complex issue to work through, they may be asked to think through an essential question, or they may be given latitude to generate a problem worth investigating independently. Through small-group discussion, students should arrive at a common statement of the problem they plan to solve. This is a foundational step in the problem-solving process.

2. Define the problem: Defining the problem includes outlining the characteristics of the problem and the major issues or subproblems involved. If there are too many issues, now is a good time for students to narrow the problem. Visual representations, such as flow charts or cause-and-effect diagrams, are especially helpful because they can help group members better understand the problem's parameters.

3. Evaluate possible approaches: Having arrived at an exact definition of the problem, now is the time to explore possible approaches to solving it. Strategies such as brainstorming or writing ideas on paper may help the group make progress. Students may need reminding that there are a number of possible approaches to any given problem and that it is important to work together to make an informed choice.

4. Act on the approaches: Groups work together to solve the problem, using the most appropriate approach. As they work to solve the problem, students should continually monitor the effectiveness of their approach.

5. Look back, review, and evaluate the effects of the approach: After students have completed their problem-solving activity, they should look back on the process, assess their group's work, and evaluate the outcome. This critical reflection lays the foundation for successful group work in the future.

While IDEAL is a group strategy for engaging in inquiry, it also supports the assessment of problem-solving skills. By introducing concrete steps for problem solving, teachers are better able to observe, assess, and ultimately evaluate students' progress as they work together (Brookhart, 2010).
Instructional Strategies

Index Card Assessment

An index card assessment (Tweed, 2009) takes advantage of the small size of index cards to quickly construct a portrait of students' understanding. On one side of a card, students write something positive in response to the day's learning, such as a summary of the class, an interesting fact learned, or a concept that finally makes sense. On the opposite side, students identify what they do not understand by describing their confusion or asking a question.

With an index card assessment, identifying the person who does not understand a concept is less important than discovering what is not understood. Therefore, consider reinforcing anonymity by creating a drop box in which students can place their index cards as they exit the classroom. Upon collecting the cards, list students' comments and questions and use the list to identify patterns in students' understanding.

Jigsaw

Jigsaw (Aronson, Blaney, Stephan, Sikes, & Snapp, 1978) is a strategy for shifting the classroom from a competitive to a cooperative environment. In a jigsaw, students divide lessons or readings into manageable chunks, learn individually about the chunks, and eventually teach each other about the whole. As students develop individual understanding of a subject, they work together toward common understanding. Like many other cooperative learning strategies, jigsaw may be new to students and therefore may require an extended period of time to master.

To conduct a jigsaw, Aronson (2010) recommends the following steps:

1. Divide the class into groups of five to six students each.
2. Appoint one student from each group to serve as the group's leader.
3. Divide a lesson or a reading into five or six sections and assign a different section to each student in a group. No student should have access to a section he or she has not been assigned to.
4. Give students time to read their sections at least once—twice, if possible.
5. Form temporary expert groups made up of students who have each read the same section. In their expert groups, students should review their sections, highlighting the main points and rehearsing how they will present the important information from the text to their original groups.
6. Re-form the original groups. Each student should present what he or she discussed and rehearsed in the expert group. As each student teaches his or her peers, the group as a whole will gain a more complete picture of the original topic. Listening students should ask questions and request clarification on points they do not understand.
Instructional Strategies

7. Observe the groups as they work together, stopping to answer any questions students may have. (As students become more skilled at working in jigsaw groups, the group leader should eventually assume responsibility for answering group questions.)

8. Immediately following a session, assess students’ understanding of the complete lesson or reading. This reminds students of the importance of focusing on content and maximizing their time together. This may also be a good time for students to assess their own understanding.

Aronson (2010) found that students who learned using the jigsaw were absent less often than those who did not. They also showed greater relative academic improvements: in particular, less able students showed higher levels of academic improvement while students who performed well before the jigsaw continued to perform well.

Journals

Learning Independently Ongoing

Requiring students to write in journals has a long tradition in teaching English courses. Mathematics and science teachers have also observed several of the benefits of journals observed by English teachers such as Burke (2003). For example:

- Journals serve as a place where students can reflect upon and represent their learning in safety (Burke, 2003). DiPillo, Sovchik, and Moss (1997) found that using journals helped increase student interest in mathematics. Shepardson and Britsch (2000) showed that using journals promoted increased reflection on scientific concepts and increased understanding. Students become more engaged in science class and more responsible for their own learning.

- Journals provide a place where students can have private conversations with their teachers (Burke, 2003). Observing two mathematics classes, DiPillo et al. (1997) discovered that journals opened up a new platform for conversations between students and teachers. Teachers learned about their students’ understanding and frustrations more easily through the journals. They were able to conduct private conversations with students to correct misconceptions.

- Journals help teachers learn more about their students’ progress (Burke, 2003). Jurand and Zein (1998) found that mathematics teachers had a finer sense of students’ intellectual growth, questions, and abilities in class when their students kept journals. Journals helped the teachers assess their students’ work and change their instruction accordingly.
Instructional Strategies

The way that Burke (2003) uses journals can be a good model for introducing them in other classrooms. First, he has students write in their journals frequently. Sometimes he prompts students to write with focused, thought-provoking questions, quotations, or images. Focused prompts can help develop students' interest in the material (DiPillo et al., 1997). At other times, Burke's journal prompts are open-ended, such as when he asks students to write an immediate response to an in-class reading. Such open-ended prompts can promote reflection and develop understanding (Shepardson & Britsch, 2000). To promote openness and offer students a positive model to follow, Burke periodically reads his own journal entries aloud. Finally, Burke reads his students' journal entries, but because he wants students to use their journals to explore new ideas, he never grades them.

K-W-L

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Know-Want to Know-Learned (K-W-L) can be used to develop active reading of expository text (Ogle, 1986) as well as to engage students in thinking about what they know and what they are learning.

To employ K-W-L, when starting a new unit or reading or introducing a concept, the teacher initiates a session where students share what they already know about the topic. After refining the class list by placing what they know into categories, students identify what they want to learn. This step requires that students analyze the “Know” list to identify conflicting information and/or gaps in their knowledge. Following this discussion, each student prepares an individual list of personal knowledge and learning aspirations. At the end of the unit, reading, or concept introduction, students prepare a third list of what they have learned. This final list can be compared to the first two lists to illustrate student progress and/or direct their attention to the need for additional study.
Learning Log

Learning Independently

A learning log is a type of journal that documents learning with a series of brief entries. As such, it gives students an opportunity to reflect on what and how they are learning. Buehl (2008, p. 142) lists several reasons for keeping a learning log, including:

- Preparing for exams
- Predicting the results of an experiment
- Describing the steps of a math problem
- Raising and clarifying points of confusion
- Comparing one’s understanding at certain points throughout the learning process

A learning log can be as simple as a series of lists. For example, one entry might list key concepts learned, a second might list points that need clarification, and a third might list questions that need answering.

Students should be given multiple opportunities to write in and review their logs. When entries are made on a regular basis and reviewed often, the learning log offers students a means to evaluate their educational progress as well as their strengths and weaknesses as learners (Angelo & Cross, 1993).

Line-Up

Sharing Ideas

The line-up strategy (Baume & Baume, 1996) visually depicts students’ stances on a question or series of questions relevant to the day’s learning. The strategy encourages ownership of ideas and respect for other students’ opinions.

Line-up works best with questions that have ambiguous or indeterminate answers. After the question is posed, students form a line that represents a continuum between one position and another. Once in line, students should discuss their positions with nearby students to determine how well their physical positions correspond to their viewpoints.

Because it gives students time for nuanced discussion of their positions, line-up fosters discussion skills that will be necessary in more sophisticated group work.
Instructional Strategies

Memory Matrix

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<tr>
<td>A <strong>memory matrix</strong> (Angelo &amp; Cross, 1993) is a basic table that uses rows and columns to organize key concepts and illustrate their relationship. A matrix is a quick way to assess students’ ability to recall important facts in courses with high informational content. It also provides insight into how well students organize what they learn. A memory matrix can be used as an individual or group assessment.</td>
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To introduce a memory matrix, first prepare a matrix by drawing a table and determining column and row headings that categorize important lesson content. After filling in the table cells with appropriate facts and fine-tuning any headings that are unclear or ambiguous, create a second matrix with only column and row headings. Students should complete the second memory matrix. Where the teacher’s and the students’ matrices differ represent points for reteaching.

Mind Map

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<th>Learning Independently</th>
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<tr>
<td>A <strong>mind map</strong> is a weblike visual representation of what a student knows. At its center is an image of a focal concept; from this center stem branches that represent connected ideas. A mind map thus provides its creator with a picture of how ideas relate to one another and encourages a clearer, in-depth understanding of the focal concept. When students create a mind map, they gain conscious awareness of how they organize what they know (Brinkmann, 2003).</td>
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Mind mapping has many classroom applications. Students can use it to summarize information at the end of a unit. They can also use it to connect new information to prior knowledge. Essential to successful mind mapping are imagination, which makes the mind map visually appealing and easy to remember, and association, which allows the creator to make connections that trigger the memory (Buzan & Abbott, 2005). To create effective mind maps, the Buzan Organisation (2009) recommends that students

- begin with a piece of paper in a landscape orientation. This allows the creator more freedom to spread ideas in each direction.
- create an image to represent the central concept. This helps focus the creator and spurs imaginative thinking.
- use colors. This stimulates brain activity.
- connect main branches to the central concept and second- and third-level branches to the main branches. This represents the associative nature of thinking.
Instructional Strategies

- make curvy instead of straight branches. This adds visual interest.
- limit the number of words used to one per branch. This gives the mind map power and flexibility.
- use images throughout. This ensures the mind map maintains its visual nature.

Misconception Check

Monitoring Progress Short

A **misconception check** is a quick strategy for assessing students’ understanding. To conduct a misconception check, present a common misconception about an important concept or idea to students. Ask students whether they agree or disagree, and have them explain their answers (Tweed, 2009). (This can be done orally or in writing.) If the concept is relatively easy to understand or students’ misconceptions about it are minor, then present the correct information to students, explaining why the misconception is wrong. If the concept is more difficult or students’ misconceptions are severe, then conduct a discussion that leads students to understand why their prior conceptions are mistaken.

While a misconception check may take only a few minutes, it can be a powerful strategy for monitoring progress. Students draw from what they already know to better understand new information; if their prior knowledge is incorrect, their learning may be disrupted. Misconception checks are especially important at the beginning of a unit, but they can also be used anytime new information is being presented.

Muddiest Point

Monitoring Progress Short

A **muddiest point** assessment (Angelo & Cross, 1993) discovers what students misunderstand about a concept or process. Frequently employed as a closing activity, the assessment is simple: each student describes a concept from the day’s instruction he or she finds “muddiest,” or least clear. The points students identify can then be used to construct a portrait of a class’s understanding and identify areas for reteaching.
**Instructional Strategies**

**Multivoting**

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<td>Multivoting is a decision-making strategy that is especially useful when groups are faced with many items that need to be ranked. For example, multivoting could be paired with brainstorming, in which students generate many ideas, some of which may be more suitable to the group’s purposes than others. Multivoting can help groups identify and settle upon the best idea available.</td>
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Bens (2005b) outlines the following steps for multivoting:

1. Group members should review and decide upon the list of items they need to rank. The list may come from any sort of idea-generating process. Members should discuss each item so that everyone has a clear understanding of what is being voted upon.

2. Groups should establish voting criteria and ensure that all members understand the criteria. For example, are groups voting on the most important idea or the easiest to complete in the time allotted? Clarifying criteria prevents voting at cross purposes.

3. Following the established criteria, groups should vote on each idea. Voting can be accomplished in any number of ways: by placing sticker dots on index cards, each with a specific idea written on it; by allowing each student 100 voting points to divide between ideas however the student sees fit; or by a simple show of hands.

4. After voting, groups should add the scores to create lists of top priorities. The ideas with the most votes should receive the highest priority.

5. If the list is still too long, groups should repeat the process to further narrow the field of options.

Because it involves voting on a range of ideas, multivoting does not require absolute agreement within a group—every vote counts (Bens, 2005a, p. 67). Since multivoting typically results in group members seeing at least a few favorite ideas at the top of the list, the strategy helps to meet the needs of all involved (Bens, 2005b, p. 159). For these reasons, multivoting is a relatively easy-to-master strategy for learning consensus-building skills.
Pass the Whiteboard

**Sharing Ideas**

**Pass the whiteboard** is a cooperative whiteboarding activity adapted from McJimsey and Sabatier (2009). It can be used for solving problems as well as generating and evaluating ideas.

Pass the whiteboard begins when each group is given a whiteboard. Then, in response to a problem, question, or prompt, students follow these steps:

1. The student who begins with the whiteboard solves part of the problem or writes a response to the question or prompt. Then, at a signal, the student passes the whiteboard to the right.

2. The next student reviews the first student’s work, if necessary corrects it, and then adds his or her own work to the board. This process continues until all group members have added their responses.

3. The group, as a whole, reviews the whiteboard to discover which parts need revision. If time permits, students make necessary revisions.

4. The group presents its work to the class.

**Plus/Delta**

**Monitoring Progress**

**Plus/delta**, which Helminski and Koberna (1995) call a “tool of continuous improvement” (p. 318), is a feedback strategy used by teachers and students to reflect on and improve the quality of teaching and learning. The strategy encourages teachers to share control of the classroom with students and prompts students to assume more responsibility for their own learning.

To conduct a plus/delta review, first choose a specific topic or activity to address and discuss. (Plus/delta is particularly useful in a review of in-class performance, such as a discussion of a class’s work in a science lab.) Second, create a table by drawing a vertical line down the center of the board or a sheet of chart paper. Label one side of the line with a plus sign and the other side with the Greek letter delta (Δ), which represents change. In the plus column, note things that went well with whatever is being reviewed. In the delta column, identify things that need improvement. The ideas contributed by both teacher and students should yield differing perspectives and prompt further conversations about what to keep and what to change.
Instructional Strategies

Portfolio

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A portfolio is a collection of work that a student compiles throughout an academic year that showcases what the student can do. Like a portfolio created by a photographer or an artist, students’ academic portfolios should include samples of students’ best work from a variety of assignments and projects. Portfolios should not be thought of as extra work; rather, they are compilations of what a student would typically complete over a given time period.

A portfolio can be a valuable assessment. Choosing the assignments or projects to include in a portfolio requires self-assessment. At the same time, portfolios give teachers a long view of students’ progress, allowing them to gauge how individual students have improved throughout the year. Portfolios also provide a larger perspective on the class as a whole, helping the teacher evaluate which assignments were useful and which were not. This helps teachers make well-informed adjustments to their instruction.

Because portfolios showcase the best of what students have created, teachers may consider hosting an event in which students display and present their work to families, administrators, fellow students, and/or community members. Such an event gives interested parties a more detailed understanding of what has happened in the classroom throughout the school year. An event like this also provides students with an opportunity to speak in front of community members and publicly take pride in their growth.
Praise-Question-Polish (PQP) is a strategy for peer assessment of written work. The following steps for conducting a PQP session are adapted from the work of both Lyons (1981) and Neubert and Mc Nelis (1990):

1. Direct students to form groups of two to five students each and to distribute their writing to each group member.

2. Have group members draw numbers to establish the order in which they will share their work.

3. Provide students with the following PQP questions:
   P (Praise): What do you like about my paper?
   Q (Question): What questions do you have about my paper?
   P (Polish): What kinds of polishing do you think my paper needs in order to be complete?

4. Students should take turns reading their work aloud to the group. This gives students a chance to hear their own words spoken and perhaps identify errors before the peer assessment begins.

5. Group members should listen, read their copies, and respond to the PQP questions. Teachers might choose to have students read their work twice, with group members listening the first time and taking notes the second. While Lyons describes the PQP review as a discussion that occurs within a group, Neubert and Mc Nelis recommend that students comment in writing.

Because peer assessment can be difficult, Lyons recommends introducing PQP in stages, with students focusing on “Praise” for at least a few sessions. Focusing on a paper’s strengths gives writers confidence and makes them more receptive to later criticisms. Building on this foundation, “Question” encourages students to think about the organization of their work and whether their writing clearly says what they want it to say. Finally, “Polish” pushes students to reflect on the specific details of their work by identifying errors in need of correction. As students continue practicing with this form of peer assessment, their critiquing skills will steadily improve.
Instructional Strategies

Question-Answer Relationships (QAR)

Question-Answer Relationships (QAR) (Raphael, 1982) is a strategy that teaches students how to approach the process of reading a text and answering related questions. Originally based on a taxonomy developed by Raphael and Pearson (1982), Raphael’s revised QAR (1986) includes four types of question-answer relationships, further categorized by the location of the information needed to answer the question:

In the Book:

- **Right There**: These questions focus on textual details. The answers can be found directly, in one sentence of the text. Key words in the Right There question can often be found in the Right There answer. For example, the question “What color sweater did Johnny wear?” might have the following answer, taken directly from the text: “Johnny wore a purple sweater.”

- **Think and Search (Putting It Together)**: The answer to a Think and Search question can also be found in the text, but it requires the reader to integrate information from more than one sentence or paragraph. For example, the answer to “How do you make a chocolate chip cookie?” is still in the text, but the reader must put together different pieces of information to provide it.

In My Head:

- **Author and You**: While the answer to this question comes from a student’s prior knowledge, it must also connect to what he or she has read in the text. For example, an Author and You question might be “What would you have done once you figured out where the keys were hidden?” The answer, while still deriving from the student’s imagination, would not make sense if the student did not understand what the keys opened.

- **On My Own**: The answer to an On My Own question is not in the text. Students do not need to read the text to be able to answer it. For example: “What do you do when you are tired, like Sammy was in the story?”

Students who are new to QAR may require extensive practice to be able to identify the type of question asked, use the QAR to locate the right sort of information to answer the question, and provide an adequate response to the question. To support students as they learn the strategy, first provide them with a short passage, and then follow it with a question. Ask students to identify the type of question asked. When students can identify it, ask them to locate an answer based on the sort of question it is. Finally, have students write their answers to the question.
QAR is useful for teaching students that both textual information and their own knowledge are important for answering questions. Through QAR, students learn to locate information, understand how the structure of a text communicates information, and determine whether personal knowledge or an inference is needed to answer a question.

**Question Box**

By allowing students the opportunity to record questions they might be reluctant to ask publicly, a classroom question box serves an important assessment function (Wiggins & McTighe, 2005). Especially in the face of awkward or sometimes sensitive questions, a question box allows the teacher to “troubleshoot before something arises” (Crawford, 2004, p. 102).

Chadha (2008) suggests placing a question box in a special location in the room. After each day’s lesson, students should be given time to reflect on what they have learned and identify any remaining questions. As they leave for the day, they should drop their questions in the question box. Students do not need to put their names on their questions. Afterward, the teacher should review all of the questions, plan how to address them, and set aside class time to do so. Chadha points out that students may not submit many questions initially; however, this may change when students see the teacher addressing their questions meaningfully, either through providing the answer or guiding students to discover it themselves.

**Quick Write**

A quick write, also referred to as a minute paper, is an in-class exercise that prompts students to write for up to five minutes on a topic relevant to the day’s instruction. It is sometimes called a “written conversation” (Brewster & Klump, 2004) because some teachers treat the exercise like a think-pair-share, asking students first to share initial ideas with a partner and then to collaborate in writing a response to the topic. Quick writes are useful as assessments of prior knowledge and as formative assessments because they can be reviewed to check students’ understanding. A quick write has immediate in-class benefits, too: because it gives students time to discover what they think, it can contribute to their learning and improve class discussion.
Instructional Strategies

Rally Coach

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**Rally coach** (Kagan & Kagan, 2000) is a cooperative learning strategy that ensures students work together to further each other's learning. It promotes student motivation and prepares students to work together in larger groups.

When enacting rally coach, students work in pairs with a single sheet of paper and a pen or pencil. To begin, Partner A works on solving a problem while Partner B coaches by providing feedback when Partner A struggles or praise when Partner A does something well. When Partner A arrives at a solution, Partner B checks its accuracy. If it is incorrect, Partner B continues coaching Partner A to correct any mistakes. If it is correct, the partners switch roles and repeat the process.

Reader's Theater

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**Reader's theater** is a strategy of reading aloud that relies upon the expressiveness of drama to give students practice reading. According to Prescott and Lewis (2003), reader's theater can

- improve listening and speaking skills as well as reading skills and reading fluency,
- enhance reading confidence,
- turn reluctant readers into reading enthusiasts,
- encourage students to interpret dialogue and communicate meaning, and
- create opportunities for collaboration.

Conducting a reader's theater requires little more than a common text and willing students. However, Prescott and Lewis note that students learn more with greater preparation. For example, when students are first learning reader's theater, an instructor-written script is especially effective, as is explicit modeling of a dramatic reading.

While the primary goal of reader's theater is to model and encourage expressive reading, it can also give students important practice working together on a common task.
**Reciprocal Teaching**

Palincsar and Brown (1984) found that *reciprocal teaching* has significant benefits in reading comprehension. The goal of the strategy is to teach the following four skills, which are central to reading:

- **Summarizing:** This is the skill of identifying and articulating important information from a passage.
- **Questioning:** With this skill, students write a question relevant to the main idea of a passage. A common prompt during questioning is “What kind of question might a teacher ask about this text?”
- **Clarifying:** This is the process of resolving problematic passages. Clarifying is especially important for students who are struggling with comprehension.
- **Predicting:** This is the ability to hypothesize what turn the argument or plot will take next.

When beginning reciprocal teaching, a teacher models each skill. Depending upon students’ abilities as readers, the modeling might be very explicit, with teachers prompting students with paraphrases and questions to copy. Over time, as teacher and students take turns summarizing, questioning, clarifying, and predicting, students develop greater and greater skill, not only with these four skills, but with reading in general.

**Round-Robin Brainstorming**

*Round-robin brainstorming* is a variant of brainstorming that can be used when participation in a class or small group is dominated by a few students (Tague, 2005). It proceeds like a standard brainstorming session until students begin to volunteer their ideas. Rather than have students speak up at their leisure, round-robin brainstorming invites them to speak in turn until everyone in the class or small group has spoken. However, Tague cautions against using the strategy indiscriminately: in a class or group that usually participates well, the strategy can backfire, undermining instead of promoting creativity.
Say Something

Say something is a reading strategy that Beers (2003) describes as particularly helpful for struggling or dependent readers who have trouble focusing. Working in pairs, students read a short passage aloud, trading turns every paragraph or so. After each student completes his or her part of the reading, the partner is given an opportunity to say something. The partner might

- ask a question,
- identify confusing passages,
- predict what will happen next,
- describe how he or she imagines a particularly vivid description or scene, or
- connect what has been read to something he or she knows.

If the partner has nothing to say, the reader should reread the passage and give his or her partner a second opportunity to say something (Gregory & Nikas, 2005). As pairs work, the teacher should observe their progress, noting any difficulties students might have. Because students may need practice using this strategy, students should be given repeated opportunities to try it.

Scientific Terminology Inventory Probe (STIP)

Keeley (2008) describes a Scientific Terminology Inventory Probe (STIP) as a metacognitive exercise that checks students' familiarity with scientific terms. It is administered as both a pre- and postassessment so that, at the end of a unit, students can compare their responses and reflect upon their new understanding.

A STIP is a basic questionnaire. In response to a term or set of terms on a form, students select one of the following responses:

- I have never heard of this.
- I have heard of this, but I’m not sure what it means.
- I have some idea what it means.
- I know what it means, and I can describe it.

Keeley recommends limiting the STIP to at most twelve terms (p. 181). Including space on the form where students describe what they know about each term can provide useful information about students' level of understanding.
Self-Questioning

**Learning Independently**

Self-questioning helps students to clarify, reflect on, and regulate what they are learning. In other words, self-questioning helps students analyze their own thinking to identify the precise concepts with which they struggle. Self-questioning is an ongoing academic behavior that helps to develop students’ self-knowledge.

To introduce self-questioning to younger students, McLaughlin and Allen (2002) recommend exploring “I wonder” statements, as in the following steps:

1. Model “I wonder” statements with a think-aloud in front of the class. For example, examine the cover of a book and ask, “I wonder what role the character shown here will play?”

2. Have students practice self-questioning in small groups. As students survey a book, for example, they should look at the table of contents, skim the chapter headings, or read a few paragraphs. Periodically, they should ask themselves “I wonder” questions. This step can include students comparing their questions with their peers.

3. Direct students to use “I wonder” statements independently. Students should record their questions in their journals as they work. (The effectiveness with which students are using self-questioning can be assessed later by reviewing students’ journals.)

For introducing self-questioning to older students, Buehl (2007) recommends steps built around the revised Bloom’s Taxonomy:

1. Lead students through the six levels of the revised Bloom’s Taxonomy: Remember, Understand, Apply, Analyze, Evaluate, and Create (Anderson & Krathwohl, 2001). Conduct a think-aloud that models how the verbs at the different levels would direct your thinking. For example, note that “Remember” involves recalling information, while “Analyze” may involve trying to figure out a main point or underlying assumptions.

2. Discuss how each level corresponds to a certain kind of comprehension statement. For example, “Understand” means that I can restate and explain an author’s message.

3. Match each level with a focusing question. For example, the focusing question for “Understand” might be “What does the author want me to understand?”

4. Encourage students to develop additional questions for their repertoires as they become comfortable asking themselves higher-order questions. Making sure students are comfortable asking higher-order questions before adding more questions ensures they do not remain at a lower level of thinking. For example, an additional “Understand” question might be “What facts or perspectives is the author trying to communicate?”

Regardless of age, students should work continuously to develop a range of self-questions.
Instructional Strategies

Socratic Seminar

A Socratic seminar is a type of classroom discussion that promotes inquiry with rich questions and student participation. Socratic seminars have been shown to effectively promote metacognition, higher-order thinking skills, and enhanced understanding of a subject (Chowning, 2009). They are well suited to explorations of ethics, such as when exploring the consequences of scientific advances (see Chowning, 2009) and complex social issues raised in literature (see Alfonsi, 2008; Tredway, 1995).

A Socratic seminar takes preparation. First, to promote evidence-based discussion, a Socratic seminar should be based upon a text (or video or work of art—anything that students can respond to and grapple with intellectually). The text should be thought-provoking (Chorzempa & Lapidus, 2009); Chowning (2009) recommends primary texts that are open to interpretation. Second, to set the direction of the discussion, the teacher should prepare questions prior to class. The questions should address the key objective for the discussion and focus students' attention on the text at a high level of evaluation or interpretation (Alfonsi, 2008; Chowning, 2009; Tredway, 1995). This helps focus students' thoughts and encourages them to turn to the text for evidence to support their claims. Other questions that refocus the discussion on the objectives (Alfonsi, 2008) and clarify what had been asked (Chowning, 2009) can also be prepared; however, such questions should be held in reserve as much as possible. Finally, to ensure that students will be prepared for the discussion, they should read the text ahead of time. For example, Chorzempa and Lapidus described asking students to read the text three times to generate their own questions to address in the discussion. In contrast, Alfonsi discussed no special preparations in the reading stage; instead, her discussions relied upon the strength of the high-level questions she prepared as well as her students' eagerness to participate.

When all the preparations are complete, the Socratic seminar can begin. The following suggestions compiled from Alfonsi (2008), Chorzempa and Lapidus (2009), Chowning (2009), and Tredway (1995) can help make the seminar effective:

- Students' desks or chairs should be arranged so students face each other. This promotes interaction between students.
- Students should be reminded of the rules and expectations for discussion, such as the necessity of supporting claims with evidence, the importance of maintaining a lively and focused conversation, and the avoidance of sarcasm.
Instructional Strategies

- The teacher should sit with students in the circle or just outside it, on the same level with them. By lessening the appearance of power in the classroom, this helps to ensure the discussion is the students' own.

- After asking the initial question, the teacher should refrain from speaking during the discussion. It should be students' jobs to speak and to avoid long stretches of silence if they occur. The teacher should listen and take notes on student participation, keeping track of who contributes positively to the discussion and who does not.

- Before the end of class, a debriefing should be held. Students should be asked to reflect on their performances during the discussion, identifying what they did and did not do well. The teacher can use this opportunity to review the participation notes he or she took and identify students who may need to be reined in (such as those who dominate discussion) and those who need encouragement to participate more.

Student-centered discussions like Socratic seminars take time to master. Debriefings of early discussions will necessarily emphasize process as students learn what is expected of them. With time and guidance, students will become comfortable, even enthusiastic, about participating.

Star-and-a-Wish

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<tr>
<th>Monitoring Progress</th>
<th>Short</th>
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**Star-and-a-wish** (Harste, Woodward, & Burke, 1984) seeks to balance praise and constructive feedback on ungraded work. Writing a sentence describing something positive about students' work—a star—as well as a sentence describing how the work could be improved—a wish—helps students see their strengths and weaknesses and motivates them to improve their work. This kind of balanced, detailed information can help all students focus their efforts effectively. The strategy can be used by teachers when reviewing student work using comments-only marking or by students when giving peer feedback.
Instructional Strategies

Survey, Question, Read, Recite, and Review (SQ3R)

Survey, Question, Read, Recite, and Review (SQ3R) (Robinson, 1941) is designed to enhance reading comprehension of informative text. Each step in SQ3R represents a discrete reading activity. The steps are:

1. **Survey** is a prereading strategy. When readers survey a text, they pay attention to structural features such as headings and to graphic features such as charts and illustrations.

2. **Question** means that readers ask questions about what they discovered in the first step. They should be questions that are likely to be answered by reading the text.

3. **Read** is reading the text. Readers take notes and seek out answers to the questions raised in the second step.

4. **Recite** is best understood as reflect (Huber, 2004). Readers take time to answer any remaining questions, write journal entries about the text, and/or discuss the text with someone else (Burke, 2000).

5. **Review** is a postreading step in which readers summarize what they have learned, take any remaining notes, review the questions they asked, and ask new questions about the text.

For SQ3R to be widely effective, studies suggest that each step and the skill it encompasses be modeled at length (Huber, 2004).

Tableau Drama

Tableau Drama is a dramatic re-creation of a scene from literature that uses costumes, props, and expressions in lieu of dialogue and movement. As in the dramatic form of tableau vivant, students conducting a tableau drama create “living statue” poses depicting critical events that have affected a characters’ “inner action—struggles of emotion, conscience, and will” (Pirie, 2002, p. 49). The tableau drama pauses a plot’s action, requiring students to closely examine details such as contradictions in characters’ behavior or emotions.
Because performing a tableau drama requires preparation, it teaches students important planning and collaborative skills. For example, as a group students must

- decide what message they want to convey;
- determine how to capture that message through body position, facial expression, and even costumes or props;
- try out different positions and expressions by physically moving each living statue’s body; and
- provide each other with feedback on whether they think they have met their goal.

### Team-Pair-Solo

Team-pair-solo (Kagan, 1994) is designed to help students learn problem-solving skills. Working first in teams, students solve one or more problems, discussing work and solution strategies and helping each other when they struggle. Then, working in pairs, students solve a similar set of problems, continuing the pattern of discussion and mutual assistance. Finally, applying the understanding and self-confidence acquired from the first two steps, each student works alone to solve a final set of problems. Students are able to assess for themselves how well they have mastered the new skill or concept.

### Team-Then-Teacher (TTT)

Team-Then-Teacher (TTT) (Jacobs, Power, & Loh, 2002) emphasizes cooperative learning by requiring that students turn to their partner(s) when questions arise before seeking help from the teacher. When TTT is consistently applied in the classroom, students working together in groups learn to first look to each other for help when they have trouble solving a problem or answering a question. In this way they learn interdependence, an important group work skill. Only when the group continues to have trouble solving the problem or the answer remains elusive do students finally turn to the teacher for help.

As students become more responsible for their own learning, adding an extra step between the team and the teacher becomes possible. In this advanced variation of TTT, students who cannot agree turn to another group for help before turning to their teacher.
Instructional Strategies

**Think-Aloud**

A think-aloud (Davey, 1983) is a strategy to model reading. It targets five skills that struggling readers may find most difficult: forming hypotheses, creating mental images, drawing upon prior knowledge to make connections, monitoring comprehension, and knowing how to approach a difficult passage.

To prepare for a think-aloud, Davey suggests selecting a passage that includes a number of difficulties, contradictions, unfamiliar vocabulary, or ambiguities. (Constructing an original reading to meet all these criteria is also possible.) Once the reading has been chosen, practice reading it aloud. Mark up the text, flagging passages to comment upon, noting questions to ask while reading, and noting words that might cause students trouble.

Once preparations are complete, read the passage aloud to students. When reading, read from the marked-up copy; Distribute the unmarked text to students so they can follow along silently as it is read aloud.

To help struggling readers, Davey recommends taking the following actions during a think-aloud:

- Make predictions as you read. For example, “From the title, I bet we’ll be reading about fighting wildfires” or “I think we’ll learn the solution to the mystery in the next section.” This models hypothesis development.

- Describe the picture that forms in your head as you read the information. For example, “I have a picture in my mind of a leaf-covered trail lined with tall oak trees.” This demonstrates image formation.

- Use an analogy. For example, “Reading that adventure book was almost as exciting as the time we went to that baseball game and I caught a foul ball!” This is an example of using prior knowledge to make connections.

- Note a confusing point. For example, “This example doesn’t make sense” or “I don’t think I know what this word means.” This models comprehension monitoring.

- Use a fix-up strategy to help with a confusing point. For example, “Let me read this part again” and “Can context clues help me figure out this word, or do I need to go get a dictionary?” This demonstrates how to approach difficult texts.

Primarily modeling only one of the above reading strategies during any given think-aloud is also a possibility as long as all of the strategies are eventually modeled (Tovani, 2000). Because students may require practice to develop good reading strategies, consider conducting think-alouds periodically throughout a unit or a school year.
Think-Pair-Share

Think-pair-share (Lyman, 1981) fosters collaboration by giving students time to develop their ideas during class discussion. There are three steps to a think-pair-share:

1. Students independently contemplate a response to a question or prompt.
2. Students pair up to discuss and refine their ideas.
3. Student pairs share their discussions with the entire class.

The think-pair-share strategy is useful because it relieves individual students of the pressure of sharing ideas on the spot. Because they are sharing and exploring multiple perspectives on a common problem or issue, the collaborative discourse initiated by think-pair-share engages students in inquiry that extends their thinking and understanding. It is just this sort of collaborative discourse that research (Sawyer, 2004) shows is particularly conducive to learning.

Three-Minute Review

A three-minute review (Turville, 2008) is a brief pause in a lecture or class discussion to allow student interaction. Working in pairs or small groups, students review the material that has just been covered by asking each other clarifying questions or answering questions posed by their peers. A three-minute review helps build students’ cooperative learning skills by giving them an opportunity to confer with one another before querying the teacher.
Instructional Strategies

Three-Stage Scaffolding Process

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<th>Medium</th>
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<tr>
<td>The three-stage scaffolding process (O'Connell &amp; Croskey, 2008) is a set of activities for teaching writing. It begins by modeling writing and ends with students writing independently.</td>
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- In a write-aloud stage, the teacher models how to write the solution to a problem or a response to a prompt. Whether the writing is done on chart paper, on a transparency, on the board, or on a computer connected to a digital projector does not matter, as long as the writing is done publicly. As the teacher writes, he or she should describe the decisions made along the way, such as what work to show or how to organize an explanation. The experience can be made interactive by asking students to offer their own ideas and assist in the decision-making process.

- A write-along stage is supported student writing. As students write with partners or in small groups, the teacher guides them with questions, suggestions, and encouragement. Writing together helps students work out and explain their ideas. It also develops their understanding of vocabulary and skill at writing.

- A write-alone stage has students write without support from a teacher or peers.

Traffic Light Icons

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<td>With traffic light icons (Atkin, Black, &amp; Coffey, 2001), students use the familiar symbol of a traffic light to represent their understanding of a concept or term. The icons serve as both self-assessments and as a way for teachers to monitor student progress. They can be used with many kinds of classroom activities, such as lectures, labs, readings, and discussions.</td>
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Making the icons is the first step in introducing the strategy. Their construction can vary so long as the colors red, yellow, and green are used: plastic cups (Keeley, 2008) work well, as does a three-sided name tent with each side its own color. Most important is that students grasp the meaning of each color:

- **Green:** I understand this very well.
- **Yellow:** I understand most of this, but could use a little help.
- **Red:** Help! I do not understand!

In other words, each icon says something about what students know. During an activity, students who understand display the green icon, students who are unsure display yellow, and students who need immediate help display red. Too many greens can mean the exercise is too easy; too many reds can mean it is too hard.
Visualization

Visualization is described by Beers (2003) as a reading strategy that develops students’ grasp of descriptive and figurative language. Wilhelm (1997) adds that visualization helps students access and apply prior learning; improves reading comprehension as well as prediction, inference, and memory skills; and develops students’ ability to monitor comprehension. The ability to visualize while reading, Wilhelm concludes, is an important mark of a good reader.

To teach visualization, encourage students to explore language imaginatively. First, model it. Begin by reading a passage aloud. For example, Richard Connell’s short story “The Most Dangerous Game” is set on “Ship-Trap Island.” After reading the story to the third paragraph (which names the island), describe how you imagine such an island might appear. Describe its steep, craggy bluffs dropping into wild waves and the broken masts of broken ships jutting from the rocks. Then, continue reading. Invite students to listen for words and phrases that help them further visualize the setting as well as the plot’s action. Students should write down the words and phrases so they can later describe how their own imaginations were affected.

For students to learn visualization well, it should be modeled and practiced with increasingly complex texts several times over the course of the year.

WebQuest

Dodge (1997) defines a WebQuest as an inquiry activity in which some or all of the information that students encounter comes from online resources. A short-term WebQuest can take as many as three class periods. Its purpose is to introduce students to a lot of new information and have them try to make sense of it. A long-term WebQuest can take as long as a month to complete. Its aim is to have students deeply analyze a body of knowledge, transform it in some way, and demonstrate an understanding of this knowledge by creating something to which others can respond.

WebQuests can be individual or group projects. They should be centered on reasonable and interesting tasks. In addition, they should include the following elements:

- An introduction of the project that sets the stage and provides background information as well as the criteria by which the project will be evaluated.
- A set of information sources that students will need to complete the assignment independently. Providing such resources can anchor the project, pointing students to pertinent online resources.
Instructional Strategies

- A description of the process that students must follow to finish the assignment.
- Guidance on how to organize the information acquired. This guidance can take the form of guiding questions, concept maps, or graphic organizers.

A WebQuest should be concluded in a way that brings closure to the assignment, reminds students of what they have learned, and encourages students to extend the WebQuest experience into other areas of study.

Whiteboard Presentations

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<th>Sharing Ideas</th>
<th>Medium</th>
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**Whiteboard presentations** are structured, impromptu presentations that use handheld dry-erase boards as the media for representing a group’s consensus ideas. In science classrooms, they are often used when designing investigations, analyzing data, and drawing conclusions (Keeley, 2008). Because the collaborative use of whiteboards promotes an environment of student-generated ideas (Henry, Henry, & Riddoch, 2006), the presentations can be just as valuable in other disciplines.

When introducing whiteboard presentations, Henry, Henry, and Riddoch (2006) recommend methodically modeling the group interactions expected. It may also be helpful to set the following criteria:

- The whiteboard should be easily read by everyone in the room.
- The whiteboard should clearly identify the problem or question being addressed.
- All group members should help develop the presentation.
- The speaker(s) should elaborate upon and explain the group’s thinking about what is written on the whiteboard.
- Graphs should be labeled with appropriate units.

During the whiteboard presentation, the rest of the class should participate by listening attentively and asking clarifying questions.
Instructional Strategies

Word Wall

Learning Independently: Ongoing

When introducing new vocabulary, create a word wall. A word wall uses a clear, visible area in the classroom to display vocabulary terms along with brief definitions, examples, and illustrations. As such, it helps to develop students' ability to learn, remember, and use academic vocabulary.

Dugan (2004) outlines the following steps for using a word wall in the classroom:

1. Decide what words to include on the wall. Words can be general academic terms or language that is specific to a particular discipline. Students may participate in this process through identifying, from a larger list of words, vocabulary that is unfamiliar.

2. Introduce each word one at a time as it comes up in lessons or discussions. With each introduction, pronounce the word clearly and ask students to repeat it. Give a short definition of the word, offer examples, and use it in context. Photographs or illustrations may also be useful.

3. Have a student write each word on a card. The student should write clearly and in large letters. Then, the student should add the word to the word wall.

4. Discuss with students how best to display the words, such as posting the words alphabetically or pairing words that are connected or have similar meanings. As new terms are added, students may need to reorganize cards they posted earlier.

5. Encourage students to refer to the word wall continually as they practice using new vocabulary.

6. At the end of a unit, ask students to write a reflection on how the word wall helped their learning.

A word wall creates a highly visible reference guide for students to use while reading, writing, and speaking. It also helps students master academic vocabulary that is essential for effective oral and written communication in the classroom.
Appendix

Table 1 lists instructional and assessment strategies by the time frame in which they can be completed. Again, the suggested time frames are:

- **Short**: Strategies that can be completed in 15 minutes or less
- **Medium**: Strategies that can take up to a class period or that might require significant effort for students to complete
- **Extended**: Strategies that require more than a class period to complete or that require substantial scaffolding to prepare students to actively engage in the strategy or to master the content or skills taught
- **Ongoing**: Strategies that are used continuously in a classroom and are open-ended with regard to time
## Table 1. Instructional strategies listed by time frame

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**Educator’s Toolbox**