Brainstorming

Rules for Brainstorming: Before beginning the brainstorming process, students need to be reminded of the rules (listed below). Sometimes, it may be necessary during the actual brainstorming session to remind students of these rules.

- **No critical remarks are allowed.** Judgment on all ideas is deferred. No one may evaluate or criticize anything that anyone else says. Accept all suggestions even if they seem very farfetched.
- **“Hitchhiking” is ok.** Adding to or modifying another person’s idea is fine. The idea may be adapted, combined, magnified, minimized, rearranged, substituted, changed, or improved. Let alternatives prompt additional alternatives. The more thinking, the better.
- **“Free-wheeling” is welcomed.** The wilder the ideas, the better. No one should hold back any thoughts. Sometimes it takes a crazy or far-out idea to prompt a useful one.
- **Quantity is desired.** The more ideas, the better. Typically, only a small percentage of ideas from a brainstorming session are usable. Thus, the more ideas to begin with, the greater the potential for more winning solutions. From quantity will come quality.
- **Silence is fine.** It is all right to have lulls in the idea generation. During periods of silence, students are usually thinking. Let the silence linger until ideas pop up.
- **A time limit is necessary.** Stick to a set time limit. Five to ten minutes, depending on the question, is usually ample time to generate sufficient ideas. A time limit creates a sense of urgency and helps to keep ideas flowing.
- **Evaluation comes later.** Don’t be fussy. Students should not be worrying about any sort of correctness of appropriateness of ideas. Hold off any type of evaluation until after the brainstorming session.

**When to Use Brainstorming**

When you introduce new material, brainstorming is a technique that helps you involve all students. You can use this technique to begin a discussion at any time on any topic; the ideas can then be further refined. If you want to stimulate your students’ thinking, engage them in brainstorming.

In addition to generating ideas, brainstorming can be used:

1. To help solve a problem.
2. To find out what students already know about a topic.
3. To turn individual ideas into group ideas.
4. To provide material for goal setting.
5. As a needs assessment technique
6. To get talkative students to listen.
7. To get quieter students to speak up.
8. To evaluate an activity.
9. To set the stage for the formation of subgroups to carry out the ideas.
10. To add life to what maybe an otherwise dull introductory lecture.
11. As an icebreaker at the beginning of a semester.

**Guidelines for Effective Brainstorming**

As the facilitator of the brainstorming session, you need to ensure that the idea generation is structured, even though the brainstorming session appears to be freewheeling. Both you and your students should become familiar with the rules for effective brainstorming. Here are some general suggestions and some ideas for rules to establish.

- Present a well-defined, clear problem.
- Assign someone the task of recording all ideas as they are given.
- You can call out an idea without being recognized.
- Give only one idea at a time.
- Be brief; it is not necessary to explain, elaborate, or justify your ideas.
- Record all ideas where everyone can see them as they are presented.
- Since this is a group exercise, there should be at least four students in the exercise.
- Keep your mind open to all ideas.
- Do not belittle any ideas; suspend judgment.
- Watch for body language or facial expressions that demonstrate evaluation of ideas.
- Build on the thoughts of others.
- Encourage way-out and odd ideas.
- Have a student timekeeper to keep the group focused and tell when time is up.
- Once time is up or all ideas are exhausted, begin evaluating which ideas are possibilities and which ones need to be discarded.
- After sorting through ideas, try to come up with a manageable number of solutions, perhaps three to five. Mixing and matching ideas to form new ones is a common part of the sorting process.
- Throughout the entire session, encourage all students to participate and ensure that everyone’s thoughts are treated with respect.
- Have a student rule-keeper to help enforce these guidelines.

Sometimes students will just not be in a creative mood, or the well of ideas will run dry very early in the session and students may become bored with the process. When that occurs, other types of brainstorming activities may help the group back in a participatory mood. Here are several examples.

In **trigger** sessions, students generate ideas independently and silently and then read them aloud to the other students, who are encouraged to build on the ideas given. In **recorded round robin**, each student is given a card with the problem and instruction to add a new idea. The card then is passed from one student to another who continues to add an idea that is prompted by the ideas on the card.
Cards may be passed several times among students. During a **wildest idea** session, students give the most far-out ideas imaginable. Other students use these to come up with additional new ideas.

In some cases, **environmental changes** can spark renewed creativity. For example, replace the facilitator or recorder; change to a new color of pen being used for recording; rearrange students so that they are in a different seating arrangement; have everyone stand and take a stretch break; move the flip-chart to another lace in the room. The facilitator may have to work at encouraging participation.

If a questions draws hardly any responses, go back to ensure that students fully understand the problem and/or the brainstorming process.

**Sample Brainstorming Ideas**

Ideas for brainstorming sessions can come from individual disciplines, across disciplines, background knowledge, or experience. At the primary or early elementary level, students might be asked to brainstorm words that rhyme with *kind*, questions to ask a storybook character, ways to use numbers, uses of a telephone. In a secondary integrated math/science/technology course, students might brainstorm mathematical formulas used in construction work, tools needed to repair household items, factors having a negative impact on the environment. There are myriad topics and problems conducive to brainstorming sessions.

**Brainstorming Variations**

A number of variations on brainstorming have been developed that you may find useful, depending on the problem to be solved, the group makeup, and the amount of time to be devoted to generating ideas. When selecting a form of brainstorming, be sure to correlate the technique with your desired end result. Variations on brainstorming include the following:

**Reverse Approach:** In a typical brainstorming session, the goal is to generate positive things: new ideas, solutions, uses, etc. Using the reverse approach, the problem is approached in a negative way. The objective is to make things right by first identifying the things that are wrong. Have students brainstorm deficiencies and then brainstorm ways to overcome these.

For example, suppose the problem to solve concerns how to improve poor attendance rate at school. Brainstorming ways to increase absenteeism and class cutting can stimulate on the issue. Some possible answers might be: no consequences for not attending school/class; make instruction more boring; eliminate the guidance department; discontinue the attendance policy; make no parent contacts, etc. From these thoughts, ideas to improve the situation easily flow.

**SIL Method:** SIL is an acronym for the German words for “Successive Integration of Problem Elements.” In this method, all ideas may not be necessarily used, but they are heard and tried out.
• Idea generation is done individually in writing
• Two group members read their written ideas aloud.
• The other group members listen and attempt to integrate the ideas into one solution.
• A third student reads his/her ideas.
• The rest of the class integrates the third idea with the solution found from the first two students’ thoughts.
• This process continues until all ideas are entertained.

Pause That Refreshes. Brainstorming involves rapid idea generation by students and continued encouragement by the teacher or facilitator of the session to give even more ideas. Variations of this procedure involve stopping idea generation for a silent period, a time for renewal, and then returning to the idea-giving stage.

Teacher Checklist

Yes   No

☐ ☐ The problem was clear and well defined for students
☐ ☐ The rules for brainstorming were explained to and understood by students.
☐ ☐ The strategy was appropriate for generation of ideas for the topic given
☐ ☐ All ideas were accepted and recorded.
☐ ☐ All students gave at least one idea.
☐ ☐ Students’ remarks stimulated other ideas in a chain reaction effect.
☐ ☐ Students demonstrated creative thinking.
☐ ☐ All students were encouraged to participate.
☐ ☐ An appropriate pace and time limit were followed.
☐ ☐ If rules were broken, they were enforced with explanation.
☐ ☐ Praise was used to keep ideas flowing.
☐ ☐ Students were complimented on their cooperation and productivity.
☐ ☐ At the start of the evaluation process, ideas were clarified for students.
☐ ☐ Students agreed on which ideas to eliminate, join with other ideas, rephrase, consider as real possibilities, etc.
☐ ☐ Everyone’s input was treated with respect.
Students arrived at a few good solutions/ideas from the list.

Where implementation of ideas was appropriate, the ideas were put into action and students discussed the results.
Compare and Contrast

What is Compare and Contrast?

Compare and contrast is analysis to identify similarities and differences among objects, ideas, people, and events. A process used to classify, sort, and discover patterns, compare and contrast is frequently implemented when analyzing text and encourages students to discover knowledge for themselves during individual or small group work. In addition, the process of analyzing sets of data, such as numbers in a math class or statistical information in social studies, is useful in teaching how to evaluate and synthesize information.

The overarching purpose of using compare and contrast is to raise the level of rigor of thinking. In 2001 Bloom’s Knowledge Taxonomy was updated and revised by Lorin Anderson, one of Bloom’s students, and colleague David Krathwohl to reflect the movement to standards-based curricula and assessment. Nouns in bloom’s original model were changed to verb forms (for example, knowledge to remembering and comprehension to understanding) and slightly reordered. The original taxonomy shown in the Rigor/Relevance Framework describes expectations for Quadrants A, B, C, and D. the revised taxonomy elevated the importance of Quadrants B and D and indicates how 21st-century lessons should be build. Both the original and revised taxonomies are necessary and important.

Quadrant D on the Rigor/Relevance Framework is the quadrant in which students have the competence to think in complex ways and also apply knowledge and skills they have acquired. When you guide student thinking to Quadrant D, you place more emphasis on student learning and application. Compare and contrast is one of the strategies correlated with achievement because of the rigorous thinking involved (Marzano).

Compare and contrast is used to help students identify language cues, clarify thinking, and define ideas. When students see words in text such as on the other hand, but, however, yet, and nevertheless, they should identify these words as signals to make a comparison or a contrast with the information presented. Students can also learn how to compare and contrast without reading large passages of text using the strategies presented in this chapter. You can use compare and contrast in all grade levels and in all subject areas.

Using Compare and Contrast: Graphic Organizers

One way to use compare and contrast in your classroom is to have students create a graphic organizer. The student creates a graphic organizer after direct instruction, such as listening, reading, or viewing information. After the students complete the graphic organizers, a discussion is helpful so that you can help students synthesize and evaluate the information.

Alike and Different

Select two pairs of words and have a brainstorming session with the whole group. You can ask students to give answers in short phrases or in complete sentences. Remind students (especially in
Grades K-3) that when we compare, we show how things are alike and when we contrast, we show how they are different.

**Model #1 Chair—Dog**

<table>
<thead>
<tr>
<th>Alike</th>
<th>Different</th>
</tr>
</thead>
<tbody>
<tr>
<td>four legs</td>
<td>something you sit on—animal</td>
</tr>
<tr>
<td>nouns</td>
<td>silent—makes noise</td>
</tr>
</tbody>
</table>

**Model #2 Martin Luther King Jr.—Abraham Lincoln**

<table>
<thead>
<tr>
<th>Alike</th>
<th>Different</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both men who fought for</td>
<td>not a U.S. president—US president</td>
</tr>
<tr>
<td>civil rights</td>
<td>lived in 20\textsuperscript{th} century—lived in 19\textsuperscript{th} century</td>
</tr>
</tbody>
</table>

1. After you model the process, arrange the students in pairs or small groups. Ask students to divide a sheet of paper down the middle and label the left column *Alike* and the right column *Different*.

2. Provide students with several pairs of words and allow them to use resources in the classroom to help them find facts. Share a graphic organizer that has been completed for one pair of words.

3. Remind students to cite the source(s) they use to write facts.

**Cause and Effect**

You can also use a two-column table for a cause-and-effect activity. This strategy helps students identify more with contrast than compare, so it solidifies the importance of identifying how and why things are different. Model two examples of both cause and effect for the students. After they have seen two examples, leave one side of the table blank and brainstorm ideas.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>I set my alarm clock for PM instead of AM</td>
<td>I was late for school today.</td>
</tr>
<tr>
<td>I stuck a pin into a balloon.</td>
<td>The balloon popped.</td>
</tr>
<tr>
<td>Snow fell one foot an hour during a big</td>
<td>???????</td>
</tr>
<tr>
<td>storm.</td>
<td></td>
</tr>
<tr>
<td>Cause</td>
<td>Effect</td>
</tr>
<tr>
<td>-------</td>
<td>--------</td>
</tr>
<tr>
<td>???</td>
<td>I scored a 100% on the math test.</td>
</tr>
</tbody>
</table>

1. After you model the process, arrange the student in pairs or small groups. Ask students to divide a sheet of paper down the middle and label the left column *Cause* and the right column *Effect*.

2. Provide students with several sentences that are written on index cards and placed in two separate piles (one for cause and one for effect). Ask pairs or groups of students to draw two cards from each pile without looking.

3. Tell the students to write their sentences in the appropriate column, and then discuss possible causes and effects for the given situation.

**Venn Diagram**

The most common use of a Venn diagram is in math. It shows the relationship between and among sets. You can use two circles or three circles, depending upon the concept you are teaching and how much information needs to be organized. You can also use it in other content areas to provide students with a tool for organizing information. For example, in an English class, it can be used to analyze similarities and differences characters, stories, or poems. A Venn diagram is also an effective pre-writing activity. It helps students visually organize thoughts, quotations, similarities and differences prior to writing a compare and contrast essay.

![Venn Diagram](image)

To add interest, consider showing the overlapping symbols as something other than a circle. Try to select a symbol or graphic that relates to the content of what is being analyzed. For example, elementary students might compare and contrast apples and oranges by completing a graphic organizer that shows an overlapping apple and orange. Middle school students might compare and contrast the American and French Revolution by completing a graphic that overlays the outlines of the two nations.

**Compare and Contrast Between Sets**

In this example from an elementary math class, students are given two sets of numbers, one of which is labeled YES and one of which is labeled NO. Their task is to determine the concept that is
being taught based on the set labeled YES. This activity can be used as a pre-assessment strategy for you to see evidence of a student’s prior knowledge, or it can be used as a post-assessment strategy to validate learning.

YES (2, 4, 6, 8, 10, …) NO (3, 5, 7, 9, 11, …)

Guiding Questions

1. What do the numbers in the first set have in common? (They are all evenly divisible by two.)
2. What do the numbers in the second set have in common? (They are not evenly divisible by two.)
3. What concept is being taught? (Even numbers)

Compare and Contrast Among Ideas, Objects, and Other Concepts

The previous section showed compare-and-contrast activities for two sets of data. In the following activities, students are given three ideas, objects, or concepts to analyze and explain similarities and differences. Instead of graphic organizers, students use their analytical skills and ability to justify their thinking.

What Does Not Belong?

Helping students analyze larger amounts of text can be facilitated through learning activities that use smaller amounts of text. In this activity, students use sets of words to identify the “oddball” word and justify why it does not belong in the set.

You will need to have a good idea about your students’ prior knowledge, especially when you use this strategy in a specific content area. Be very intentional as you plan your lessons. The following example uses generic words. Ask your students to identify the word that does not belong and write an explanation about why that word does not belong. Students can use short phrases or complete sentences.

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Oddball</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue, Bus, Yellow</td>
<td>Bus</td>
<td>Not a color</td>
</tr>
<tr>
<td>Square, Triangle, Cube</td>
<td>Cube</td>
<td>Not a two-dimensional shape</td>
</tr>
<tr>
<td>Stove, Skateboard, Refrigerator</td>
<td>Skateboard</td>
<td>Not a kitchen appliance</td>
</tr>
</tbody>
</table>

What do they have in common?

In this activity, all three words belong in the same category. You can structure this learning activity in the following two ways:

1. Provide the students with the names of each of the categories but not in the correct order.
2. Do not provide the students with the names of each of the categories. Ask them to explain the thinking process in determining the correct category. You might find that students come up with different categories from those you feel are correct. For example, the words in Set 3 could be categorized as “things you put on a hamburger” or “things you put in a salad.”

<table>
<thead>
<tr>
<th>Data Set</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albany, Buffalo, Rochester</td>
<td>cities in New York State</td>
</tr>
<tr>
<td>Elephant, deer, dog</td>
<td>animals with four legs</td>
</tr>
<tr>
<td>Onions, tomato, lettuce</td>
<td>things we grow in our garden</td>
</tr>
</tbody>
</table>

**Analogs**

The word *analogy* simply means “word relationships.” This strategy is a higher-level thinking compare-and-contrast strategy and frequently appears on standardized tests, such as the SAT and the GRE. There are two common frameworks for an analogy. In each D is usually left for the student to answer.

1. **A** is to **B** as **C** is to **D**
2. (A) : (B) :: (C) : (D)

Categories/relationships of analogies can include the following:

- **Antonyms**: UP is to DOWN as LEFT is to RIGHT
- **Cause and Effect**: INFECTION is to ILLNESS as CARELESSNESS is to ACCIDENT
- **Descriptions**: BLUE is to SKY as GREEN is to GRASS
- **Parts of a whole**: FINGER is to HAND as LEAF is to TREE
- **Synonyms**: CALM is to SERENE as ANGRY is to MAD
- **What it is/does**: KNIFE is to CUTS as SHOVEL is to DIGS

The following are a few tips to consider when planning a lesson using analogies.

1. Decide whether you will give the students multiple-choice answers for each analogy or whether you will leave it open ended. If you leave the analogies open ended, students have more opportunities to engage in rigorous thinking.
2. Extend thinking by asking students to come up with the category for the analogy. You can provide categories for students to make connections or ask students to recall categories from examples already done in class.
The following are some examples of content-specific analogies you can use with your students.

- 6 is to 36 as 9 is to _____
- CONIFEROUS is to CONE as DECIDUOUS is to _____
- OBAMA is to BIDEN as BUSH is to _____
- NOUN is to PERSON as VERB is to _____
- BASEBALL is to INNINGS as FOOTBALL is to _____
- PAINTER is to WATERCOLORS as POTTER is to _____
- MOZART is to CLASSICAL as LED ZEPPELIN is to _____

Metaphors and Similes

A metaphor is an implied analogy, and a simile is an expressed one. A metaphor compares two unlike things often using forms of the verb to be. A simile shows a comparison using the words like or as. Students can apply the compare-and-contrast strategy when they are given examples of metaphors and similes. The following are some examples:

- Metaphor: His glare was the ice that brought me to shiver.
- Simile: She is as cold as ice.
- Metaphor: Juliet is the sun.
- Simile: Juliet’s smile is as bright as the sun.
- Metaphor: Math is a walk in the park!
- Simile: Solving this equation is as easy as pie.

Extending Learning Beyond Compare and Contrast

Making Predictions

Comparing and contrasting information can help students make predictions. Students can use their prior knowledge about a situation and compare it to a current situation that they are analyzing.

- Situation: You are in science class and need to determine which objects will float. You have a plastic milk jug and a brick. How can you use compare and contrast to determine which object will float?
- Situation: You observe that the sky has turned dark and big gray clouds are gathering. What season is it? Is it more likely to rain or snow?
- Situation: A new law is passed that requires teenagers to take driving courses at night. What is the difference between driving during the day and driving at night?

Sequencing

When we want to build reading and writing skills, using sequencing can help students arrange their thinking in chronological order. Students need to become familiar with certain words that signal a
specific sequence: *first, next, then,* and *finally.* As students become more familiar with signal words, they can learn to compare and contrast the signal words to sort out the difference among the beginning, middle, and end. The following are some examples of how you might use sequencing.

1. Provide a list of signal words and ask students to write their own short story that has a definitive beginning, middle, and end.
2. Have students read a passage that is written out of order and ask them to rearrange it in chronological order.
3. Write events separately (perhaps on index cards) and ask students to arrange them in the order in which they occurred.

**Patterns**

Compare and contrast is useful in mathematics when students are first learning how to recognize patterns and in later grades when they are asked to extend and describe patterns. Patterns can include sets of numbers, shapes, or letters.

To encourage more rigorous thinking, expose students to a wider variety of numbers patterns whose rules are less obvious. For example, look at these patterns and find the missing terms:

Pattern #1: 24, 21, 18, 15, _____

Pattern #2: 9, 12, 15, 18, _____

**Guiding Questions**

1. Compare the first two numbers.
2. Compare the second and third numbers.
3. Compare the third and fourth numbers.
4. Compare the two patterns. How are they alike? Different?

**Teacher Checklist**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td>Students demonstrate a higher level of rigor in their thinking.</td>
</tr>
<tr>
<td></td>
<td>Students show evidence that they understand the purpose of using compare and contrast strategies.</td>
</tr>
<tr>
<td></td>
<td>Students demonstrate respectful behavior during small group work.</td>
</tr>
<tr>
<td></td>
<td>Graphic organizers are used to model strategies.</td>
</tr>
<tr>
<td></td>
<td>Students are allowed to reflect after using various graphic organizers.</td>
</tr>
<tr>
<td></td>
<td>Graphic organizers are intentionally designed prior to the lesson for easy use and application.</td>
</tr>
<tr>
<td></td>
<td>Students clearly justify their thinking.</td>
</tr>
</tbody>
</table>
Cooperative Learning

Basic elements of Cooperative Learning

According to Johnson and Johnson (Circles of Learning, 1986), there are five essential components of any cooperative learning model or method.

1. **Positive Interdependence.** Student must feel that they need one another in order to succeed, that they will “sink or swim” together. It takes everyone to complete the task. When students perceive that their achievement is correlated with that of other students, they experience positive interdependence. Students recognize that each member functions as a part of a team and that the success of the whole group depends on the contributions of each member. This relationship fosters peer tutoring, support, and encouragement. Some ways to create this feeling are to:
   - Establish mutual goals; students must learn a given material and make sure that all other members learn it as well.
   - Give joint rewards; group members receive individual bonus points if all members score above a given percentage on a test.
   - Provide a task structure that involves a division of labor.
   - Provide shared materials and information; for example, the group task is completed on a single sheet of paper or each member has only part of the information or materials necessary to complete an assignment.
   - Assign roles: time manager, encourager, classifier, summarizer, etc.

2. **Face-to-Face Interaction.** When students interact with other students orally and in writing, in pairs or small group activities, it maximizes student involvement and aids in concept development. Verbal exchanges, such as giving and receiving explanations, summarizing, debating, and elaborating, provide students the language needed to internalize information and exercise higher level thinking skills. For interaction to be productive and equalized, students must learn communication skills and key vocabulary.

3. **Individual Accountability.** Cooperative learning groups are successful to the extent that they promote individual as well as group effort and achievement. Thus, it is important to assess individual learning frequently so that group members can appropriately support and help each other. Monitoring each student’s contribution deters any team member from becoming a “free rider” or a “workhorse.” Some ways of structuring individual accountability include giving individual exams, assigning a mini-topic per student, and having students initial their contributions to a team worksheet or project.

4. **Interpersonal and Small Group Skills.** Most students need to learn the social skills necessary to collaborate effectively with others in producing a common product or achieving a mutual goal. Therefore, skills such as active listening, group decision-making, leadership, and conflict management need to be taught to achieve effective group functioning.
5. **Group Processing.** Students need time and procedures to analyze how well their group is functioning. Individual students (self-evaluation), team members, student observers, or the teacher, can provide feedback. An integral part of feedback is group processing to analyze the effectiveness of the team. Social interaction skills are most needed when the cooperative task is more complex and less structured.

**Cooperative Learning Instructional Methods**

Practical classroom applications of cooperative learning principles have been developed by several independent groups of researchers. Their methods are aimed at reducing student isolation and individual competition and at increasing students’ abilities to interact and work together toward common goals. The most commonly used cooperative learning structures are listed.

**Student-Teams-Achievements Division (STAD) (Robert Slavin)**

Whole Class: You present a lesson to the class.

Teams: Students assemble in teams of four or five members and complete activities to ensure that all members understand the lesson.

Individuals: Individuals take a quiz on the material. The team’s overall score is determined by the extent to which each student improved over his/her past performance.

**Teams-Games Tournament (TGT) (Robert Slavin)**

The procedure in TGT is the same as STAD. However, members from each team vie in ability-grouped academic games. Each student earns points for the team according to his/her improvement over past performance. Team scores are usually posted.

**Jigsaw (E. Aronson)**

Teams: Students meet in teams of five.

Home Teams: Academic material is broken down into sections. You give each student an item of information that the student must teach to his/her teammates.

Experts Groups: Team members learn information from one another.

Home Teams: Experts return to home teams to share their expertise on the topic.

Individuals: Students may be tested individually for their mastery of the material.

**Jigsaw II (Robert Slavin)**

Jigsaw II is a modification of Jigsaw. In Jigsaw II, students obtain their information from textbooks, the Internet, narrative material, biographies, etc. Students discuss their topics in expert groups and
teach their teammates what they have learned. Finally, students take a quiz on the material, and the scores are used to form individual and team scores.

**Learning Together (Johnson and Johnson)**

This method is closest to pure cooperation. After you have presented a lesson, students work together in small groups to complete an assignment or worksheet. The team as a whole receives praise and recognition for work completed.

**Group Investigation (Sharan and Sharan)**

This is the most complex method of cooperative learning. Students in small groups take substantial responsibility for deciding what they will learn, how they will organize themselves to learn it, and how they will communicate what they have learned to their classmates. Students are graded on the quality of the group’s report to the class.

**Think-Pair-Share (Kagan)**

Individual: You pose a question; students work individually.

Team (pair): Students pair up and share responses with one another; sometimes the pairs work to reach consensus.

Whole Class: Pairs share with class.

**Numbered Heads Together (Kagan)**

Teams generate a number of ideas; then each member chooses one to report to the class. All students stand. You call on one student to share and then sit down; any student(s) having a similar idea also sits.

**Roundtable (Kagan)**

You ask a question with many possible answers. The students will respond on one piece of paper. Each student writes one answer and then passes the paper to the person on his/her left. The response paper literally goes round the table.

**Roundrobin (Kagan)**

This is the oral counterpart of roundtable. Students take turns stating answers without recording them.

**Three-Step Interview (Kagan)**

You generate a topic. Students are grouped into pairs. One student becomes the interviewer, and the second student becomes the interviewee. Each
student plays both roles on the given topic. Students complete a round-robin exercise where each student shares with the other team members what he/she learned in the interview.

Lineup (Kagan)

Team members divide and learn new information. Then they teach each other their part/topic.

Your Role

Successful cooperative learning requires you to train students to work together using clear procedures. Helping, sharing, and cooperating are classroom norms.

In the cooperative learning classroom you are not the sole expert who dictates instructions. You must be able to allow the students to make some choices as to the substance and goals of their learning activity.

Students participate actively in the process of acquiring knowledge as you facilitate the learning opportunities. Cooperative small groups shift instruction and supervision from direct to indirect. Authority becomes delegated through norms and roles. Considerable planning is required to create effective cooperative learning.

Your Responsibilities

1. **Decisions:** Various decisions have to be made regarding the cooperative learning methods, size of group, assignment of students, arrangement of the classroom instructional materials, and assignment of roles.

   The learning task will determine to a great extent the cooperative learning method you select. The room arrangement will also be determined by the cooperative learning method. Grouping, of course, requires changing the traditional room arrangement.

   Other factors to consider when setting up the room include: what the groups will be doing, how visible groups need to be to one another, access to materials, etc. Materials make tasks more interesting. Using a variety will improve student motivation and interest.

   When assigning roles, you need to be sensitive to students’ strengths and weaknesses. Roles should assist in enforcing group norms. Roles should be rotated for different activities so that students can learn what each role involves.

   Groups composition is optimal at four to five for short-range projects. Larger groups may be used for longer-range projects provided subgroups or task forces within the larger group are established. You should assign students to groups. Groups should be heterogeneously mixed as to academic achievement, sex, race and ethnicity. Self-selection should only be
done on the basis of interest in a particular topic. You should periodically change group composition, such as with a change in task.

2. **Setting Task and Positive Interdependence**: You need to explain the task, the criteria for success, and the desired student behaviors. Also, positive goal interdependence, individual accountability, and intergroup cooperation must be structured.

   Introduce the task. Point out and discuss the different skills needed to complete the task. Discuss what each group will be doing, what each student will be responsible for, how the product/process will be presented, and how students will be evaluated. Develop group worksheets that students may work on together to reinforce content and skills. Prepare written instructions on the task and how to accomplish it. Expectations should be clear. Check instructions by working through them yourself, or have another teacher read them for sense and clarity. Set norms and roles that will require students to use on another as resources.

   Cooperative norms for behavior should ensure that everyone:
   - Listens to one another
   - Contributes
   - Asks for help when needed
   - Helps others when asked

   To ensure that each group member is accountable:
   - Design worksheets to be completed by individuals but worked on by the groups as a whole.
   - Test students individually on content covered in the small group after the group task is completed.
   - Structure the group so that each student is responsible for a specific part of the task.

3. **Monitoring and Intervening**: As facilitator, you need to intervene where necessary to provide task assistance and to monitor student behavior. Although the students are the “active” learners in cooperative learning, you need to introduce, guide, intervene, and close the lesson. Check and monitor the working groups but do not direct them. You are responsible to structure the learning activity and ensure that its implementation will result in student learning and achievement.

4. **Evaluating and Processing**: During group work, you should provide specific feedback on content and group process. Ask questions that reflect and extend experiences. Some
categories for observation during group work are explaining concepts, encouraging participation, checking understanding, and organizing the work. By using norms and roles, constructive feedback processes can be built into group work. Use wrap-up sessions for students to share ideas, present products, and discuss their experiences working cooperatively.

**Individual Student Responsibilities**

1. Trying—improvement counts
2. Asking—requesting help, clarification from teammates
3. Helping—teammates, classmates, the teacher
4. Courtesy—requests, praisers, encouragers, no put downs
5. Filling rolls
   - Checker (checking for understanding and agreement)
   - Praise/Encourager (praising effort, ideas, helping roles)
   - Recorder (recording ideas, decision, processing, products)
   - Taskmaster (bringing the group back to the task)
   - Gatekeeper (ensuring all participate, no bully, no loafer)
   - Gofer (getting materials, books, etc.)
   - Reporter (sharing with other teams, class, teacher)

**Team Responsibilities**

1. Solving their own problems
2. Team questions only
3. Consulting with other teams and the teacher
4. Helping teammates, other teams, the teacher (if asked)
5. Listening

**Two Rules for Students When Functioning in Groups**

1. You are responsible for your own work and behavior.
2. You must be willing to help any group member who asks.

**Teacher Checklist**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
|     |    | Students received training in norms and roles for cooperative learning.
|     |    | Roles were assigned based on students’ strengths and weaknesses.
<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>The groups were heterogeneous.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>The group size was appropriate for the task.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The room was arranged to ensure effective group functioning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The cooperative learning method was compatible with the learning task.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Materials needed for each group were easily accessible.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You and the students knew specifically what was to be learned.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students understood the task.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students understood positive interdependence in relation to the task.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Students understood what they were individually accountable for.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The criteria for success were clear and understood.</td>
</tr>
</tbody>
</table>
Demonstration

Definition of Demonstrations

Demonstrations are live visual exhibitions of a process or experiment. They can be used to show students correct techniques for operating equipment, set up experimentation, emphasize safety precautions, or introduce important concepts. Demonstrations use the power of visual learning. Many skills and concepts can be taught more effectively with a dramatic visual demonstration.

Demonstrations help students share learning experiences, through the interplay of ideas, observations, questions and comments on what they have observed. Demonstrations can add considerable interest to a lesson and make learning easier. The visual aspect of a demonstration helps students to remember.

Demonstrations are not as effective a learning technique as having students participates directly in a hands-on experiment of their own. However, demonstrations are the best strategy to reduce hazards, such as showing safety procedures or a process for handling dangerous materials. In this type of demonstration, the students observe only, and don’t repeat the actions themselves.

A demonstration allows the teacher to model proper behavior. The teacher sets the standards of speed or accuracy that students are expected to follow after sufficient practice. Demonstrations can also reduce the time the students need to practice and reduce the likelihood of trial and error learning.

As with other teaching techniques, planning is essential to be sure that the demonstration will have maximum benefit in helping students learn. Effective demonstrations require the teacher to be competent at the skill—but not necessarily a world expert! If the teacher is unfamiliar with a skill, he/she should practice it prior to demonstrating it to a class of students. The teacher must be able to present the skill in easy, learnable steps or stages. The steps should lead to competence when practiced by students.

A demonstration should:

- Capture students’ interest
- Draw on the personal ideas and experiences of the students
- Create in students a desire to do the procedure
- Make students think about what the demonstrator is doing and why it is done in that way
- Provide an easy transition from observing to doing it in practice
- Set standards—provide a “mental template” or good example to follow
- Be followed by student application or replication of the skill
Steps in Preparation of a Demonstration

1. Analyze the skill or process to be taught.
2. Divide the activity into a series of steps and select key stages as teaching points.
3. Identify what may be difficult, unfamiliar, or confusing for a learner, as well as parts that may need more explanation or practice than others.
4. Prepare demonstration notes.
5. Assemble materials and prepare the physical setting.
6. Set up the demonstration area so that everyone will be able to see.
7. Prepare any handouts or visual aids.

Steps in Giving a Demonstration

1. Explain the purpose of the demonstration.
2. Check what students already know about this skill or concept.
3. Point out any new or unusual features of the equipment or materials to be used.
4. Describe the process.
5. Review key steps or difficult parts.
6. Demonstrate the skill or process to present a “mental template” of a correct or appropriate performance.
7. Point out particular highlights as they occur, but don’t talk the whole way through the demonstration.
8. Repeat specific parts afterwards, using slow or exaggerated movements if necessary.
9. Introduce essential information at suitable times, stressing main points and safety aspects.
10. Use visual aids if and when required.
11. Put away equipment and materials after use to set a good example for work habits.
12. Prepare the students to practice what they have observed.

Suggestions:

- Display or have a handout of a list of key steps to reinforce these points with students.
- Encourage questions and ask the students questions to test their understanding of the process and steps.
- Ask one student to replicate the demonstration while others observe and comment. This approach lets you check any errors as they occur and provide further explanations if needed.
- Check the group understands of the key stages as the task is repeated.
- Don’t demonstrate the incorrect method as the visual impact may remain with the students and confuse them. Explain things that can go wrong, but don’t give a visual demonstration of them!
**Teacher Checklist**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Feedback and Reflection

Feedback and Reflection—An Important Step in Learning

Feedback and reflection involves directing student learning by checking for understanding, giving student feedback, and/or encouraging student reflection. Many teachers become frustrated when they feel they have delivered an effective lesson and students perform very poorly on an assessment of their knowledge. Teachers can easily become wrapped up in teaching and assume that if students are in class and not disruptive, they are absorbing all that new knowledge from a teacher’s passionate presentation.

To avoid disappointments in student achievement, an essential teaching responsibility is checking for understanding, giving students feedback, and stimulating reflection. Teachers need to ensure that students are grasping new concepts and knowledge. This does not mean simply posing the question, “Do you understand?” and continuing on with the lecture or presentation when one or two students nod their heads positively. Teachers need a more accurate assessment of student understanding.

Checking for Understanding

There are many different ways to check for understanding, some more formal than others. In this era of high-stakes testing, one of the most common forms of checking for understanding is having regular assessments that are closely aligned with final high-stakes tests or end-of-course exams. This type of checking for understanding is useful, particularly in subjects related to achievement on state tests. However, teachers of English language arts and mathematics should strive for levels of understanding beyond the low rigor/low relevance knowledge that is required on state tests. Do not rely solely on common assessments to check for understanding. Some additional techniques to check for understanding include students’ oral language, teacher questions, quick writes, projects and performances, and student body language (Fisher and Frey).

The practice of checking for understanding also includes formative assessment. A formative assessment is an assessment given during instruction. It allows teachers to make adjustments, leading to greater student understanding and achievement. In contrast, summative assessment is the final exam that a student takes at the completion of a course or year of study. Using common assessments and types of quizzes can be useful formative assessments during instruction.

Oral Language

Oral language is a dominant form of communication in the classroom. Teachers give oral directions and information. Teachers ask students to respond orally to questions and engage in discussion. When students use oral language, they expose their understanding of new material. Facilitate activities during lessons that allow students to use oral language. Monitor what students are saying as an informal measure of students’ understanding of the content. To stimulate oral language, you can specifically ask students a question; however, a process that more fully engages the entire class is to facilitate student discussions either in pairs or small groups
Another form of oral presentation used in checking for understanding is having the students give oral summaries. For a further discussion of summarization, see the Summarization section in this handbook.

**Using Oral Strategies to Check for Understanding**

The following are several group activities. As a teacher listens to ideas or information shared by students, he or she can determine the level of understanding.

**Compass Points.** Students get into groups of four where each student is labeled north, south, east, or west. Ask students to reflect on a concept and draw a visual of his or her interpretation. The teacher then calls randomly on pairs of compass points to share with each other.

**Circle, Triangle, Square.** Have each student discuss the following: something that is still going around in your head (circle); something pointed that stood out in your mind (triangle); something that “squared” or agreed with your thinking (square).

**Decisions, Decisions (Philosophical Chairs).** Given a prompt, students go to the side of the room that corresponds to their opinion on the topic. Students share their reasoning for their beliefs and then are given the opportunity to change sides after discussion.

**Example/Non-Example.** Given a concept, students sort or write various examples and non-examples.

**Reverse Example/Non-Example.** Given examples and non-examples, students determine concept.

**Fill in Your Thoughts.** Students fill in the blank as a written check for understanding. (Another term for rate of change is __________ or __________.)

**Onion Ring.** Students form an inner and outer circle facing a partner. The teacher asks a question, and the students are given time to respond to their partner. Next, the inner circle rotates one person to the left. The teacher asks another question, and the cycle repeats itself.

**Say Something.** In a cooperative group, students take turns leading discussions on sections of a reading or video.

**Timed Pair Share.** Given a prompt, students pair up and share their perspective for a set period of time.

**Word Sort.** Given a set of vocabulary terms, students sort them into given categories or create their own categories for sorting.

**Whip Around.** Teacher poses a question and asks students to write at least 3 items on a scrap of paper. When students have done so, they stand up, and the teacher randomly calls on one student to
share one of the ideas from his or her paper. Students check off any items that are said by other students and sit down when all of the items have been shared within the class.

**Using Questions**

Questions are one of the most effective techniques to check for understanding. Ask higher-level questions to stimulate deeper understanding. If you only ask questions that require a simple recall answer, you do not know the students’ depth of understanding. Without this deeper understanding, students are likely to forget information quickly.

One way to ensure full class participation when using teacher questions is to have some type of student response system. If you call on a single student and get the correct answer, you are only checking for understanding with one student, which may or may not reflect the understanding of the entire class. New technology applications have created a variety of electronic student response systems. These are excellent devices for posing questions to the entire class and require a response from every student. In this way, you can determine the level of understanding from everyone in the class.

In addition to high-tech solutions for audience response, you can create other forms of full-class response. Many teachers use small whiteboards with erasable markers that students can write an answer on and hold up for the teacher to see.

**Using Writing to Check for Understanding**

Using oral response is a good indication of understanding, but a more rigorous measure of depth of knowledge occurs when students are asked to write. The chapter “Writing to Learn” offers more thorough information on the use of student writing in the classroom. The following are several writing strategies:

**Entrance/Exit Ticket.** Each student is given a ticket to complete before leaving the room. The ticket may require students to answer one of the following questions: What is the most important thing I learned today? What questions do I still have? Students give these tickets to the teacher when exiting the room or upon entering the next day. The teacher uses this information to guide the instruction.

**Give One, Get One.** In this cooperative activity, students write responses to a prompt, meet up with another student, and share ideas so that each leaves with new thoughts to consider.

**Take and Pass.** This cooperative activity helps to share and collect information from each member of the group. Students write a response, pass their paper to the right, add their response to the next paper, and continue until they get their paper back. At the end the group debriefs.
Using Non-Verbal Checks for Understanding

Experienced teachers may not even need to ask a question in order to determine whether students are understanding concepts. Closely observing students and paying attention to verbal cues can provide a great deal of information on the level of student understanding. Watch for facial expressions, eye movement, or even restlessness to determine whether students are engaged and understanding the lesson. You can also develop a series of hand signals, such as thumbs up or thumbs down, for students to provide a reply. These quick body language signals are valuable but only work effectively in classrooms where teachers have established good relationships with students.

Another variation of non-verbal indicators is to incorporate physical movement. One way to do this is to gather feedback and actively engage students by setting up response areas in different parts of the room. Ask students to show degrees of agreement of disagreement to a particular question by physically moving to the corner of the room that represents their beliefs. Then invite students to discuss their opinions with others in that similar group and finally offer an opinion to the entire class. This physical movement is engaging for students and also provides a clear visual representation of what students are thinking. You can find additional information on this topic in the chapter on physical movement. The following are additional non-verbal activities you can use to check for understanding.

3-2-1/Fist to Five/Thumbs Up, Thumbs Down. Students communicate their level of understanding using their fingers.

4-3-2-1 Scoring Scale. This posted scale can either be used as a quick check with hand or a numerical value for students to self-assess a written assignment.

Every Pupil Response. Each student receives a pink and yellow card. Each color represents a specific response. Students raise the card to provide the correct response to a teacher-directed question.

Human Graph. In this kinesthetic activity, students in the class physically move to create a histogram. Students represent data points on the graph.

Interlocking Paper Plates. Students use two colored plates to provide feedback by sliding the two colored sections to show level of understanding.

Slap it. Teacher divides students into two teams to identify correct answers to questions given by the teacher. Students use a fly swatter to slap the correct response posted on the wall.

Triangular Prism (Red, Yellow, Green). Students give feedback to the teacher by displaying the color that corresponds to their level of understanding.
Using Projects and Performances to check for Understanding

To achieve high rigor and relevance, consider student projects and performances as a way to demonstrate understanding. When students create projects, they must draw upon a greater depth of knowledge in order to complete the performance task. These types of measures only work well if the project of performance is directly related to the content learning. In addition, the project of performance must have a clear, high-quality scoring guide to evaluate student work.

Feedback

Feedback is connected to checking for understanding. When you become aware of the current level of student understanding through student responses or common assessments, you can stimulate student reflection by giving constructive feedback to students. Brookhart offers several suggestions for giving student feedback.

Timing is important. Feedback should occur as soon as possible after the teacher has assessed the current level of understanding. Also, the teacher should give essential feedback prior to a summative evaluation. This way the student has additional time to learn the required skills and knowledge.

Feedback should always be separate from comments about the individual student and focus exclusively on the quality of the work. Never label a student with a negative phrase such as “lazy,” “careless,” or “failing.” These labels often discourage student effort because the student identifies with the label and feels that no amount of effort will achieve success. Likewise, labeling students as “good”, “straight A” or “bright,” can lead to problems. Again, students identify with the personal label and may not work as hard as they should. When they do not achieve, students may feel that the label is wrong. Keep all feedback about the work and not about the person.

Feedback should also be criterion referenced. Establish a specific scoring guide for performances and set clear expectations. Feedback should relate to the differences between student achievement and the expected criteria for effectiveness. Feedback should also be qualitative and provide enough specifics to give students ideas on how they can improve their performance. For example, in writing, the teacher should identify grammatical errors or weaknesses in tone or clarity to provide students helpful suggestions on how to improve their writing. In mathematics, the teacher should show the errors that students make in either interpreting the problem or constructing the solution. Always try to make feedback positive and encourage students to improve.

When giving oral feedback, make an attempt to provide feedback in a one-on-one conversation with the student. This can be done quietly at the student’s desk while the rest of the class is working. You can also set up individual student conference times outside of class or after school. When significant negative feedback is necessary, be sure those conversations are in private. When positive feedback is appropriate to identify exemplary work, you may do this in from of the entire class to provide recognition. However, recognize that some students may be embarrassed by public accolades.
Reflection

Reflection is a quiet internal consideration of something. The word is from Latin –flex or bend, literally bending back. So reflection in learning is bending back and taking another look at what we have learned. Reflection is an important factor in learning. When students have the opportunity to reflect and are encouraged through some activity to reflect, it reinforces their learning and transfers new information into long-term memory. To prepare for application, students need to reflect on new information to store it in their brain and later retrieve it to connect with an application activity. When students reflect on new learning, they make the internal mental connections to retrieve that new knowledge at a later time.

You can initiate reflection among students in many different ways. A number of cooperative learning and group discussion techniques stimulate reflection. Teachers frequently use writing and journaling as reflection activities. Many checking-for-understanding activities described in this chapter stimulate important student reflection on a formative basis when students still have time to learn before being held accountable for applying the learning in a summative assessment.

Most importantly, allow time for students to reflect on their learning. Do not assume that just because students have heard or read information, they have retained it.

Teacher Checklist

Yes  No

☐ ☐ Time is taken frequently to check for understanding.

☐ ☐ Activities to check for understanding involve each student, not just a few.

☐ ☐ Activities to check for understanding frequently involve student movement.

☐ ☐ Students are shown and encouraged to listen deeply to other student conversation.

☐ ☐ Feedback is given on a timely basis.

☐ ☐ Feedback always focuses on the quality of the work and not the characteristics of the student.

☐ ☐ Feedback is positive and constructive.

☐ ☐ Feedback is criterion based.

☐ ☐ Feedback provides enough detail to enable students to improve their work.

☐ ☐ Students are encouraged to reflect on the quality of their work.
Guided Practice

This chapter reviews practical guidelines for using common forms of guided practice: homework, worksheets, and computer-based drill and practice.

Homework

The following list of "Tips for Effective Homework" comes from Helping Your Students With Homework: A Guide for Teachers, published by the U.S. Department of Education.

1. *Layout expectations early in the school year.* Before handing out the first homework assignment, go over the ground rules. A written explanation of the homework expectations increases chances that assignments will be completed successfully. Write notes home laying out expectations, which parents or caregivers are asked to read, initial, and return. Talk with parents about homework at back-to-school night; telephone parents. Make special efforts to communicate with those who are hardest to reach.

2. *Create assignments with a purpose.* Some homework is not better than no homework at all. The quality of an assignment makes a huge difference in whether it gets done. Busywork is not an effective instructional strategy.

3. *Make sure students understand the purpose.* Most students appreciate understanding the purpose of an assignment, even if the purpose may not become evident until they are part way through an assignment or have completed it altogether.

4. *Make assignments focused and clear.* Focused assignments are easier for students to understand and complete. Homework that tries to introduce or reinforce too many ideas is less likely to contribute to learning. This is particularly true for students whose abstract thinking hasn't developed to the point where they can integrate many concepts successfully.

5. *Create assignments that challenge students to think.* Homework can give students an opportunity to apply a concept beyond the controlled conditions of the classroom. It can also help students pull together and connect information from different places, sources, and subjects. Good assignments often challenge students to break free of their usual way of thinking. Such assignments might require students to combine two ideas that are usually not associated.

6. *Vary assignments.* Students get bored if all assignments are similar. Try mixing approaches and styles. Since it's almost impossible for all assignments to interest all students, this approach increases the chances that all students will have some homework that they enjoy.

7. *Give homework that makes learning personal.* The assignments that work best relate to the students-the assignments are personal to them. These assignments allow students to draw upon their family, cultural, and community experiences and make learning relevant.
8. **Tie assignments to the present.** Students often complain that they can't relate to assignments involving events that took place in the distant past.

9. **Match assignments to the skills, interests, and needs of students.** Students are more apt to complete homework when assignments are neither too easy nor too hard, match the students' preferred learning styles, and allow students to work on material that they truly enjoy. Provide assignments to a heterogeneous class of students that vary in style, format, and content. This assures that all students have some that suits them.

10. **Use school and community resources.** Many creative and rewarding homework assignments draw upon resources that are close at hand.

11. **Match assignments to your style of teaching.** Assignments are more apt to succeed if you are comfortable with them.

12. **Assign an appropriate amount of homework.** Many educators believe that homework is most effective for children in first through third grades when it does not exceed 20 minutes each school day. From fourth through sixth grades, many educators recommend from 20 to 40 minutes a school day for most students. For students in seventh through ninth grades, generally, up to 2 hours a school day is suitable. Ninety minutes to 2-1/2 hours per night are appropriate for grades 10 through 12. Amounts that vary from these guidelines are fine for some students.

13. **Encourage and teach good study habits.** Children need good study skills in order to complete assignments and gain the most from them academically. Unfortunately, many students haven't developed these skills, even by high school.

14. **Provide constructive feedback.** Students are more apt to do assignments and advance their learning when they get consistent and constructive feedback. Students need to know where they excelled and where they need to do more work on an assignment. This conveys the vital message that homework helps students learn and is important.

15. **Give praise and motivate.** Adults and children alike respond to praise. "Good first draft of your book report!" or "You've done a great job" can go a long way toward motivating students to complete assignments. Praise must be genuine. Children recognize insincere compliments.

16. **Give help as needed.** Students who don't understand an assignment need to know that help is available from you or another appropriate person. Students at risk of academic failure or with personal difficulties may need extra support with both academic and logistical aspects of homework. It is important that they know it is okay to ask for help. In fact, it is imperative that they do so.
17. *Communicate with parents.* Student learning improves when you communicate with parents on a broad range of issues. Among the most vital of these is homework. Parents are not expected to know or teach specific information to their children, particularly as students get older. Parents can be an enormous help, however, in creating an environment at home that allows learning to take place. You can also help create situations that allow parents and educators to work together to strengthen all learning, including what takes place at home.

18. *Show respect for students.* Students are more inclined to complete assignments when you and the students respect one another. Students sense when teachers care about them and want them to do their best work.

**Homework Guidelines**

1. Set the expectations for homework early in the school year.
2. Don't give homework as punishment.
3. Don't give spur-of-the-moment homework assignments, especially if you expect students to devote their time and care to the work.
4. Don't assume because no questions are asked when you give the assignment that students have no questions about their homework.
5. Explain the purpose of every assignment.
6. Acknowledge and praise students' efforts to complete homework.
7. Listen to what students say about their experiences with homework.
8. Include parents by making your homework expectations clear and encouraging students to ask their parents for appropriate help.
9. Offer to help students before and after school with homework. You are the best judge about which assignments really must be completed independently.
10. Don't confuse excuses for incomplete homework assignments with legitimate reasons.
11. Make every effort to acknowledge completed homework assignments and, if you grade them, do so and return them right away.
12. Be consistent in the amount of time students are expected to devote to homework. Avoid assignments that are significantly larger than typical assignments.

**Worksheets**

In elementary school (and to a lesser extent in middle and high school) worksheets can help children develop good work habits and attitudes. Worksheets can:

- teach children the fundamentals of working independently
- encourage self-discipline and responsibility, as assignments provide youngsters the chance to manage time and meet deadlines

Worksheet assignments should have a clear purpose and be tied directly to the overall instructional plan. Like homework, worksheets should not be used as punishment. Students need to know the
purpose of the worksheets and not consider them busy work. Worksheets require a fair amount of planning and thought as to why you are assigning them in the first place.

Worksheets can be used for practice of a procedure, vocabulary, application of concepts, or recall of information. Worksheets are also useful for independent research or observation. Worksheets used in this manner provide a good structure for students learning in individual learning centers. The worksheets provide students with questions to follow and become an easy tool on which to record their work for your review.

**Computer-or Mobile Device-Based Drill and Practice**

By its nature, computer-based and mobile device-based practice is a highly repetitive activity that, if not carefully crafted, can quickly lose learner interest. Students mechanically work through drill questions, pressing keys and moving on, with little real engagement of creative or critical thinking. In short, students can become bored, and the educational opportunity of the drill-and-practice exercise will be lost.

Variety in design and delivery is the key weapon in the war against boredom. Too often software developers attempt a "quick fix" of cute sounds and graphics, which signal the correctness or incorrectness of responses but add no real training value to the process. Too much "cuteness" can actually detract from, rather than enhance, the training goals.

Better alternatives exist to combat learner boredom. Whether you are reviewing software for purchase or designing your own computer drill-and-practice activities, consider the tips listed below.

- **Employ a Short, Modular Approach**
  Short guided practice segments are better than confronting the learner with a long list of repetitive questions that cover a broad spectrum of topics. Each segment should consist of a limited number of questions targeting very specific topics. (This is especially useful if exercises are integrated into a larger tutorial project.)

- **Record the Learner's Exit Point**
  Quite often students will use a guided practice tool on a number of occasions over a period of time. In these situations, learners find it both distracting and discouraging to be forced to "rework" materials covered in previous sessions. To avoid this problem, exercises should track learner use for quick navigation over "completed" sections of instruction.

- **Interchange Questions and Responses**
  One of the simplest ways to add variety to drill-and-practice questions, especially in multiple-choice questions is through the interchange of the question and response. The response becomes the key element in the new question stem and vice versa.

- **Reorder Questions within an Exercise**
  If learners will use a drill-and-practice tool more than once, the same questions should not always be presented in the same order. For maximum variety, it is best to have a large pool
of questions-in equivalent form and level of difficulty-and randomly generate a "new" order each time the student begins the lesson.

- **Student Responses**
  After presenting the learner with a question (and possibly a number of alternative answers), the exercise waits for some form of student input in response. It could be multiple choice or some form of constructed response. The form of the question will determine both how the computer or mobile device receives and evaluates this input. Be sure to provide the student with clear instructions in how the input procedure works.

- **Reinforcing Correct Answers**
  Providing feedback for learner responses to drill-and-practice questions demands more than simple correct or incorrect evaluation. When a correct answer is given, the guided practice tool should (1) confirm the correctness of the answer, and (2) offer a brief statement of the rationale for the answer. This feedback should center on the logic or reasoning that leads to the correct response. Such a reference will reinforce the learner's correct thinking or will correct the wrong thinking of a student who selects the correct answer by incorrect reasoning or a lucky guess.

Remember these guidelines for good feedback to incorrect answers:

1. Never chide the learner. Negative feedback-especially language that questions the learner's abilities-serves only to discourage the learner and often leads to an "early exit" from the drill exercise. Focus on the logic leading to the response rather than any personal qualities of the responder.

2. Identify faulty reasoning. Questions should be carefully constructed to anticipate the most common errors in learner reasoning. Feedback should point out these logical mistakes in incorrect responses and then draw the learner to correct logic for answering the question. Feedback on wrong responses must explain why the answer was wrong.

3. Anticipate technically correct but wrong answers. Students who are equipped with all the skills and information to answer a question may nevertheless offer an incorrect response through a typing error, misspelling, or alternative form of the correct answer. Well-crafted questions offer complex answer judging-the recognition of a variety of acceptable responses, including the most common misspellings of an answer. In such cases, the feedback should evaluate the content of the answer as correct, but identify the technical error and supply the correct form of the answer.

- **Sensitivity to Learning Level**
  Exercises need to show sensitivity to repeated learner success or failure and adapt question levels to learner needs. If a learner has succeeded in answering 10 successive questions demonstrating a specific skill, it is time-consuming and frustrating to force the learner to complete 100 questions. The same is true if a learner has failed to answer the same ten questions successfully.
Guided practice exercises also show sensitivity to learner success or failure by providing early exit options and qualitative leaps to more difficult or less difficult questions. If all questions in an exercise reflect the same difficulty level, provide an early exit opportunity.

**Teacher Checklist**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>☐</td>
<td>☑</td>
</tr>
</tbody>
</table>
Inquiry

Elements of Inquiry

Inquiry has similarities to other instructional strategies. For example, the instruction should be well planned and should relate to the appropriate learning standards. You should serve as a facilitator of learning rather than a distributor of knowledge and should try to use questions effectively in order to allow students to think more deeply about the problem at hand. By focusing on the three elements of inquiry - intriguing investigations, student discourse, and thoughtful reflection - you can better construct inquiry learning in your classroom.

Intriguing Investigations

Successful initial activities have two requirements. They must be interesting enough to capture student attention, and they must pose problems that generate additional questions. You can find many types of situations that make intriguing investigations. Problems, current events, students, the school itself, the community, and "what if" scenarios can be used to create intriguing investigations. In mathematics, you might use a complex math problem. In science, you may select a natural phenomenon and have students explore why it happens. In history it could be a "what if" scenario that changes the course of history which stimulates student questions. And in English, younger students might predict the end of a story while older students might modify a work of literature based on a different author's style.

Student Discourse

The second element in inquiry learning is student discourse. This requires that students be able to work in groups. Successful groups create positive opportunities for students to get feedback and encouragement from their peers for their tentative questions, observations, and solutions. By using group discussions, you can provide multiple learning opportunities for students and, at the same time, create an environment in which not all feedback has to involve you. However, it is vitally important that students have first developed the competence to work effectively in a group. If a class has not had experience in working in cooperative discussion groups, you must devote time to defining the roles and guidelines of group work and to helping students understand and practice participating in discussion groups.

It is in the process of active discourse that inquiry occurs. While each student develops his/her own thoughts and questions, the group context allows these questions to be analyzed and explored as the group seeks detailed observations and solutions through discourse and discussion. It is through such discourse that vague, tangential ideas are either converted into solid, precise understandings or discarded.

There are several ways you can foster thoughtful reflection. One way is to designate a portion of group discussion time for personal reflection. By expecting students to reflect on their work and by reinforcing good practice, you can motivate students to think about the quality of their observations.
and questions. You should particularly encourage students to offer recommendations for improving the next inquiry opportunity. Another technique you can use to stimulate reflection is to have students write about their inquiry activities. Journals provide a good forum for students to engage in regular and thoughtful writing. Writing about their experiences allows students to organize their thoughts better and leads to higher quality thinking.

**Teacher Behaviors**

The three inquiry elements give you observable activities to plan, prepare for, and carry out. These elements are necessary for inquiry, but they are not sufficient. The behaviors listed below are the vital nutrients that bring the elements of inquiry to life. To achieve an effective inquiry environment, cultivate these habits.

1. **Create a culture in which everyone is expected to learn well.**
   - Establish expectations of performance early and make them clear.
   - Display expectations for and models of quality work and procedural guidelines so that they are constant reminders to everyone.
   - Form groups of students with varying abilities.
   - Always expect the best of students. Don't let previous performance or negative reputations influence your actions.
   - Always look for positive aspects in students' work.
   - Reflect on your behaviors continually as you interact with students. Give equal opportunities to all students.

2. **Provide rich and varied resources and learning experiences.**
   - Learning results from stimulation. The more exposure students have to objects, observations, and experiences, the more they will learn.
   - As a facilitator of learning, you need to pay attention to the "stuff" of education. Be vigilant about identifying materials that could be brought into the classroom to stimulate student inquiry.
   - Don't expect textbooks to be the sole source of learning. Look for real-world materials that will engage students.
   - Frame lessons with questions about phenomena, systems, or current events that are interesting and familiar to students.
   - Strive to make connections between disciplines through the use of real-world activities.
   - Be creative in finding ways to make topics interesting to students. Find ways to give students real-world experiences and opportunities for observation. Think about how to bring real-world objects into the classroom for students to work with. Be outrageous, but NEVER compromise the safety of your students. Some creative variations on traditional themes are:
Instead of measuring manageable objects, measure the dimensions of the school property or the height of trees on the playground.

Instead of creating a tabletop Iroquois longhouse, convert a corridor of the school into a life-size longhouse.

Instead of asking students to analyze word problems concerned with fabricated data, have students collect their own data based on hypotheses about their world. For example, who has more pockets in their clothes, boys or girls?

- Ask open-ended questions to open students' minds and stimulate reflection. Some good question phrases are: "Why do you think ... ?" "What evidence do you have ... ?" and "How would you explain ... ?"
- Ask imaginative questions that compel students to look at current information in different ways and from different perspectives.

3. **Focus on individual students' learning progress and specific performances.**
   - Learning is a very personal experience, and students require personal feedback if they are to experience growth in learning. Your fundamental challenge is to make each student in a large, diverse classroom feel like an important individual.
   - Elicit responses that uncover what students know or think about a topic by encouraging them to think about previous experiences or other observations.
   - Find opportunities to observe individual students efforts and recognize achievements.
   - Make a mental note of the achievement of individual students and compliment them at the appropriate time.

4. **Respond appropriately to student questions, accounts, and other work.**
   - Use focused questions, rather than hints or suggestions, to redirect students' investigations when necessary.
   - Before responding to a student's question, be sure that the rest of the class has heard and understood the question.
   - Consider the following options in responding to a question:
     - Expect and encourage students to use their own reasoning to seek solutions and explain their answers. This will allow students to rely less upon you as the sole authority for answers.
     - Redirect the question to the class. This strategy helps to promote student-to-student interaction and lessens students' dependence on you as the exclusive source of information.
     - Assist the student to answer his/her own question. This may require some prompting to help the student remember previously learned information, or it may require asking the student a more basic question to begin the thought process. This strategy can help students learn how to search for answers on their
own, but it is important to be sensitive to the possibility of embarrassment or intimidation, which may discourage students from asking questions in the future.

- Answer the question yourself. This strategy is best when you have little time remaining in class. The disadvantage of this approach is that you do not encourage student-to-student interaction or deeper inquiry and reflection.
- Ask the student to stop after class to discuss the question. This strategy is most appropriate when a student raises a complicated, tangential question or when a student is obviously the only one who does not understand something and a simple answer does not clarify the point. You should be careful, however, to ensure that other students are not having the same problem before moving on to a new topic or question.

- Never fake an answer. If you do not know the answer to a student's question, admit that you can't answer the question and then select one of these or another strategy that you find appropriate:
  - Suggest a resource where the student can find the information. The resource may be written material, another staff member or student, or someone from the community.
  - Volunteer to find the answer yourself and report back to the class. Make sure you actually do return with the answer if you choose this option.

5. Use questions to expand and deepen students' thinking.
- Use questions that stress deeper understandings of "big" ideas and problem-solving skills.
- Work with other teachers to create a list of good open-ended questions. Don't just "wing it" with questions that pop into your head at the spur of the moment.
- When using open-ended questions, give students time to think. Have students first think about the question on their own and then discuss their ideas in groups of two or three. This will enable them to think through their ideas before responding in front of the class.
- Allow three to five seconds of wait-time following questions. Easy questions require less wait-time, perhaps only three seconds. Higher-level questions may require five seconds or more. With particularly complex questions, some instructors will ask students to spend two or three minutes considering the question and noting ideas.
- Maintain eye contact when a student is speaking. Use nonverbal gestures to indicate your understanding, confusion, or support. Do not interrupt even if you think the student is heading toward an incorrect conclusion.
- Call students by name rather than pointing in their general direction. This avoids confusion as to who was called on and also helps create a positive climate in which students feel that you know them as individuals.
• Use active listening. Wait for a second or two following a student's response, paraphrase long answers, and check with the student to be sure that your perception of the response is accurate.

6. Use appropriate assessment.
• Assessments used to measure student progress must reinforce the elements of inquiry, and emphasize the same level of understanding expected of students during instruction. Interesting inquiry-based instructional activities will quickly evaporate if the test that students take does not require the same level of thought and questioning.
• Do not avoid tests that ask students to demonstrate conceptual understanding. Assessments should reflect a balance that reinforces both the behaviors you expect students to develop and the knowledge you expect them to acquire.
• A portion of students' grades should be based on the quality of their work in making observations, posing questions, and contributing to student discourse. Another portion of the assessment should be based on students' demonstration of conceptual understanding.
• Many types of authentic assessments are best administered at the same time that students are completing an inquiry. Don't wait for a certain time to give a test. Use objective evaluations of the quality of student work made during the actual inquiry as part of the assessment.

Teacher Checklist

Intriguing Investigations

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| ☐   | ☐  | Initial activities were intriguing problems rather than simple demonstrations or student exercises.
| ☐   | ☐  | Initial activities were grounded in real-world experiences whenever possible.
| ☐   | ☐  | Initial activities were well planned, introduced clearly, and interesting to students.
| ☐   | ☐  | Initial activities left unanswered questions, prompting students' own questioning.
Student Discourse

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
</tbody>
</table>

Thoughtful Reflection

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
</tbody>
</table>

Teacher Behaviors

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>🟢</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td>I asked thought-provoking, open-ended questions.</td>
</tr>
<tr>
<td></td>
<td>I posed genuine questions for which I did not know the answers.</td>
</tr>
<tr>
<td></td>
<td>I asked testing questions to find out what my students know.</td>
</tr>
<tr>
<td></td>
<td>I asked focusing questions that encouraged students to think further about an idea to explain, justify, or hypothesize.</td>
</tr>
<tr>
<td></td>
<td>I used wait-time before and after I received responses to questions.</td>
</tr>
<tr>
<td></td>
<td>I explored ways to pursue student inquiry in relation to each instructional situation.</td>
</tr>
<tr>
<td></td>
<td>I modeled inquiry.</td>
</tr>
<tr>
<td></td>
<td>The classroom atmosphere encouraged students to ask questions.</td>
</tr>
<tr>
<td></td>
<td>Inquiry assessments reinforced students’ communication skills by giving them feedback on their writing and speaking.</td>
</tr>
<tr>
<td></td>
<td>Students were assessed at appropriate times during the inquiry.</td>
</tr>
<tr>
<td></td>
<td>Assessment criteria were known to students in advance.</td>
</tr>
<tr>
<td></td>
<td>Assessment included feedback to students on areas that need improvement.</td>
</tr>
</tbody>
</table>
Learning Centers

What Are Learning Centers?

Learning centers are areas set up around a classroom for brief student activities that focus on developing a particular skill and/or concept. Students may work individually or in cooperative groups. The term learning centers can mean different things to different educators. Two other terms are often used interchangeably with learning centers: literacy centers and learning stations.

The most frequent definition of learning centers, and one of the earliest uses of the term, comes from the National Association for the Education of Young Children (NAEYC). It defines learning centers as "areas/activities that allow children to manipulate materials; explore ideas; discover consequences; build, create, and express themselves through art mediums. Learning centers give the child an opportunity to make decisions and choose the timing of his or her learning." This vision gives the student opportunity to make decisions, other educators may use learning centers a little differently.

A literacy center is common in elementary schools, where learning centers are used frequently and the focus is on literacy.

Literacy centers are considered the same as learning centers, with the understanding that the focus is exclusively on literacy: reading, writing and listening.

A learning station is teacher directed and more sequential as students work to move through the stations. Many educators distinguish between learning centers and learning stations by the purpose of these locations in the classroom. In this chapter, we will use the single term learning centers but with slightly different purposes and applications.

Some may have the perception that learning centers are only for younger children or that they are set up only for free-time for unstructured academic practice. Certainly those scenarios exist. However, learners achieve well in learning centers because of the student-centered and independent inquiry approach. More importantly, students are more satisfied and confident in their ability to learn. Learning centers can be an effective strategy in many different classrooms and at different levels.

Optional Uses of Learning Centers

To encompass all of the variations of learning centers, literacy centers and learning stations, the following list explains how some types of learning centers can be used in various classroom settings.

Learning centers for inquiry and exploration - This highly student centered approach is recommended for early childhood education. The teacher creates optional centers with rich and diverse materials that allow students to choose to play and explore learning. In these types of learning centers, students choose where they will spend their time.
Learning centers for literacy centers - In primary grades, literacy centers provide differentiated student-centered learning exclusively focused on literacy skills. In literacy centers, students might have some unstructured choices similar to inquiry and exploration, but teachers might encourage participation in selected centers depending on the needs of the students.

Learning centers for differentiated instruction - One of the strategies to differentiate instruction is to create learning centers where students have greater flexibility of time or student work to develop learning outcomes. Teachers might design different centers to specifically reach different learning styles. Teachers assign or direct the movement of students based upon individual learning needs.

Learning centers for developing independent engaged learners - In these centers, teachers focus on creating multiple modalities of learning related to a common theme. For example, an elementary classroom might select a theme of whales. In different stations, students might read a book on whales, view a video, calculate sizes of different whales, draw a whale, write an imaginative narrative about a whale seeing a ship, or research and diagram the migration of a whale species. Students rotate among the centers, eventually completing all tasks.

Learning centers for sequential student-centered learning - In these types of centers, the teacher breaks a student performance into several sequential steps. Students move through the steps/centers at their own pace to eventually complete the total performance. Using sequential centers or stations differentiates time for student learning. Students that need more time to write or read at one of the centers have more time. These centers also help to more efficiently use limited instructional resources and equipment.

Benefits of Learning Centers

Regardless of the type and purpose of a learning center, it provides many benefits. Learning centers do the following:

- Provide opportunities for students to explore, discover, create, practice, and apply skills
- Promote critical and creative thinking skills
- Stimulate cooperative learning
- Address different learning styles when a variety of activities are available for student choice
- Allow the teacher opportunities for flexible grouping and varied activities such as individual conferencing and guided reading groups
- Promote independent learning
- Provide opportunities for students to take responsibility for their learning and demonstrate what they have learned

Learning Centers for Inquiry and Exploration

When setting up learning centers, remember the following:
• Learning centers should give children the opportunity to make choices, problem solve, and create. If the activity chosen does not fulfill these expectations, rethink the activity. Giving children a pre-made page is not a good activity for a learning center. For example, a coloring book page does not help a child make choices, problem solve, or create.
• Each learning center should have a goal or purpose. Keep in mind the developmental guidelines for young children and create learning center activities that have a purpose.
• Organize learning center activities so that children can independently function at the center. (Make arrangements to help any child not capable of functioning independently).
• Learning center activities and materials should be open ended enough to encourage children to extend the activity or create an alternative activity.
• Adjust learning centers if children lose interest or the activity is not positively engaging for the group.

Learning Centers for Literacy Centers

The role of literacy centers is to offer engaging, hands-on learning activities that promote reading skills and an interest in reading.

Literacy centers are not meant to be a supplement to large-group, small group and one-on-one literacy and reading lessons. Literacy centers take time to set up and organize; however, when they are done well, they can be a wonderful classroom management tool that offers rewarding learning opportunities for students. The following are suggestions for literacy centers:

• Literacy centers should be attractive and comfortable.
• Label literacy centers for a limited number of students, generally one, two, or three at a time.
• Set up literacy centers to be relatively independent learning opportunities. First introduce students to the activities, supplies, goals, and rules of each literacy center.
• Vary literacy centers to address a variety of learning styles and interests.
• Allow every student the opportunity to visit literacy centers. Using literacy centers as a reward for those students who have finished their work is appropriate as long as all students have an opportunity at some point to participate. In some cases, those who need the literacy center activities the most often have the least opportunities to visit them.
• Change or update literacy centers at least every few weeks to reduce boredom and present new learning opportunities.
• Involve students in creating decorations, labels, or rule lists for literacy centers.

Examples of Literacy Centers

Library Center. Most classrooms have a library. Transform the library into a literary center by combining a set of theme-related books with an inviting reading area. For example, use a plastic swimming pool with a few pillows and a picnic basket of books on sea animals.
**Listening Center.** A literacy listening center has books on tape or CD, along with headphones so that students can read along with the books. Another great option is to have a recorder that children can use to read and record themselves.

**Game Center.** A game center for two or three players can be an effective literacy center choice. Depending on grade level, games such as letter bingo, word bingo, Scrabble, or spelling dice can reinforce reading skills.

**Name-this-Story Center.** A name-this-story literacy center offers a variety of printed, age-appropriate stories that students are given the opportunity to title. Students can create a book cover with their chosen title as well as an illustration.

Keep in mind that the goal of well-planned literacy centers is to build reading skills and an interest in reading.

**Learning Centers for Differentiated Instruction**

Differentiated instruction is a philosophy of teaching that advocates the teacher adjusting and adapting instruction based upon the students' individual needs. Rather than forcing all students to move lockstep through a curriculum, the teacher identifies individual student's needs and learning preferences and provides a variety of learning experiences. Learning centers support differentiation.

**Suggestions for Success with Learning Centers**

- Start out with only two centers: one teacher-led activity and one independent activity. Add additional centers as students become more comfortable.
- To reduce persistent student questions, spell out very clear directions. Laminate and post these directions.
- Train student how to work the centers. Once students are introduced to the expectations and how the rotation among centers works, only a few students will need extra attention. Use resource teachers, aides, or parent volunteers to help manage these students through the centers.
- Be sure to have a visible timer to help students manage their time and movement through the centers.
- Use groups of three to five students at the centers. An odd number discourages pair conversations and encourages the group to work together.
- Have a diagram for students that actually shows the rotation schedule and locations of the centers around the classroom.
- Ensure that all materials are available at each center. It is often helpful to have all of these contained in one envelope or plastic bag. Have students return items to these containers after completing the activity.
- Have self-checking center activities; provide an answer key that students can use to check their own work.
• If you have access to one or two computers on a regular basis, set up several of the centers around technology application.

Learning Centers for Developing Independent, Engaged Learners

Learning centers get students up and moving and are an interesting way to introduce a new topic, text, or concept. Learning stations require a fair amount of preparation and monitoring to ensure a valid experience. They work best when a classroom can be sectioned into four or five smaller areas and students are given an activity sheet (guiding questions, thoughtful questions, or tasks) that must be answered or completed at each center. Each center should be geared toward a different aspect of the topic and challenge students. The centers can be visited in any order, can be visited by more than one student at a time, and should provide a comprehensive understanding once all centers are visited.

For example, if you are teaching The Great Gatsby, by F. Scott Fitzgerald, you could design the centers to give students a general understanding of the novel, the author, and the Roaring '20s in America. One center might have music for students to listen to jazz and write their thoughts. A reading location might provide a biography of Fitzgerald from which students record interesting facts. A poetry corner might challenge students to write their own beat poem, or an interactive video station might teach students the Charleston. Your role is to facilitate the activities, ensure that the students are on task, and answer clarifying questions. Learning centers put the weight of learning into the student's hands and provide a more authentic experience than traditional lecturing.

Learning centers can be designed to fit virtually any and every curriculum at all levels, especially language arts, social studies, science, foreign language, math, and fine arts. They are an excellent way to incorporate many skills and concepts as well as state learning standards. Centers can be used to supplement instruction or provide review for an upcoming test or end of chapter/unit assessment.

The following are examples of different learning center activities. Although these examples come from a language arts curriculum, they can be adapted to fit nearly any subject area.

**Vocabulary Center.** Students at this center develop skills in vocabulary by completing a vocabulary chart. The chart contains four columns labeled "vocabulary word and page number," "context clues," "my definition," and "actual definition." Using actual sentences from the book written on sentence strips, students identify the underlined vocabulary word and the page number where it can be found. Students then use context clues to discover the meaning of the word on their own.

**Compare/Contrast Center.** At this center students complete a thinking map, or graphic organizer, to compare and contrast two characters from the story. An example of a thinking map is a Venn diagram.

**Journaling Center.** You can use a journaling center in a variety of ways. Post a picture that goes along with a theme or character and have students reflect on what the picture depicts or how the
character feels. Students can put themselves in the character's shoes or the overall story to write about their thoughts and feelings about what is occurring.

**Reciprocal Teaching Center.** Give students a reciprocal teaching task prior to them participating in the center activities. Tasks include summarizing, clarifying, predicting, and questioning. Students complete their tasks ahead of time so that once it is time to work at the center, they can come together and discuss their findings with group members. The group then makes a poster with four sections (one for each task), and writes down the information pertaining to each of their tasks.

**Memory.** This center is the ever-so-popular Memory game. Design the cards for Memory using the story in a variety of ways: vocabulary cards with definition cards; character cards with description cards; literary element cards with example cards. The cards can be made by the students or by you.

**Visualization Center.** This center allows students to represent their interpretations of the story. Students work individually or as a group to draw a scene or particular character from a book. Students should choose a scene that is memorable for them, include the sentence(s) they are visualizing, and cite the sentence(s) with page numbers.

Some center activities require whole-group work while others are meant to be completed independently. Still other centers offer students the choice to work together or alone. Since center activities require groups, you can form cooperative groups based on student ability or use differentiated instruction.

To apply this section to other curricular areas, break down the focus into workable pieces. For example, in a science class (specifically a lab), workstations may be broken down into hypothesis development, refinement, and conclusion; experiment development; procedure and data acquisition; and recording and analysis. In a social studies classroom, a teacher might break a history lesson into stations including primary source material, timeline development, cultural implications, geography and mapping, and connection to current events.

**Learning Centers for Sequential Student-Centered Learning**

Learning centers provide a more student-centered approach to instruction. When you facilitate learning to culminate in a performance task (typical in Quadrant 0 Gold Seal Lessons), often you have several activities and formative assessments that lead up to the task. Not every student proceeds at the same pace through those formative steps. Learning centers provide flexibility for students as they acquire the necessary skills to complete the performance.

Learning centers are also beneficial when you have limited resources in the classroom. For example, if you only have three or four computers and students must do an Internet search, set up a learning center where students in sequence groups use the computers for research. Likewise, if students in a science lab have to use a microscope and you have limited microscopes, you might use a learning center.
When setting up sequential learning centers break down the unit of instruction and identify the major activities that students will engage in to get to the final performance. Assemble resources and materials for each of the centers, and create specific directions for students.

Decide if students will complete the centers individually or in small groups, and give students a full roadmap of each of the centers that must be completed. Students are usually required to master all of the learning center requirements, even though they may do so in differing order or in differing amounts of time. In this manner, learning centers ensure that every student reaches a level of proficiency. Frequently, learning centers have a formative assessment that is part of the overall unit.

Sequential learning centers can be a very engaging form of instruction. While they require more advance planning and conditioning of students to take responsibility for their own learning, they efficiently use limited resources and teach students to be independent learners.

Choosing Learning Centers

You have a variety of choices to present academic content. You have the choice not only to teach (or not to teach) with learning centers, but also to choose the sub-categories of content of each center, nature of activity, form of assessment, and time structure. Some teachers, especially in later grades, think that learning centers are not for them because of a potential loss of control. They cannot envision their students working responsibly without direct supervision and close monitoring. However, once teachers understand the practices of effective learning centers, many teachers choose to consider them.

Teacher Checklist

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>The learning centers have a clear purpose.</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
<td>The purposes of the learning centers are communicated to students.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td>All materials necessary for the learning centers are prepared in advance.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td>Students have clear directions to follow in each of the learning centers.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td>Directions are written out for students to follow to reduce additional questions of teacher.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td>Sufficient time is allocated for students to work in learning centers.</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
<td>Careful consideration is given to the assigning of groups for learning center activities.</td>
</tr>
</tbody>
</table>
Yes  No

☐ ☐ Learning center activities are varied and appeal to different learning styles.

☐ ☐ Students are encouraged to take responsibility for their own learning in using learning centers.

☐ ☐ The classroom facility provides adequate space for learning centers.

☐ ☐ Students are given the opportunity to reflect on experiences using learning centers.
Lecture

When to Use a Lecture

Lecture is by far the most popular instructional strategy used by teachers. It is also one of the least engaging strategies for students. When planning a lesson, ask yourself if a lecture is the most appropriate strategy. It can be, if:

- You, the teacher, are the primary source of knowledge on a topic.
- There is considerable and critical knowledge students must know before they begin to work on a problem or activity. For example, a lecture on safety procedures is the best way for students to gain the awareness they need before beginning science lab work.
- Time is limited. Lectures are not always engaging but they are efficient ways to use instructional time.
- You need to change the pace. Effective teaching requires frequently "shifting gears"-changing the activities in which students are engaged. Students struggling through a difficult design or research problem will find a well-timed, interesting lecture a welcome change of pace.
- When you have a particularly interesting and appropriate story to share with students, the lecture serves as an effective medium for telling the tale.
- An outside expert or resource person is visiting the class. A lecture may be the most efficient technique for sharing the person's expertise.

Suggestions for Preparing a Lecture

Good lectures don't just happen. They must be planned. Here are some things to do prior to a lecture:

- Know your subject. Study the material thoroughly and only talk about topics you understand well. Lectures that only reiterate textbook passages are ineffective and a waste of everyone's time.
- Prepare several visuals to reinforce the few ideas you want students to remember. Don't make students guess at what is important.
- Develop one or more stories to illustrate the points you are making in the lecture. Stories are an excellent way to reinforce your ideas, since people enjoy listening to and tend to remember stories. These anecdotes need not be humorous. They should not appear to be about you personally.
- Relate the content to the students' previous knowledge or experience. As with all learning, students remember lecture material by making connections to previous experiences.
- Plan your opening carefully. This is when you capture or lose attention. A dramatic demonstration, colorful story, probing question, or powerful visual can spark interest and start your lecture off on a positive note.
Pre-Lecture Activities for Students

The following strategies will help increase student interest prior to a lecture.

- **Reading.** Assign a short piece to read that relates to the lecture topic. Avoid a textbook assignment. Find something in a trade book, in a magazine article, or on the Internet.

- **Case Problem.** Give students a problem related to the topic. Ask them to generate solutions or propose an answer. For example, a case study preceding a lecture on U.S. participation in World War II could ask students to decide whether the United States should enter the World War in Europe in 1941.

- **Opinion Question.** Before you start a lecture, you might pose a question to students, poll their responses, and post them on a visual. For example, before lecturing about a scientific principle, you might ask students their beliefs on a science related myth, such as heavier objects falling faster.

- **Personal Response.** Prior to starting a lecture, give the students a question that relates to the topic and have them write a personal response. For example, prior to a lecture on nutrition, you might ask students to describe the foods someone trying to lose weight might avoid.

- **Puzzle Exercise.** As a warm-up, have students do a puzzle or game that relates to the lecture. For example, you might have students do a word search using key terms from the lecture.

- **Questions.** Have students generate questions in advance. This is particularly useful for a guest lecture. Agree on several questions and have students be prepared to ask them.

- **Structured Note-taking.** Have students use a three-column technique for recording notes on a lecture.

  | Facts I Already Know | New Information | Questions I Have |

Suggestions During Lectures

These ideas will improve the quality of lectures.

- State the objectives up front. Make it dear why this information is important and how it connects to other learning experiences that preceded or will follow the lecture.

- Be enthusiastic and animated. You cannot expect your students to get excited about a topic for which you appear to have little enthusiasm.

- If you're nervous, write out the first two or three minutes of the lecture. That will carry you until you loosen up.

- Keep it short. Consider the attention span of students. Don't fill a time slot; only spend as much time as necessary. While college lectures are 50-60 minutes, younger students are less likely to stay engaged in a lecture of that length. Keep lectures for elementary students to 10-15 minutes and high school students to 20-30 minutes.
• Avoid standing behind a desk or podium. Move around the room. Stand as close to the audience as possible and still be seen clearly by everyone.

• Make eye contact with each member of the audience at some point. Don't read your material. Use a system of brief notes to keep your lecture organized and remind you of key information.

• Avoid personal stories or references. Stories are effective but telling personal stories about yourself is not. "I did this" or "I remember when I was your age" are killers to student interest. Instead, convert those interesting personal experiences to third person stories.

• Limit use of statistics unless students have visuals or handouts to which they can refer. Also, present statistics in graphical form rather than in lists or tables of numbers.

• Watch student body language and other indirect responses. Are students attentive, distracted, or bored? Are they taking notes? Asking questions?

• Be ready to change the pace or do something dramatic to get students' attention. If you see students gazing out the window or heads nodding, find a technique to refocus attention. A visual, question, or sound bite related to the topic is useful, but you could also develop some routine technique for dramatically refocusing the attention of the audience. One teacher periodically tosses a soft rubber Koosh® ball to a student and asks the student to summarize the last point of the lecture.

Use of Visuals

Visuals can increase interest and retention of information in lectures if they are used effectively. There are excellent tools for preparing visuals to enhance lectures. Here are some tips.

• Always prepare visuals in advance. Avoid drawing or writing in front of class. Routinely writing information on a chalkboard or even an overhead projector wastes time and frequently results in visuals that are hard to understand and words that are difficult to decipher.

• Maintain eye contact with the audience by using such visuals devices as overhead, slide, and computer projectors with remote control to reduce interruptions. When you must manipulate the visual, you lose eye contact with the students.

• Be sure your visuals can be seen and read. A frequent error is using visuals that are too small. Letters on visuals must be larger than those normally used for printed material. As a rule, always make sure the font size on overhead transparencies is at least 18 point. Use at least 24 point for computer displays. One way to determine if a transparency can be viewed easily is to place a white sheet of paper behind it and lay in on the floor. If you can read it easily from a standing position, your audience can probably read it.

• Keep visuals simple. Visuals work better if they are limited to a few words or short sentences. Use bullets and key words to convey ideas; avoid paragraphs. Don't put everything you're going to say on your visuals and then read them. Your students can that for themselves.
• Build your visuals one idea at a time. When showing complex charts or diagrams, use a sequential display of several slides that each adds more detail. Computer displays make this easy to do and contribute to making complex visuals easy to understand.

Questions and Answers

Good lectures stimulate a lively exchange of information through student questions and responses from the lecturer. Poor lectures are void of questions and merely fill the allotted time with teacher talk. The following techniques will help to stimulate student questioning and make lectures more interesting.

• Allot time for questions. Prepare in advance to fill time with additional material if questions don't materialize, but don't eliminate time for questions.
• Wait. Silence may seem like wasted time, but it gives students time to think and generate a question. Don't stop abruptly, ask for questions, and quickly move on if there is no immediate response.
• Encourage questions during a lecture. Don't hold questions until the end.
• Distribute paper and require students to write down a question.
• Compliment the questioner. Refer to the questioner by name and tell him/her that the question is a good one (if it was indeed good).
• Have students form groups to generate a question to ask.
• Give rewards. Include questioning and class participation in grading procedures.
• Listen carefully to questions. The level and focus of questions are clues to the depth of students' understanding. If a student seems embarrassed about asking a basic question, you can say, "I'm glad you brought that up. Probably a lot of people are confused about it."
• Encourage your students to question beyond the information in your lecture. Admit when you don't know something. Instead of bluffing, you can work on the question with the students or bring the answer to the next class.

Suggestions for Improving Lecture Quality

Any lecture can be improved. You should develop a habit of regularly reflecting on the effectiveness of your lectures.

• Periodically record presentations on audiotape or video tape to judge your use of language, speed, and voice.
• Use the "minute paper" (or other assessment techniques). Ask students to respond in one or two sentences to the following questions:
  1. What stood out as most important in today's lecture?
  2. What are you confused about?

Do this for every lecture. It will take you 15 minutes to review the sheets and you'll learn an enormous amount.
Flipping Your Classroom

A recent trend using technology to improve student engagement is termed "flipping" your classroom. This refers to the fact that traditional instruction is often introduced to students in the form of a lecture followed by some student activity in which they practice or discuss what they've learned in a lecture and then may do additional practice in the form of homework. The lecture becomes a large component of the class instruction and homework becomes practice. In a "flipped" classroom the teacher uses homework as time for students to acquire new information from a lecture. By removing the lecture from the classroom, more time can be devoted in class to student discussion, interaction, and individual support and assistance from students as they reinforce their learning. Teachers provide the lectures in the form of pre-recorded audio or video that is made available to students in the form of podcasts. The homework assignment for students is to view the lecture and then engage in classroom discussion based upon that knowledge.

There is initially additional work for teachers to record lectures. How-ever, over time it proves to be a more efficient use of teacher time, as the lessons are recorded and teachers can devote time to work with small groups of students and check for understanding. The use of flipped classrooms is more personalized and more engaging to students.

Teacher Checklist

Yes   No

☐ ☐ The lecture was fully prepared and connected to course/grade objectives.
☐ ☐ Lecture was the most efficient strategy to develop these objectives.
☐ ☐ A pre-lecture activity helped to get students engaged in the topic.
☐ ☐ Effective visuals were used for the main points.
☐ ☐ Students were engaged and asked questions.
☐ ☐ A summary at the end highlighted the key purposes of the lecture.
☐ ☐ Information was linked to students’ prior knowledge (i.e., common experiences or previous coursework).
☐ ☐ I exhibited enthusiasm for the topic and information.
☐ ☐ Students were given time to think and genuine opportunities to respond.
☐ ☐ I had students assess the lecture.
Manipulatives and Models

What Are Manipulatives and Models?

Manipulatives and models are tangible objects students create or use to facilitate understanding. These objects engage students in hands-on learning and can be used in all subject areas and at all grade levels.

Manipulatives can be used when a new concept is introduced, practiced, or reviewed. They provide students with a hands-on, visual way to represent abstract ideas. They also can differentiate instruction for learners. Manipulatives might be simple, everyday items, such as toothpicks or bingo chips, or more sophisticated items, such as those purchased from teacher's stores or educational companies. Manipulatives that students or teachers create in the classroom can be very effective because the students feel ownership toward them, making the experience more relevant.

A growing number of teachers want to include technology while using manipulatives. These manipulatives are called virtual manipulatives. They include those found on educational software or educational sites on the Internet.

There are a variety of ways in which to incorporate the use of virtual manipulatives in the classroom; some of which will be explored in this chapter.

Models can also be used when a new concept is introduced, practiced, or reviewed. They are equally as beneficial as manipulatives but typically more static. For example, a model of the solar system cannot be manipulated because the currently accepted order of the planets is not interchangeable. Models are typically created with simple items, such as cardboard, construction paper, or aluminum foil, but can also be prefabricated models. The growing trend to use virtual models also will be explored in this chapter.

Why Are Manipulatives and Models Useful?

To understand why models and manipulatives are so effective, we look to one psychologist's research and learning theory - Jean Piaget.

A brief summary of Piaget's research states the following: Children master concepts by progressing through three levels of knowledge - concrete, pictorial, and abstract. In addition, Piaget theorized that children are active learners. Manipulatives and models are useful because they help facilitate understanding at the concrete level and serve as an avenue to engage students in an active manner as they move to the pictorial and then to the abstract.

More About the Three Levels of Knowledge

One important idea to consider is the notion of "moving" from one stage to the next. Are students "moving on" or "moving through?" Does moving from one stage to the other suggest that the movement is strictly forward and that it is inappropriate to go backward? If the stages are
interpreted as isolated, then how can a teacher feel comfortable with revisiting a previous stage to remediate the learning? Perhaps one interpretation of movement and these three stages is that one stage supports or reinforces the next stage, and if a previous stage needs to be revisited, then that can be helpful to a student who is not quite ready for higher-level/abstract thinking.

<table>
<thead>
<tr>
<th>Concrete</th>
<th>Pictorial</th>
<th>Abstract</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Commonly known as the most basic level of understanding: &quot;What do I do?&quot;</td>
<td>• Also known as the &quot;semi concrete&quot; level of understanding: &quot;How can I show what to do?&quot;</td>
<td>• Commonly known as the most sophisticated level of understanding: &quot;Why do I do it?&quot;</td>
</tr>
<tr>
<td>• Teacher first models a concept or skill using concrete materials.</td>
<td>• Students draw pictures that align with the manipulatives being used.</td>
<td>• Students sort out most information &quot;in their heads&quot; and clearly explain their thinking.</td>
</tr>
<tr>
<td>• Students need opportunities to play and practice with manipulatives.</td>
<td>• Students need opportunities to play and practice with drawing pictures.</td>
<td>• Students can be re-taught at this level if they do not demonstrate a prior understanding by reverting to the concrete and pictorial levels.</td>
</tr>
<tr>
<td>• Teacher needs to encourage students to verbally justify their thinking.</td>
<td>• Teacher needs to encourage students to verbally justify their thinking.</td>
<td></td>
</tr>
</tbody>
</table>

Learning Styles

Manipulatives and models are useful because they also address different learning styles. For example, a synthesis of research indicates that, on average, about 30% of students are thought to be tactile learners – students who learn best by being involved with a lesson that employs fine motor skills. When teachers consistently use more traditional instructional strategies, such as lecturing and writing notes, they are addressing only the auditory learners (and on some level the visual learners). So what typically happens to those students who are primarily tactile and kinesthetic learners? They are unable to keep up, unwilling to keep up, or worst of all, bored. Using manipulatives and models is a hands-on way to re-energize your teaching and re-engage your learners. The following table shows a few examples of how manipulatives and models can actually benefit all four types of learners: auditory, kinesthetic, tactile, and visual.
**Learning Style** | **Manipulatives and Models**
--- | ---
Auditory Students who learn best by hearing and talking | Lessons can be designed to include small groups of pairs; students discuss concepts and ideas while using manipulatives and models.

Kinesthetic Students who learn best by being more physically active | Lessons can be designed to include learning centers or stations so that students need to walk from one place to the next; manipulatives or models are set up at each learning center or station.

Tactile Students who learn best by using fine motor skills | Lessons can be designed so that while a teacher is lecturing, he or she is also modeling a concept or idea.

Visual Students who learn best by seeing | Lessons can be designed to include visual representation of a concept or idea using a model; students can also be required to create a model or set of manipulatives as part of the lesson.

---

**Manipulatives**

**General Strategies for Implementation**

Students need to become comfortable with the practice of using manipulatives. Here are a few general strategies to consider.

1. Before implementing a lesson using manipulatives, talk with students about how manipulatives are helpful for learning a new concept or skill. Be sure that you choose developmentally appropriate manipulatives for your students.

2. Give students time to play with the manipulatives before they use them in a more intentional manner. They will be curious about them, so build in time for students to examine them individually, then in pairs or small groups.

3. Talk about the guidelines for using manipulatives. For example, they are not to be used as toys to be thrown around the classroom or at each other. They need to be gathered at the end of the lesson and properly put away for future use. Encourage students to be respectful of the materials used in the classroom by asking them where the manipulatives should be located for easy access. When you co-create a shared responsibility, students are more likely to feel empowered.

4. Build in a lot of time to demonstrate how the manipulatives will be used. Set the stage for the lesson by showing as many examples as possible.

5. Before allowing the students to proceed with the lesson, ask them to write down their observations about what you demonstrated. This will help you understand if the students have a good idea about how to use the manipulatives to develop conceptual understandings and procedural skills.

6. Have students record their observations after the lesson is over. This will help you determine if the manipulatives were develop mentally appropriate and used appropriately or if the manipulatives were not helpful to the students.
Benefits of Using Manipulatives

- Students have control of how they are used.
- Students are provided with hands-on learning experiences.
- Manipulatives facilitate a deeper understanding of concepts by presenting problem-solving approaches in different ways.
- Students have more flexibility to explore and discover concepts and skills.
- Learning becomes more engaging, active, and student-centered.
- Students can be creative and find other ways in which manipulatives might be used.
- All sensory learning styles can be addressed if lessons are designed with all four learning styles in mind.
- Cooperative learning opportunities facilitate development of social skills and working as part of a team.
- Students can co-create the manipulatives and feel more of a sense of ownership and responsibility for their own learning.

Challenges of Using Manipulatives

- Manipulatives might be used inappropriately or become lost or stolen.
- Students can easily become distracted from the purpose of their use (might be interpreted as toys rather than educational tools).
- Hand-made manipulatives can be poorly designed, resulting in the students becoming disgruntled by having to make them again.
- Pre-made manipulatives might not be available or too expensive.

Virtual Manipulatives

Virtual manipulatives are Internet-based representations of concepts and ideas. There has been much discussion among educators regarding the efficacy of virtual manipulatives in the classroom because some people do not consider them true manipulatives. If students cannot physically touch them, how can they be manipulatives? In general, virtual manipulatives are just another way to engage learners in discovering reinforcing or reviewing concepts and ideas. They are useful in conjunction with hands-on manipulative Benefits of Using Virtual Manipulatives

- Most websites provide activities that provide timely feedback. In some cases, a student knows immediately whether an answer is correct or incorrect.
- Virtual manipulatives can be more explanatory than concrete manipulatives.
- Graphics can be more dynamic and engaging.
- Teachers with Internet access in the classroom can easily find sites to suit learning needs.
- The teacher saves time by having manipulatives instantly available (instead of having to make them or look through stores).
Challenges of Using Virtual Manipulatives

- Students miss the tactile experience by not being able to physically touch manipulatives.
- Some students are not comfortable or familiar enough with how to use a computer or how to navigate through a particular site.
- Not all content at all grade levels is available.
- Not all classrooms have sufficient technology.
- Technology might be too geared toward abstract thinking for students who need more practice at the concrete and/or pictorial level.

Models: General Strategies for Implementation

A model is typically a full-or small-scale representation of an object. Determine the best types of models to create by considering the following:

- rigor and relevance of the lesson
- skill levels of students in designing models
- cost and availability of materials
- time needed to complete the model
- use of the model in the current lesson and for future lessons

Students need to know why they will be creating a model within a particular lesson. Here are a few general strategies to consider.

1. Identify clearly the situation for which a model will be built. Provide students with a design brief that states the situation and an example of a model that can be built.
2. Have students brainstorm about the situation and write down all the information they can think of related to the situation.
3. Check in with students after their brainstorming session. Have a group discussion about details including the way the model will function and how it might look.
4. Begin the process simply and slowly. Building a model takes time, so keep the complexities out of the process until you see how the students are progressing.
5. Allot enough time for students to work on the model in the classroom, or offer guidance about how they can work on the model outside of the classroom.
6. Encourage students to document their thinking by keeping a record of both the creative and analytical steps in the process. Remind them that the focus is not solely on the end product but also what they are learning along the way.
7. Remind students that they don't need to "get it right" the first time. Part of the design process is taking risks and modifying what doesn't work or looks the best.
8. Provide students with a rubric or scoring guide to help them achieve the best results. Clearly state the scoring criteria so that students can modify their models if certain goals are not specifically met.
Benefits of Building Models

- Students have control of how they are built.
- Students have a wide variety of choices, from selecting appropriate materials to use to how the model will be presented.
- Students are provided with hands-on learning experiences.
- Students have more flexibility to integrate concepts and skills.
- Learning becomes more engaging, active, and student-centered.
- Students can be creative. You might be surprised at how their thinking is translated into three dimensions.
- Cooperative learning opportunities facilitate development of social skills and working as part of a team.

Challenges of Building Models

- Students might not feel that they are creative enough to fully participate.
- Students can become discouraged if they need to keep modifying the model to meet the teacher's criteria.
- One or two students might be too involved in a group process, omitting the ideas and input of others.
- Materials might be unavailable or too expensive for what students really want to do.

Virtual Models

Similar to virtual manipulatives, these are also Internet-based representations of concepts and ideas.

Benefits of Using Virtual Models

- Usually free and available to the entire class (if the necessary technology is provided for the students)
- Can have more dynamic and engaging graphics
- Do not require time to design a plan
- Do not require time to build and modify
- Often come with specific directions about how to navigate the site to help students become more confident with working independently
- Keeps the classroom free from messes

Challenges of Using Virtual Models

- Students can be missing out on exploring their own creativity and problem-solving skills by not designing, planning, and making the physical model.
- Some students are not comfortable or familiar enough with how to use a computer or how to navigate through a particular site.
- Not all content at all grade levels is available.
- Not all classrooms have sufficient technology.
- Some students do not like being taught by a machine and would prefer more interaction with the teacher.

**Teacher Checklist**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Memorization

Memorization as an Instructional Strategy

Memorization is a legitimate and important part of a student's education. The traditional route to memorizing is through rote repetition until the information is firmly planted in memory. Memorizing through repetition takes up so much time, however, that it distracts from the real purpose of learning, which is to understand information.

No one knows precisely what knowledge students will need to know to succeed in the future. Ultimately, it is better to help students develop habits of thinking that will enable them to learn on their own whatever they need to know. Part of becoming a lifelong learner is learning how to memorize information effectively.

The ancient Greeks developed basic memory systems called "mnemonics," a name derived from their goddess of memory, Mnemosyne. In the ancient world, a trained memory was an immense asset, particularly in public life, because there were no convenient devices for taking notes.

The Greeks discovered that human memory works by linking things together. Any thought, action, word, or statement can trigger an associated memory.

There are three main components to be considered in memorization:

- Using multiple senses.
- Making an association interesting or familiar.
- Associating items to something already known.

Multiple sensory instruction and interesting, relevant instruction will aid in memory. In addition, the use of memorization techniques or mnemonics will create associations that will enable students to recall critical and important information.

Examples of Mnemonic Devices

The following are several different forms of associations that can be used to memorize information.

Acronym: Form a word or phrase from the first letters of the names you wish to memorize. One example is the word HOMES, an acronym for the five Great Lakes: Huron, Ontario, Michigan, Erie, Superior.

Acrostic: An acrostic is another common mnemonic. It is a phrase or a sentence in which each word begins with the first letter of the items being learned. For example, "Every Good Boy Does Fine" is a mnemonic for the five notes on the treble clef-EGBDF.
**Rhyming:** Use a rhyming word or simple poem to remember information. For example a common mnemonic to memorize the number of days in a month is "Thirty days hath September, April, June, and November . . . "

**Image Links:** By making a connection between a word, number, or concept with a vivid image you can easily bridge the gap between the concrete state and the symbolic. You can use a combination of image links and alliterations to remember peoples' names. When you meet someone, focus on a physical feature or manner that starts with same letter as their name. For example, Rhonda - red hair, Justin - jaw, Allison - affable. When you notice the feature again you will recall the name.

A good example of image links comes from the Mind Tools website. If you want to remember a list of counties in the South of England (Avon, Dorset, Somerset, Cornwall, Wiltshire, Devon, Gloucestershire, Hampshire, Surrey) you might develop a series of picture links such as the following (Source: Mind Tools, Inc. www.mindtools.com/March 1999):

- An AVON (Avon) lady knocking on a heavy oak DOOR (Dorset). The DOOR opens to show a beautiful SUMMER landscape with a SETting sun (Somerset).
- The setting sun shines down onto a field of CORN (Cornwall). The CORN is so dry it is beginning to WILT (Wiltshire).
- The WILTing stalks slowly fall onto the tail of the sleeping DEVil (Devon).
- On the DEVil's horn a woman has impaled a GLOSsy (Gloucestershire HAM (Hampshire) when she hit him over the head with it.
- Now the DEVil feels SORRY (Surrey) he bothered her.

A picture link need not have a sequence of images. All that is important are the images and the links between images.

**Story Method:** An expansion of the picture link method is to sequence the picture images into a story.

An example of the picture links to remember English counties might go like this (Source: Mind Tools Inc. www.mindtools.com/March 1999): An AVON lady is walking up a path towards a strange house. She is hot and sweating slightly in the heat of high SUMMER (Somerset). Beside the path someone has planted giant CORN in a WALL (Cornwall), but it's beginning to WILT (Wiltshire) in the heat. She knocks on the DOOR (Dorset), which is opened by the DEVil (Devon). In the background she can see a kitchen in which a servant is smearing honey on a HAM (Hampshire), making it GLOSsy (Gloucestershire) and gleam in bright sunlight streaming in through a window. Panicked by seeing the DEVil, the AVON lady panics, screams SORRY (Surrey), and dashes back down the path.
Given the fluid structure of this mnemonic, it is important that the images stored are as vivid as possible and that the significant coding images are much stronger than the ones that merely support the flow of the story.

**Number/Rhyme Technique:** This technique works by creating mental pictures in which the numbers are represented by things that rhyme with the number and are linked to images that represent the things to be remembered. This is useful when you need to remember items in numerical order or linked to a number.

A typical rhyming scheme for numbers 1-10 is: 1 - Bun, 2 - Shoe, 3 - Tree, 4 - Door, 5 - Hive, 6 - Bricks, 7 - Heaven, 8 - Skate, 9 - Line, 10 - Hen.

If you find that these images do not attract you or stick in your mind, then change them to something more meaningful to you. These images should be linked to images representing the things to be remembered, for example, a list of ten Greek philosophers could be remembered as (Source: Mind Tools, Inc. www.mindtools.com/March 1999):

- Parmenides - a BUN topped with melting yellow PARMesan cheese.
- Heraclitus - a SHOE worn by HERACLes (Greek Hercules) glowing with a bright LighT.
- Empedocles - a TREE from which the M-shaped McDonalds arches hang hooking up a bicycle PEDal.
- Democritus - think of going through a DOOR to vote in a DEMOCRatic election.
- Protagoras - a bee HIVE being positively punched through (GORed?) by an atomic PROTon.
- Socrates - BRICKS falling onto a SOCk (with a foot inside!) from a CRATE.
- Plato - A PLATe with HEAVEN’s angel’s wings flapping around a white cloud.
- Aristotle - a friend called hARRY clutching a bOULE of wine possessively slipping on a SKATE.
- Zeno - a LINE of ZEN Buddhists meditating.
- Epicurus - a HEN's egg being mixed into an EPileptics'sCURE.

Once you have done this, try writing down the names of the philosophers on a piece of paper. You should be able to do this by thinking of the number, then the part of the image associated with the number, then the whole image; finally, you decode the image to give you the name of the philosopher. If the mnemonic has worked, you should be able to re-call the names of all the philosophers in the correct order.

**Journey System:** The journey method is a flexible and effective mnemonic based around the idea of remembering landmarks on a well-known journey. In many ways it combines the narrative flow of the story and the structure and order of the number systems into one highly effective mnemonic.
Because the journey method uses routes that you know well, you can code information to be remembered to a large number of easily visualized landmarks along the routes. Because you know what these landmarks look like, you need not work out visualizations for them!

This route could be your way to school in the morning, the route from one classroom to another, the route to visit a friend, or the way you get to a store. It could even be a journey around the levels of a computer game. Once you are familiar with the technique, you may also be able to create imaginary journeys that fix things in your mind.

Preparing the Route: To use this technique most effectively, it is best to prepare the journey beforehand so that the landmarks are clear in your mind before you try to commit information to them. One way of doing this is to write down all the landmarks that you can recall on your chosen route in order on a piece of paper. This allows you to fix these landmarks as the significant ones to be used in your mnemonic, separating them from others that you may notice on the actual route.

Consider these landmarks as stops on the route. To remember a list of items - people, experiments, events, or objects - associate each thing or representation of a thing with a stop on your journey.

Suppose you want to remember a shopping list: coffee, lettuce, fresh vegetables, bread, paper towels, fish, chicken breasts, pork chops, soup, fruit, and bath cleaner, you may choose to associate this with a journey to the supermarket. A series of mnemonic images therefore appears as (Source: Mindtools, Inc. www.mindtools.com/March 1999):

1. Front door: spilt coffee grains on the doormat.
2. A bush in front: growing lettuce and tomatoes around the bush.
3. Car: potatoes, onions, and cauliflower on the driver's seat.
4. End of your street: an arch of French bread over the road.
6. Under railway bridge: from which haddock and cod are dangling by their tails.
7. Traffic lights: chickens squawking and flapping on top of lights.
8. Past church: in front of which a pig is doing karate, breaking boards.
9. Under office block: with a soup slick underneath: my car tires send up jets of tomato soup as I drive through it.
10. Past car park: with apples and oranges tumbling from the top level.
11. Supermarket parking lot: a filthy bathtub is parked in the space next to my car!
The system is extremely flexible. To remember many items, use a longer journey with more landmarks. To remember a short list, only use a part of the route.

One advantage of this technique is that you can use it to work both back­wards and forwards, and you can start anywhere within the route to retrieve information.

Roman Room. The Roman Room technique is an ancient and effective way of remembering unstructured information where the relationship of one item of information to the other items is not important. It functions by imagining a room you know well. The technique works by associating items with the objects in that room. To recall information, simply take a tour around the room in your mind, visualizing the known objects and their associated images.

For example, imagine a family room or living room as a basis for the technique. In this room, you can visualize the following objects: table, lamp, sofa, large bookcase, small bookcase, CD rack, tape racks, stereo system, telephone, television, chair, mirror, black and white photographs, etc.

To remember this list of World War I war poets, for example, Rupert Brooke, G.K. Chesterton, Walter de la Mare, Robert Graves, Rudyard Kipling, Wilfred Owen, Siegfried Sassoon, and W.B. Yates, walk into the living room and look at the table. On the top is RUPERT the Bear sitting in a small BROOK (we do not need to worry about where the water goes in our imagination!). These codes for Rupert Brooke.

Someone seems to have done some moving. A CHEST has been left on the sofa. Some jeans (Alphabet System: G=Jeans) are hanging out of one drawer, and some cake has been left on the top (K=Cake). This codes for G.K Chesterton.

The lamp has a small statuette of a brick WALL over which a female horse (MARE) is about to jump. This codes for Walter de la Mare, etc. (Source: Mind Tools, Inc. www.mindtools.com/March 1999)

Memory Techniques

Don't confuse memorizing with comprehending. You might have students memorize dates for a history class or formulas for a math class, but they also need to understand why a date or a formula is significant to the key ideas of the material you are teaching. Before spending vast amounts of time having students memorize details, ask yourself if it would be better to step back and focus on overall comprehension of the big picture.

Here are a few general tips on the use of memory systems to share with students:

- Creative or silly mnemonics often work best because they are easy to remember. Exaggerate size and choose unlikely functions for the image.
- Create your own mnemonics based on your own vivid pictures.
- Use positive, pleasant images. The brain often blocks out unpleasant ones.
• Closing your eyes while trying to visualize an image or story will make it more vivid.
• Be humorous! Funny or peculiar things are easier to remember than normal ones.
• Symbols (red traffic lights, pointing fingers) can be used in mnemonics. The age-old technique of tying a string around your finger really does work.
• Vivid, colorful images are easier to remember than drab ones.
• Use all the senses to code information or dress up an image. Remember that your mnemonic can contain sounds, smells, tastes, touch, movements, and feelings as well as pictures.
• Bringing three dimensions and movement to an image makes it more vivid. Movement can be used either to maintain the flow of association or to help remember actions.
• Remember to use a unique location for each list to separate similar mnemonics. By setting a mnemonic story in one location and dearly using that location as a background, you can separate it from a different mnemonic set in a different place.
• When learning new vocabulary words, use a mnemonic to remember the terms.

You may forget things that you have coded with mnemonics if the images are not vivid enough or if the images you are using do not have enough meaning or strength for you. If this happens, try changing the images to more potent ones.
Note-taking/ Graphic Organizers

Tips for Helping Students to Take Better Notes

1. Outline Your Lecture

Be overt in the organization of your lecture, both orally and visually. Use the board to outline important ideas; however, studies show that students usually record what the teacher has written, so be discriminating in your use of the board or transparencies.

Use signaling phrases and transition statements, such as "this is important," "you'll want to remember," "these differ in three important ways," or "next."

2. Use a Framework

Give your students a framework or schema for organizing information. Two common frameworks are sequence and classification.

Sequence may be used to explain change, phases, and stages of growth and can be illustrated easily with arrows connecting one idea with the next in a sequential flow. If the information contains parts, characteristics, elements, etc., you can classify the material and present it in a chart form. Both of these frameworks assist students in comparing, contrasting, and determining similarities and differences in the information.

3. Tell Students What to Record in Their Notes

In the early weeks of class, provide explicit instructions for students on what to record in their notes. The substance of notes may vary from class to class. Students need assistance in determining whether or not to record dates, sample problems, research cited, solutions to problems, questions raised, etc.

4. Guide Students on How to Take Better Notes

Give students feedback. Review their notes occasionally and give suggestions for improvement. If a student comes to you for academic assistance, ask to see his/her class notes. Inadequate notes may be the source of the academic deficiency. Hand out your version of the notes after a class so that students may make comparison with their own.

5. Provide Time for Note-taking in Class

Use note-taking as a means to encourage students to think about the lecture content. If you show that you value note-taking and provide attention and time to this during your class, students may not only take notes more frequently but also improve their note-taking skills. Many students will learn more by taking and reviewing notes.
Note-taking Strategies

Instruct students on the following tips for improving note-taking skills.

Preparation

- Use a large, loose-leaf notebook. Use only one side of the paper. This way you can take the pages out to "see" the whole thing at once.
- Draw a vertical line about 2-3 inches from the left side of the paper. This is the recall column. Keep all notes to the right of this margin. Use the recall column later to record key words, phrases, questions, and comments about the topic.
- Date and label note pages.
- Know what the topic is before you begin to listen; this helps you to keep focused on the topic.
- Sit where there are few distractions, where you can more easily hear, see, and attend to the material.

During the Lecture

- Outline; indent supporting details and examples under main ideas.
- Capture general ideas; paraphrase and summarize. Don't try to copy sentences verbatim except when definitions and formulas are given.
- Abbreviate (e.g., &, imp., WWII for World War II) and skip unimportant words; asterisk (*) or underline important points. Use symbols: +, =, &, @.
- Write legibly but don't worry about neatness. Use "highlighting" to signify important points.
- Practice the TLQL Technique:
  - Tune-in: Listening takes energy.
  - Look at the Speaker: Mannerisms will give extra clues to important points, and looking helps you focus your attention.
  - Question: Nothing will generate interest so much as an appropriate question.
  - Listen: Be alert for speaker emphasis through tone or gesture, repetition, use of cue words such as remember, most important, etc.
- Note especially ideas that are in opposition to your own. These ideas are difficult to understand initially and so require extra effort. People remember things that support their existing concepts and tend to forget those things that disagree with them.

After the Lecture

- Read through your notes and make them more legible if necessary. Rewrite incomplete or skimpy parts in greater detail; fill in gaps that you may recollect.
• Use the column to the left of your notes to record key words or ideas. You will need to reread the teacher's ideas and then reflect them in your own words. When you cover up your notes to show only the recall column, you have a review.

• Relearning is rapid if regular review is used. Review your notes periodically. Compare the information in your notes with your own experience.

• Be critical but also be willing to hold some seeming inconsistencies in your mind over a period of time. Make meaningful associations and memorize what must be memorized.

Using Graphic Organizers in Instruction

Graphic organizers are excellent instructional aids; however, some are more suitable for certain content and types of information than others. Determining which graphic organizer to use and selecting the appropriate information to record on the organizer affect the value of the graphic organizer to the learner.

Graphic organizers have a number of instructional uses. These include:

• locating and remembering key ideas and information
• introducing text information
• summarizing learning units or chapters
• grasping information as a whole
• drawing interrelationships among ideas
• serving as alternative test formats
• providing study guides

As a beginning exercise, make a list of the various types of graphic organizers, analyze the content you teach, and match instructional topics with different forms of the organizers on your list.

Choosing Appropriate Graphic Organizers

Think about the need for and appropriateness of a visual tool as it relates to the ultimate learning goal. Some essential questions to consider when choosing graphic organizers as a part of your instruction include:

1. *Which type will best support the purpose of the lesson?* The learning goal and student expectations are essential considerations when selecting a graphic organizer. For example, if you want students to generate ideas for a writing exercise, a clustering web could be used. If you want students to show the cause and effect of multiple factors and their interrelationship on an event or idea, then a fishbone diagram would be appropriate.

2. *Which graphic organizer is developmentally appropriate?* Once you identify the organizer that correlates with your instructional purpose, then you need to consider the form and procedures that are appropriate for the developmental level of your students. At the elementary level, the graphic needs to be large, and instructions may need to be given
verbally as well as in writing. Colored markers and crayons become the tools for completing the forms. At this level, a few visual forms, such as triangles, squares, or circles, are best. Too many forms will distract and confuse the learners and they will lose interest. For middle school and secondary students, steps for using the tools need to be clearly explained so that students may work independently to design and use the graphics. Computer software programs for visual learning and graphic organizers are very appropriate and motivating at this level.

3. How will the class use this tool? It is important to know how you intend the class to interact with the graphic organizer. Will students use the organizer individually, in pairs, or in groups? Will it be a part of whole group instruction or will it be included in a facilitated learning activity? Maybe it will be a combination of approaches. The selection needs to account for these options.

4. How will the effectiveness of this organizer be assessed? After using a graphic organizer, it is important to reflect on its usefulness and effectiveness in student understanding and learning.

5. Are graphic organizers going to be used throughout the year as a part of instruction and student learning activities? If you are going to use graphic organizers and expect students to use them, it is important that you make this clear to students. If you eventually want your students to be able to use graphic organizers independently and as easily as writing, then you need to demonstrate and reinforce them frequently.

**Designing Graphic Organizers**

Follow these guidelines when designing graphic organizers:

1. Identify the information to be depicted on the organizer.
2. List the main idea and key points to be included.
3. Choose an appropriate organizing format.
4. Show interrelationships among points.
5. Include items that require higher-level thinking skills.
6. Show items that present a summary or synthesis of the whole lesson.
7. Include enough information for the student to reconstruct the original information.
8. Use adequate connecting lines.

**Assisting Students to Design Graphic Organizers**

The most effective way to have students design and use graphic organizers is to teach with them. Model their use for students. Have students design the organizer with you as a part of instruction. Use the following guidelines:

1. Introduce students to graphic organizers by explaining and showing what they are and how they can be used to depict information.
2. Give students effective and non-effective examples of graphic organizers. Pull the information for these from material that students are familiar with or have just studied.
3. Use graphic organizers or fill them in as you teach.
4. Have students complete the organizer as you teach.
5. Provide students with a template of the graphic organizer you are using in instruction. Complete the organizer with students.
6. Have students work in small groups to complete graphic organizers. Have groups complete more than one organizer for the same information. Discuss the different emphasis portrayed by the organizer chosen.
7. Give students opportunities to create their own graphic organizers.
8. Have students present their organizers to the class and explain the formats they selected.

Types of Graphic Organizers

**Describing**

**Brainstorming Web.** A brainstorming web starts with a core concept, or main idea, at its center. Information related to the main idea is identified in a free-flowing manner and radiates outward from general to specific, linking related ideas.

Clustering Web. Clustering generates ideas, images, and feelings around a stimulus word. One idea builds on another, enabling students to enlarge and categorize their ideas for writing and to see patterns in their thoughts. The clustering web differs from the brainstorming web in that ideas are grouped in logical categories or clusters.
Character Web. A character web represents a character in a work of literature. It depicts the character's traits and can include quotations that illustrate those traits.
Hierarchy. A hierarchy shows connections between people or objects in a system of ranking one above another. These might represent groupings, such as animal species, or show a traditional organization chart. Another type of hierarchy is a family tree, which shows how family members are related.

Continuum. A graphic organizer is a simple tool to illustrate a sequence of events. It is used to show timelines of historical events, degrees of something, shades of meaning (Likert scales), or rating scales. The main organizers are what is being scaled and the extremes or end points. This might be used for a listing of major wars or events that occurred in a story.
Spider Map. The spider map is used to describe a central idea, process, thing, concept, or proposition. It is useful for brainstorming ideas and to organize thoughts for a writing project. The main ideas are illustrated as well as their attributes or functions.
Solving Problems

Affinity Diagram. This graphic sorts many ideas into logical groupings. Solving problems or making decisions frequently starts with generating a long list of ideas. The affinity diagram leads to more thoughtful analysis by sorting and labeling these ideas.

What are the issues involved in successfully marketing our holographic phones?
**Cause and Effect (Fishbone Map).** This graphic organizer, sometimes called a fishbone map, is often used for problem solving. It is helpful in analyzing changes, conflicts, and the causes-and-effects of events or situations. The factors involved in the problem or event and their interrelationship are identified and recorded. The varied causes are analyzed, ordered, and prioritized as to the most rational conclusions.

![Fishbone Map Diagram]

**Media Plan.** This is a graphic, sequential depiction of a narrative. Students recall major events of the story, and then illustrate the events in the squares provided.

![Media Plan Diagram]

**Decision Matrix.** This graphic organizer is useful for evaluating possible solutions to a problem. Several criteria are identified to rate the alternative solutions. These are organized in a matrix. Each alternative solution is evaluated against each criterion. This systematic evaluation and graphic presentation of alternative solutions can lead to easier decision making.
**Making Meaning**

**Concept Map.** This is used to show connections among complex ideas (e.g., democracy) or branching procedures (e.g., the circulatory system). Key questions: What is the superordinate category? What are the subordinate categories? How are they related? How many levels are there?
**Cycle.** The cycle graphic organizer shows how a series of events interact to produce a set of results that repeat. Some examples of this would be weather patterns, the life cycle, cycles of achievement and failures. The cycle depicts the responses to the main events in the cycle.

![Cycle Diagram](image)

**KWL Chart.** KWL stands for Know, Want to Know, and Learned. This chart helps students activate prior knowledge, pinpoint knowledge needed, and reflect on learning.

![KWL Chart](image)
**Interaction Outline.** An interaction outline is used to show the nature of an interaction between persons or groups, such as the interaction between European settlers and American Indians. The graphic depicts a response to the persons or group. What were their goals? Did they conflict or cooperate? What was the outcome for each person or group?

**T-Graph.** This is used to show similarities and differences between two things (people, places, events, ideas, etc.). The graphic shows what is being compared and how they are similar and different.
Venn Diagram. This is made up of two or more overlapping circles. It is often used in mathematics to show relationships between sets. In English language arts instruction, Venn diagrams are useful for analyzing similarities and differences in characters, stories, poems, etc. This organizer is an effective pre-writing activity. It helps students to organize thoughts, quotations, similarities and differences visually prior to writing a compare/contrast essay.
Teacher Checklist

Note Taking

Yes   No
☐ ☐ Students were made aware of the importance of note-taking and its impact on learning.
☐ ☐ You instructed students in effective note-taking procedures.
☐ ☐ You used signaling phrases and transition statements, such as "this is important," to alert students to take notes on the item.
☐ ☐ You used frameworks, diagrams, and graphic organizers to organize your information so that it was easier for students to take notes.
☐ ☐ You provided students with copies of your notes so that they had a model to follow and to compare with their notes.
☐ ☐ Students paraphrased what they wrote in their notes, rewrote definitions, restated relationships, or retold examples in their own words.
☐ ☐ Students explained their notes to other students.
☐ ☐ You gave students feedback on their notes.
☐ ☐ You included time for note-taking activities in class.

Graphic Organizers

Yes   No
☐ ☐ Students understand the various formats and purposes of graphic organizers.
☐ ☐ You used graphic organizers to explain and illustrate relationships found in text material.
☐ ☐ You provided visual links to content learning through graphic organizers.
☐ ☐ You used graphic organizers to assist visual learners to understand abstract concepts.
☐ ☐ Your instructional purpose and your expectations of students determined the type of graphic organizer you included in instruction.
☐ ☐ The developmental level of your students determined the form of your graphic organizer.
Your choice of the type of graphic organizer was partially based on how the organizer would be used in class.

You and your students reflected on the usefulness of the graphic organizer.

You modeled the use of graphic organizers in your instruction.

Students are provided with sites for virtual manipulatives that are pre-approved.

Students developed graphic organizers with you and independently.

You used graphic organizers as alternative test formats.
Physical Movement

Why Do We Need Movement in the Classroom?

It is important to create a classroom environment that stimulates learning in all students. Physical movement is one of the most important instructional strategies a teacher can use in the classroom today. By using movement techniques to assist delivery of content material, a teacher can address all standards, connect across content areas, improve test scores, and have a profound effect on a student's life skills. Movement does not mean just getting up out of a desk and moving to another part of the room; it means incorporating short bursts of physical movement to increase oxygen intake, awaken the brain, and refocus student's thinking and experiences.

Obesity in our population today has grown at an alarming rate. The statistics now show that approximately 25 million kids are overweight or obese, and the lack of physical movement is the leading cause of this epidemic. With intense focus on high-stakes testing and extensive use of multimedia, our students today are the most sedentary generation that has ever existed.

American children have the highest obesity levels in the world. The present generation of children is predicted to be the first not to outlive parents. Not only is the lack of movement affecting the physical health of our children, but also it is affecting the emotional and intellectual health of our students. The Centers for Disease Control and Prevention found that movement and physical activities enhance learning in the classroom.

An important component that is directly related to the need to increase movement is one's inner ear. Movement stimulates the inner ear as well as the cerebellum. Sensory data is regulated in the inner ear and helps one to maintain balance, to turn thinking into actions, and to coordinate movements.

What We Have Learned from Brain Research

Brain research has shown that increased physical activity does improve cognition. When the brain is active and linked to physical activity, it produces a chemical that helps neurons communicate. The brain is better able to retain information, leading to improved understanding, comprehension, and information retrieval rate.

Exercise also positively affects the levels of neurotransmitters, such as glucose, which stimulate cognition. Creating more movement in the classroom helps students' bodies create more blood flow to brain cells, increasing overall blood circulation. By increasing the oxygen levels in the brain through simple physical activity, students can show marked increases in attention levels, short-term memory, processing speed, planning, sequencing, and self-monitoring.

Active instruction in the classroom can help to reduce students' stress levels. Stress stimulates the adrenal glands to produce a chemical called cortisol. When cortisol is present in high levels, the brain is less capable of planning, judging, and problem solving in alignment with the higher order thinking skills.
The brain is activated through the body's motor system. Movement in all forms plays a very important role in memory and mental cogitation. By embedding physical movement in your daily lessons, you can engage both the mind and the body, allowing the brain to function at its peak level.

Achieving 2151-century skills may be an ambitious goal to help our students become proficient in a global society; however, unless physical movement is a regular part of instruction, student thinking and achievement will likely decline.

**How Can I Do This? My Plate Is Full! How Can You Not?**

The students in today's classroom are sedentary for the majority of the time they are in school despite what research is telling us. Daily stretching, walks, dancing, drama, seat-changing games, brain busts, and classroom energizers are simple techniques to integrate into the content areas and can be done with minimal preparation. The benefits of movement in the classroom can increase a student's academic and emotional performance in the following ways:

- improved emotional health
- improved self esteem
- increased alertness
- increased concentration
- improved mathematics, reading, and writing test scores
- less disruptive behavior
- higher rates of learning
- improved problem solving
- less school absenteeism

In Seattle, third-grade students who studied language arts concepts through dance activities boosted their reading scores by 13% in 6 months, according to Gilbert. Incorporating music and dance has increased math and verbal scores by using rhythm and repetitive beats and movements. In Canada, a study was conducted which increased vigorous aerobic exercises in the classroom. The results found a marked improvement in short-term memory, reaction time and creativity. When the movement activities are directly related to the academic theme and goals of the teacher, the students are more focused and better behaved.

Schools that have incorporated more physical movement into the classroom on a daily basis have seen positive effects on academic achievement, including increased concentration; improved mathematics, reading, and writing test scores; and reduced disruptive behavior. Even when time
for physical activity reduces the time for academics, test scores go up. The students are engaged and healthy, and the teachers are having fun teaching.

Alicia Moag-Stahlberg, the executive director of Action for Healthy Kids, has been quoted as saying, "There absolutely is an association with grades and fitness levels. When schools had more kids in higher fitness levels, they had higher grades, math in particular." When you blend physical movement with learning experiences, comprehension and thought processing skills are greatly increased. After invigorating movement sessions, students are better able to focus on the next lesson and more receptive to information, improving cognitive skills.

With more physical movement in your classroom, don't forget to fuel the brain. The brain is composed of roughly 80% water and must be hydrated for optimal functioning. Have your students drink plenty of water throughout the day as dehydration can negatively affect their concentration. Upon entering school each year, students in Singapore are given a water bottle to carry with them each day. Teachers in Singapore have found that simply keeping their students hydrated keeps them alert and engaged.

**The Time Has Come to Move!**

When you incorporate a variety of movement activities into a classroom, an array of benefits emerges:

- sense of belonging
- improved self-esteem
- rest for the brain
- improved communication and listening skills
- opportunity for problem solving and higher level thinking
- environment that encourages laughter and fun while engaging learners
- improved motivation and discipline
- increased interest in attending and participating in class
- improved relationships

**Struggling Students**

Those students who are struggling readers or deficient in math skills have been shown to have fewer brain synapses, thus limiting the passageways of both hemispheres of the brain to communicate. This is often the result of a child's lack of physical movement, as movement stimulates an increase in body awareness, visual tracking, and coordination.
Students who struggle with reading often experience trouble with visual tracking, often due to the brain hemispheres not efficiently communicating. Utilizing cross-lateral movement to reinforce communication between the left and right sides of the brain has increased skills such as reading, writing, thinking clearly, and problem solving.

**Movements that Support Learning**

**Physical movement seems to assist and improve the following:**

- memory
- mental concentration
- planning and organizing
- test scores
- stress levels of students
- classroom behavior
- attendance
- attention in the classroom

**Music**

There is a strong link between academic achievement and steady beat competence, particularly in math and reading achievement scores. Music stimulates right brain learning and makes the learning process more enjoyable. You can use music to introduce a new physical movement or activate vocabulary. By incorporating music and movement, students quickly make associations and connections to the material being taught. Rhythmic movement can be learned by moving parts of the body in enjoyable and interesting ways such as learning to dance.

Select appropriate music to align with the content you are trying to teach:

- Music should be used as an aid and not a distraction. Do not choose music with disharmonic patterns.
- If you want students to concentrate, select music that has regular periods with repeated phrases and patterns.
- A repetitive pattern of music helps with the repetitive nature of learning in math or grammar.
- Use music when asking the students to use their imagination to write descriptively.
Walking and listening to music prior to lessons has been shown to increase verbal fluency scores in addition to making students feel better emotionally and mentally.

**Movement Strategies**

Cross-Crawl - This technique accesses both hemispheres of the brain simultaneously by moving opposite arms and legs together, either in a sitting or walking position. The arms and legs move in various directions to the beat of music or rhythm. Cross lateral movement stimulates the reconnecting of both brain hemispheres. This exercise is helpful for spelling, writing, listening, reading, and comprehension. Another option is to put the right hand across the body to the left knee as you raise it. Then put the left hand on the right knee just as if you were marching. Do this either sitting or standing for about two minutes.

Rocker - Sit on a chair and lift feet up. Rock one way and then reverse the direction. This releases tension in the lower back and sacrum. When the sacrum is free to move, the brain located at the other end of the central nervous system is activated as well.

**The Calmer:** This works well with students before a test to calm nerves and improve concentration.

- Stand or sit. Cross the right leg over the left at the ankles.
- Take your right wrist and cross it over your left wrist. Link up the fingers so that the right wrist is on top.
- Bend your elbows out and gently turn the fingers in toward the body until they rest on the sternum (breast bone) in the center of the chest. Stay in this position.
- Keep your ankles crossed and your wrists crossed. Breathe evenly in this position for a few minutes.

**Where Am I?:** During academic instruction, encourage students to stand and move around the room in groups or individually. This helps with knowledge of personal space and spatial awareness. A combination of the following activities will develop and improve vestibular systems and spatial awareness:

- spinning
- balancing
- jumping
- rolling
- turning

Those lacking in these concepts may have trouble in the following areas:

- reading
• organizing written work
• understanding abstract math concepts
• reproducing patterns and shapes

One-Minute Commercials: Have the students use drama to role play their learning or key points in a lesson.

Thinking on the Move: Have the students walk around the room, school, or outside while discussing a question(s) that you have aligned with your lesson. Moving while talking relaxes the brain to think on a higher level and relieves stress and barriers that potentially inhibit the student thought process.

Time Out for Yoga (or stretching of some form): This allows students to get more oxygen into their systems, feeding their brain cells, bringing calm to the classroom, and decreasing stress.

Motor Activities: This can increase motivation and enjoyment of the learning process for spatial and kinesthetic learners. They gain benefits from doing and being engaged in the learning. Some examples include the following:

Understanding a comma: Students walk while saying a sentence and pause to represent the purpose of a comma.

Understanding number sequence: Students stand up and represent a number sequence using their bodies.

Understanding a war: Students role play the war.

Understanding an atom: Students become the atom.

Test Review

If you have the students move while reviewing cognitive information, retaining and recalling becomes easier. Students can walk in place while reviewing for a test. Use music or rhythm when working with math skills.

Jogging: Have your students jog in place when they are reviewing their spelling words or any other academic knowledge.

Game Time: Play hangman on the board when reviewing the states and capitals. Then have students do pushups or squats until they get the correct answer.

Up and Down: While the students are waiting in line or waiting for the bell to ring, have them do stretching exercises. Have students reach overhead and then touch their toes.
Cool Down: After doing a motor activity, try doing a cool down activity in order to get the students focused and ready to learn. Have students stretch and do deep breathing exercises.

Energizers - Simple physical tasks can give students renewed energy for engaging in more academic work. Have students toss a ball when doing review, vocabulary building, or storytelling.

1. Human Knot - While in a circle, have students put their arms in and hold someone else's hand. Then try to unravel the knot without letting go of hands. This activity involves getting physically close to others, stretching, laughing, and problem solving.

2. Group Juggle - Throw balls to others in a sequence, using each person's name.

Tips on Bringing Movement into the Classroom

- Short-term memory is best in the morning and least effective in the afternoon. Do activities that require quick recall early.

- Long-term memory is generally best in the afternoon. Lessons with repetition or emotional energy may be more meaningful later in the school day.

- Give students a mental break several times a day. When you find students becoming disruptive, staring off into space, or fidgeting, bring some movement into the classroom.

Yes No

☐ ☐ Students have opportunities to play periodically.

☐ ☐ Play in a school setting has a specific time, and students are informed in advance.

☐ ☐ Students are given choices and options in play activities.

☐ ☐ Time for play is sometimes spontaneous and not always during a rigid time frame.

☐ ☐ Students are adequately supervised to keep them safe in play activities.

☐ ☐ Students are provided multiple resources to play with during unstructured play time.

☐ ☐ Students are not graded on play activities.

☐ ☐ Students reflect on play experiences through conversation or writing.

☐ ☐ Students are given frequent breaks (15-20 minutes) for body play, such as physically stretching.

☐ ☐ Objects are used along with student discussion to stimulate brain activity.

☐ ☐ Students are given role playing opportunities to act out adult roles.

☐ ☐ Students are encouraged to be innovative in creative play activities.
Problem-based Learning

Defining Problems

Problem-based learning (PBL) requires the use of real-world problems. This adds an exciting authenticity for students but creates challenges for you. Real-world problems, by their nature, are messy. It is often difficult to predict how long it will take students to develop a solution. These problems don't match well to traditional classroom resources such as textbooks and exams. PBL using real-world problems demands more preparation and a high degree of comfort with the realization that things will not always go as planned. So be prepared for the unexpected. These cautions aside, the benefits of problem-based learning outweigh the risks.

Problem-based learning is organized around an ill-structured problem that:

• is complex and messy in nature
• has no simple, fixed "right" solution
• requires inquiry, information-gathering, and reflection

Here are some examples of open-ended problems used in PBL:

• You are a scientist at the State Department of Nuclear Safety. Some people in a small community feel their health is at risk because a company keeps thorium piled above ground at one of plants. What action, if any, should be taken?

• You are a consultant to the U.S. Department of Fish and Wildlife. A first draft of a plan for the reintroduction of wolves to Yellowstone National Park has received strong, negative testimony at Senate hearings. What is your advice regarding the plan?

• You are a member of President Truman's Interim Committee. What advice will you give the president to help end the war in the Pacific? An atomic bomb has just been detonated at Los Alamos.
In PBL, the problem comes before anything else. Problems provide clues, context, and motivation; they are the maps that guide learners to useful facts and concepts. Problems should not include detailed information. A "good" problem cannot be understood or resolved at first encounter; it should challenge thinking, require thoughtful research, and demand extensive learning.

The diagram on the previous page illustrates the PBL cycle. After posing an initial hypothesis, students use the learning issues to seek out additional information. This information is used to reexamine the problem. Based on this information, students can modify the existing hypothesis or reject it and repeat the process.
Finding Problems

Problems need to be connected to the curriculum, but efforts should be made to make them real-world and about issues that are related to the students' experiences. Problems are often interdisciplinary, so be prepared when creating a problem in one subject to cross over into other disciplines.

Problems are difficult to design to obtain the proper balance of a well-defined problem with no obvious solution, but with clues that trigger students to pursue in-depth learning. Inspiration for problems can come from newspapers, news reports, literature, state or national policy issues, curriculum guides, technology innovations, social problems, or community issues. Think of controversies, conflicts, debates, dilemmas, political decisions, or complex processes. By examining many of the issues around you, you can identify rich problems for students to analyze.

Once you identify a potential subject, think it through to see if it includes sufficient issues for students to investigate. A good way to analyze the problem is to develop a visual concept map. By mapping out a number of potential issues, you can decide if there are enough topics that relate to the curriculum and will provide good learning opportunities for students.

Teacher's Role

Your role in PBL is divided into three key areas: designer, coach, and evaluator.

In the designer role, you complete the essential creation of an interesting and doable real-world problem. The problem must be one that can be completed with the resources and time available to students. You must also clearly define how the problem relates to the skills and knowledge that have been set for this overall learning experience. PBL may be a waste of time unless it develops the skills that are expected of students.

As students work on the problem, you assume the coaching role. You help shape the students' efforts, reminding them of the problem, keeping them focused on the task, providing clues when they are stuck, and offering encouragement. A good coach remains on the sidelines and lets the students play the game. This applies to coaching problem-based learning as well. Let the students struggle some and develop confidence in their abilities as they work through solutions. A successful solution will be a source of pride only if it is truly their work.

Your role as evaluator is to provide the final determination of the quality of the work. Your expertise in the problem, related skills, and evaluation techniques is essential. In many cases, you do not judge the final work but rather facilitate evaluation by developing scoring guides and/or training peer or external evaluators. Another part of your role as evaluator is to give feedback on progress while students are engaged. This formative type of evaluation helps to improve learning while students are problem solving.

Students assume a different role in PBL in that they are active problem solvers, decision-makers, and meaning-makers rather than passive listeners. You model, coach, provide support and
encouragement for the beginning investigators and then step aside to observe as students complete their work. Collaboration among students should be encouraged.

You model, coach, provide support and encouragement for the beginning investigators and then stop aside to observe as students complete their work. Collaboration among students should be encouraged.

**Connecting Related Skills**

One of the values of PBL is that it demands the use of many different skill areas. Make sure students understand that they will be expected to use and will often be evaluated on language, problem-solving, and inquiry skills as well as knowledge in several disciplines. It is important to structure learning experiences so that they emphasize and reinforce all of the related skills. Avoid the situation where students become so focused on solving the problem that they fail to develop desired skills and knowledge along the way. Well-designed scoring guides and individual coaching will ensure that related academic skills are covered.

**In planning the problem-based learning activity, you**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**During the problem-based learning, you:**

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Helped the students decide which learning issues to pursue and how to pursue them.

Invited reflection on the session’s progress and guided planning for the next session.

Helped the students becoming increasingly adept at helping each other.

Helped the students to integrate and apply what they learned.

Created an environment in which the students felt they could take risks.

Helped the students to bring closure to the problem in a timely fashion.
Simulation/Role-playing

Uses for Simulation

Simulations can be used for various phases of instruction: presentation, guidance, practice, and assessment. This makes simulations one of the most versatile types of instructional strategy. Simulations can be used: before the formal presentation of new material to spark student interest; to help students recall previous knowledge about the topic; and to provide a concrete example. After students have been introduced to new content, simulations can be used to enable them to transfer what they have learned to an actual application.

Simulations can be used in a variety of instructional activities. These can extend from the simple introductory exercise to culminating activities that include extensive student research and preparation. Some examples are described below.

Icebreakers. Simulations are effective for team building and introducing course content. They also serve as a means of introducing students to a learning environment that encourages participation and interaction. These types of simulations should be short, creative, and focus on communication skills. An example is "Detective Story," developed by Ken Jones (1991). In this simulation, students become ideas for characters in an unfinished detective story still in the author's imagination. The author has a writer's block that disallows the ideas coming together. In pairs, the students must meet and negotiate ideas to try to get the story to unfold.

Developing Empathy and Understanding. Numerous simulations bring students into situations in which they need to make critical choices and deal with diversity and social conflict. These real-life experiences broaden students' perspectives and assist in developing greater sensitivity, understanding, and tolerance of differing social, cultural, economic, and political aspects of society. In Simulations: In A Sourcebook for Teachers and Trainers, Jones describes "Tenement," a British simulation that engages students in the problems and challenges of living in a large-city tenement. Students assume various roles of tenement life, such as landlord, tenant, and representative from a public agency. Through the simulation, students become aware of a lifestyle that might otherwise be foreign to them. Awareness is enhanced by learning ways to solve some of the problems associated with tenement dwelling.

Analyze Social Problems. It is possible through simulations to immerse students in the causes, effects, and scope of social problems. Students determine their impact or consequences and analyze prescribed solutions. The tenement example is also appropriate for students to look closer at social problems and possible solutions.

Explore the Future. Computer simulations allow students to predict or explore the future. Students practice creative problem solving and build capacity to manage and cope with continuous change as they make decisions about future ideas, events, etc. The future of a city is the subject of a commercial simulation, "Cities." Students make choices about the future life and activities of a city. (Lewis, 1974)
**Develop Analytical and Research Skills.** Typically, simulations enhance students' ability to analyze situations. Simulations also nurture the ability to transfer and apply analytical and research skills to other curricular areas.

**Develop Oral and Written Communication Skills.** Involvement in simulations requires students to analyze, evaluate, and extrapolate ideas. These activities stimulate communication skills. Students learn to negotiate; argue; interview; take notes; draft, edit, and organize; speak publicly; and listen. A common simulation involves students assuming roles as representatives of other countries in a United Nations debate over a topic of current economic, social, or political interest. In these roles, students strengthen their communication skills through negotiating and debating.

**Factors to Consider When Selecting a Simulation**

1. The simulation must match the instructional objective.

2. The purpose of the simulation must always relate to the course content and competencies. Assigning simulations because students enjoy them is not a good reason to use this strategy.

3. Placement of the simulation in a course is a consideration. There are distinct advantages to having the simulation at the beginning or the end of the course. At the beginning, the simulation will encourage interaction and participation. At the end, the simulation may be a culminating or summative activity. Sufficient time needs to be provided not only to complete the simulation but also to discuss it.

4. Time for simulations is a factor in planning your instruction.

Your experience with using simulations will to some extent determine how much time you allow for them. As you are introducing simulations, keep them brief. Use one class period or an extended class. After you become more experienced at facilitating simulations, you can incorporate ones that require more time to complete.

5. Participation is a key component of simulations. Try to use ones that involve many students. In most cases, the simulation will indicate the ideal number of participants. Various roles can be modified or extended to increase participation. Avoid using simulations that engage only a few students.

6. Careful consideration needs to be given to role assignments. The consequences of these in relation to the success of the simulation need to be addressed. The process of assigning or designating roles can lead to other perceptions unrelated to the simulation. This may be particularly true in the assignment of high status roles.
7. Many simulations require teams. Thus, you need to assist students in developing teaming skills and strategies and provide them with opportunities to function effectively as a team. Capitalize on class groupings that are already in place.

8. Debriefing activities need to be student-centered. Students should debrief using a guide that you develop on the major outcomes of the simulation and additional learning resulting from the simulation.

9. Identify all the resources you need to implement the simulation.

**Preview materials and itemize what will be needed to have success.**

**Implementing the Simulation**

In order to maximize student learning from the simulation, decisions about organization and grading need to be made prior to implementing the simulation.

1. Be familiar with the simulation. Know its objectives, procedures, etc., and be prepared to introduce, conduct, and process it. Plan all pre-simulation activities, such as materials, instruction sheets, seating arrangements, etc.

2. Determine your role. Are you an observer or a guide? It is necessary to monitor the simulation but only in a facilitating manner. It is the students' learning opportunity so you need to be careful not to intervene unnecessarily. You are not an active participant. Rather, provide help as needed.

3. Assess performance in the simulation. Whether and how the simulation is to be graded needs to be decided prior to the simulation. Care must be taken to ensure that grading does not interfere with students' risk-taking, interaction, outcomes, and other

**Designing a Simulation**

When first using simulations, it is best to start with commercially developed products. However, after you become more proficient with this instructional strategy, you may prefer to develop your own simulated activities based on the course content and competencies.

**To design a simulation, use the following points as guides:**

1. Identify the educational objective. Determine the simulation's purpose and define each concept and competency you wish to develop.

2. Define the model to be replicated. Decide what problem or subject will be the focus of the simulation activity. Outline the scenario and determine the purpose and name of the organization involved, nature and number of roles, etc.

3. Explain the dynamics of the model. Describe roles for both students and teacher; outline types of interactions that will occur. Define the behaviors on which the simulation is focusing.
4. Outline the rules of participation. Define procedural and behavioral rules as well as the goal and how students will be motivated. Establish how feedback will be given and evaluation carried out. Set standards for measurement of goal attainment and develop a process for resolving conflicts and enforcing rules.

5. Prepare discussion questions for debriefing.

**Designing a Simulation**

When first using simulations, it is best to start with commercially developed products. However, after you become more proficient with this instructional strategy, you may prefer to develop your own simulated activities based on the course content and competencies.

To design a simulation, use the following points as guides:

1. Identify the educational objective. Determine the simulation's purpose and define each concept and competency you wish to develop.

2. Define the model to be replicated. Decide what problem or subject will be the focus of the simulation activity. Outline the scenario and determine the purpose and name of the organization involved, nature and number of roles, etc.

3. Explain the dynamics of the model. Describe roles for both students and teacher; outline types of interactions that will occur. Define the behaviors on which the simulation is focusing.

4. Outline the rules of participation. Define procedural and behavioral rules as well as the goal and how students will be motivated. Establish how feedback will be given and evaluation carried out. Set standards for measurement of goal attainment and develop a process for resolving conflicts and enforcing rules.

5. Prepare discussion questions for debriefing.

- Students learned from what they do rather than what they were told, observed, or read.
- The activity involved real-world problem-solving experiences and reflected reality.
- The simulation’s instructional objective was clear.
- Financial and classroom resources needed for the simulation were identified.
- During the simulation, it was safe for students to make mistakes.
- Students received immediate feedback on their progress.
Learning was active rather than passive; everyone participated.

Students, not you, were the “main players”.

Group composition was appropriate to the simulation and supported interaction.

A debriefing process was carefully planned and carried out.

There was a rubric for assessing students’ behavior during the simulation.

Students were aware of the grading process.
Socratic Seminar

Elements of Socratic Seminar

A Socratic Seminar fosters active learning as participants explore and evaluate the ideas, issues, and values in a particular text. A seminar begins with an open-ended question to start students reflecting on the meaning of the text. Through careful use of listening techniques and further questions, the teacher as facilitator leads the students to deeper reflection on the work in question. A seminar consists of four interdependent elements: (1) the text being considered, (2) the questions raised, (3) the seminar leader, and (4) the participants. A closer look at each of these elements helps explain the unique character of a Socratic Seminar.

The Text

Socratic Seminar texts are chosen for their richness in ideas, issues, and values and their ability to stimulate extended, thoughtful dialogue. The text can be drawn from readings in literature, history, science, math, health, and philosophy or from works of art or music. A good text raises important questions in the participants' minds, questions for which there are no right or wrong answers. At the end of a successful Socratic Seminar, participants often leave with more questions than they started with.

The Question

A Socratic Seminar opens with a question, either posed by the leader or solicited from participants as they acquire more experience in seminars. An opening question has no right answer; instead it reflects a genuine curiosity on the part of the questioner. A good opening question leads participants back to the text as they speculate, evaluate, define, and clarify the issues involved. Responses to the opening question generate new questions from the leader and participants, leading to new responses. In this way, the line of inquiry in a Socratic Seminar evolves on the spot rather than being predetermined by the leader.

The Leader

In a Socratic Seminar, the leader plays dual roles as leader and participant. The seminar leader consciously demonstrates habits of mind that lead to a thoughtful exploration of the ideas in the text by keeping the discussion focused on the text, asking follow-up questions, helping participants clarify their positions when arguments become confused, and involving reluctant participants while restraining their more vocal peers.

As a seminar participant, the leader actively engages in the group's exploration of the text. To do this effectively, the leader must know the text well enough to anticipate varied interpretations and recognize important possibilities in each. The leader must also be patient enough to allow participants' understandings to evolve and be willing to help participants explore nontraditional insights and unexpected interpretations. Assuming this dual role of leader and participant is easier if the opening question is one that truly interests the leader as well as the participants.

The Participants

In a Socratic Seminar, participants share with the leader the responsibility for the quality of the seminar. Good seminars occur when participants study the text closely in advance, listen actively,
share their ideas and questions in response to the ideas and questions of others, and search for evidence in the text to support their ideas.

Participants acquire good seminar behaviors through participating in seminars and reflecting on them afterward. After each seminar, the leader and participants discuss the experience and identify ways of improving the next seminar. Before each new seminar, the leader offers coaching and practice in specific habits of mind that improve reading, thinking, and discussing. Eventually, when participants realize that the leader is not looking for right answers but is encouraging them to think out loud and to exchange ideas openly, they discover the excitement of exploring important issues through shared inquiry. This excitement creates willing participants, eager to examine ideas in a rigorous, thoughtful manner.

Room Arrangement

Modification of room arrangements is often necessary. It is very important that the students have direct eye contact with one another and that they appear equal to the discussion leader. This is most often done by arranging the desks in a circle, with the teacher sitting at one of the desks. A seminar is probably ideal with 15-20 students, although it can work with 25-30. If the classroom is not large enough to arrange all of the desks in a circle, create two circles, one inside the other. The inner circle is the seminar group and the outer circle observes. To maintain the interest of students in the outer circle, leave two seats in the inner circle empty. As the seminar proceeds, when a person in the outer circle wishes to add a comment, he or she moves from the outer circle to take a seat temporarily in the inner circle.

Conducting a Socratic Seminar

Preparation

• Read the assigned text carefully. Focus on formulating provocative questions while you’re reading. Select short passages for special attention.

• At the start of each seminar, your role is to get the discussion moving by setting the stage. A few brief comments are in order; but remember, you’re not there to deliver a lecture.

• Choose an introductory question in advance that is broad, open-ended, and provocative.

• Set the room arrangement in a circle to support a positive environment for a seminar.

Conducting a Seminar

• Listen carefully so that you can follow every answer with another question.

• Stick with the subject at hand, and encourage the group to turn to the assigned texts frequently to support their ideas. Do not let the discussion wander or participants ramble.
• Use neither praise nor negative comments. Your role is to press participants to clarify and amplify their ideas.

• Insist on standards of intellectual rigor. A good seminar is focused.

• Remember that your role is to be a co-learner and discussion facilitator, not an authority on "correct" thinking.

• At the end of the seminar, give the group time for thoughts on how the discussion evolved. Ask each individual to reflect. Use the feedback to guide future meetings.

Guidelines for Participants

Socratic Seminar

• Do not participate if you are not prepared. A seminar should not be a bull session. Read the assigned text(s) thoroughly and reflectively.

• Mark key issues or take notes on the text to make it easier to refer to citations during the seminar.

• Refer to the text when needed during the discussion. A seminar is not a test of memory. You are not "learning a subject." Your goal is to understand the ideas, issues, and values reflected in the text.

• Form opinions you can defend by citing evidence in the text.

• If you do not understand something, ask for clarification.

• Stick to the point currently under discussion; make notes about ideas you want to come back to.

• Search for connections with previous reading and other discussions.

• Listen carefully and completely to another's opinion before forming a response.

• Listen critically to others and take issue with inaccuracies or illogical reasoning.

• Maintain an open mind to a diversity of opinions.

• Speak up so that all can hear you.

• Be courteous and respectful of peers.

• It's OK to "pass" when asked to contribute.

• Avoid repeating the comments made by others.
• Talk to fellow students not just to the leader or teacher.
• Discuss ideas rather than each other's opinions.

Participants

☐ ☐ Have read and analyzed the text.
☐ ☐ Speak loudly and clearly and avoid inappropriate language.
☐ ☐ Listen to others respectfully and support each other.
☐ ☐ Cite reasons and evidence for their statements.
☐ ☐ Talk to each other, not just to you.
☐ ☐ Question others in a civil manner.
Leader

- Reminds students of the rules for a Socratic Seminar.
- Sits at the same level as the students.
- Gets all participants engaged early.
- States a clear opening question.
- Corrects misunderstandings without demeaning students.
- Allows for discussion of disagreements.
- Listens carefully to participants’ statements.
- Accepts participants’ answers without judgment.
- Serves as a good model of seminar participation.
- Speaks infrequently so that students can carry the conversation.
- Allows time (pauses) for thinking.
- Brings the seminar to closure and reinforces major points made.
- Conducts a reflection session for feedback from students.
Storytelling

Humans are not ideally set up to understand logic; they are ideally set up to understand stories.

-Roger C. Shank

Our Brains Remember Stories

Story is as old as language itself. Prehistoric civilizations told stories to share location of food and shelter and to warn of danger. They also shared exaggerated stories of the enormous and dangerous kill or the "one that got away." Stories are easier to remember than a grocery list, and one of the most effective mnemonic devices is to convert a technical list of items into a narrative story, thus making it easier to remember.

The popularity of movies and fiction literature show that we crave stories for entertainment or a diversion from life. Stories can also effectively convey meaning and concepts. Nursery rhymes and fables often describe in colorful forms important events or concepts. For example, the story of the tortoise and the hare is a vivid and imaginative way to convey the concept that perseverance is often more important than speed.

In many ways we are rediscovering storytelling as a communication tool. In our effort to refine teaching language skills, curriculum experts have often focused on memorizing the discrete tools of language: vocabulary, spelling, sentence structure, and literary technique. However, this is like giving a construction worker a set of tools and saying that he or she is a master builder. Effective language use takes practice as well as the proper tools. Just as students might practice writing a research report or business letter, a story can be a way to combine language into effective communication. Furthermore, storytelling can be used as a strategy in other subjects such as science and social studies.

What Is Storytelling?

Storytelling involves imagination and the use of language and gestures to create scenes in the mind of the listener. The more you know about storytelling, the better you can teach and model it for students. Stories are not fixed scripts that are always recited or read the same way; the good storyteller finds a new adjective or gesture to more deeply engage the listener each time he or she tells the story. Storytellers are often just as important as the story. While a joke may be exceedingly funny when told by one person, the same joke may fall flat when told by another. The delivery of the joke triggers our laughter. Effective storytelling intimately combines the storyteller and the story. A storyteller's cultural background and unique personal attitudes and experiences should come through in words and gestures. The unique character and voice of each teller brings to life a good story.

Benefits of Storytelling
Story exercises imagination, an essential for higher-level thinking. A quality education requires that we not only give children the ability to spell words correctly and create grammatically correct sentences but also encourage them to develop rich experiences with words and gestures through story. When we listen to a story, we do more than listen to the words and ideas: we connect with our emotions. Storytelling uses the logical brain's functions (language, a story line, sequences of cause and effect) to speak the conceptual brain's language of symbolic, intuitive, imaginative truths. Thus, storytelling stimulates the brain as a whole, promoting health and development.

**Strategy and Student Work**

Story can be both a teaching strategy and a form of student work. Since story is more engaging than straight lecture, teachers can use a story with narrative hooks and vivid images to introduce content and help students understand concepts. Teachers can also ask students to present the results of reading or research in the form of story. While it takes additional time to demonstrate for students the form of creating and delivering stories, students will be more engaged in learning and develop a form of communication that is a lifelong skill.

**Effective Storytelling Skills**

The following list details the characteristics of effective story telling. When students tell a story, these observable criteria may be used to evaluate the performance.

**Voice**

- Speaks with an appropriate volume for the audience to hear
- Enunciates clearly
- Avoids monotone
- Uses changes in vocal expression to clarify the meaning of the text

**Gestures**

- Expressively uses non-verbal communication to clarify the meaning of the text
- Avoids any body language that distracts from the storytelling

**Focus**

- Makes eye contact with audience
- Maintains a charismatic presence in space (stage presence)
- Stays in character of the story teller throughout the story
- Uses voice different from character voices if dialogue is used

**Words**
Uses descriptive and articulate language
• Gives context to new words to help audience understand meaning

Setting
• Appears comfortable, relaxed, and eager to tell the story

Pacing
• Presents story efficiently and keeps listeners' interest throughout the story

Story Structure
• Presents clear and engaging opening
• Presents sequence of events easy for the listener to follow
• Tells story completely and presents clear ending

Innovation
• Employs unique or creative use of language, sound, or body language
• Creatively presents the sequence of events
• Artfully expresses or suggests perception of the meaning of the story through telling

Tips for Teacher Stories
• Tell or enact a story to illustrate the points made in Effective Storytelling Skills. Begin with personal tales before moving on to short stories, such as Aesop's fables. Select stories that are easily learned.

• Storytelling will require you to be loose, expressive, and even goofy at times. Some students may love storytelling, and some may hate it. However, because the ability to speak with comfort and conviction in front of people is important to success in this world, stress the importance of storytelling so students are encouraged to improve their own skills.

• Prepare for your performance: write, practice, and rearrange the story; make notes to yourself; and view your performance on videotape or in the mirror. Then stand in front of your class, take a deep breath, smile, and just start talking. Trust yourself to know where you are going with the story and give yourself permission to change the timing, rhythm, sounds, facial expressions, and even a few words if necessary.

• Although you may hope to entertain your students, your purpose is to build literacy skills through storytelling. To keep the emphasis on language, help your students analyze the story. Ask students to summarize your story in one sentence.
Working with Students as Beginner Storytellers

Students initially may have a fear of telling a story in front of an audience. Impress upon them that the audience is essential; without an audience, there is no purpose to tell the story. Also, remind students that storytellers improve over time. No one delivers a perfect story the first time. When coaching students about improving their storytelling skills, always start with compliments about things they have done well. Help students develop, improve, and evaluate their performance using the following suggestions:

• Draw on a variety of sources when constructing your stories. Personal tales, or stories of real experiences, are a good first step since the facts are well known to you.
• Brainstorm. First write down some story ideas without considering how good they are. Now put one idea or memory into a sentence. Decide if you want to tell a story in the first or third person and what impact that will have on the story.
• Write down the sequence of facts. From there, add the details, descriptions, situations, time reference, and colors. Finally, layer the feelings and emotions. Choose your words carefully.
• If appropriate, put in a few sound effects, vocalizations, facial expressions, and silences. As funny as you may feel about talking out loud while you are writing, certain words sound better than others when they are spoken. Speaking out loud may help you with sentence structure and word choice.
• Practice telling the story to one person at a time. Keep changing partners. As your confidence builds, tell the story to small groups. When the story is well rehearsed, tell it to the class.
• Visualize the scenes: Who are the people in each scene? What do they look like? How do they talk, move, and stand? Imagine the action in the story. Use your imagination to add to the story.
• Use movement when telling the story. Audiences respond to physical movement, and it enlivens the tales. Moving also may put you at ease and help you convey ideas. Dull storytelling is often static and word based.
• Embellish adjectives. Practice selecting additional adjectives to describe a scene. [Note: Show students an image and ask them to come up with as many adjectives to describe the scene without repeating previously mentioned adjectives.]
• Practice using your eyes to hook the audience into the story. Storytellers talk directly to the audience. Using eye contact helps the audience feel your energy.
• Try to use three to five senses in your stories. Describe how things look and feel, including colors, scents, textures, and tastes.
• Watch the audience and learn from their reactions. When does the story cause the audience to lose interest? What words and gestures create interest? Adjust stories to engage the audience.

If you have students who have difficulty telling a story, meet with them individually. Encourage them to think about events in their lives, people, places, and celebrations. Let them know that we are all storytellers and that their experiences are worth sharing. Explain how you resolved difficulties in creating your story and assure them that they can do the same.

Making a chart or outline may help some students focus on different story elements. Others may get frustrated with concentrating only on specific parts of their stories and will need to deal with all the story elements at once. Encourage students to try alternative words and phrases out loud before committing to a final version.

**Storytelling Ideas**

• **A picture is worth 1000 words** - Choose a picture, such as a classical painting or a photograph with interesting people or characters, and have students create a personal story about the images in the picture.

• **Proverbs** - Have students use familiar proverbs to develop a story that illustrates a particular proverb. Proverbs might include the following:
  1. The pot calling the kettle black.
  2. A watched pot never boils.
  3. You cannot have your cake and eat it too.
  4. Haste makes waste.
  5. It takes a village to raise a child.
  6. A bird in the hand is worth two in the bush.
  7. A stitch in time saves nine.

• **Animal stories** - Assign students an animal character and challenge them to create a story about a person they know who has similarities with the animal. Do not have students identify the person as this might be embarrassing; however, encourage students to illustrate a person using the characteristics of the animal.

• **Puzzle folktales** - Take a printed copy of a folktale and cut it into separate pieces by paragraphs. Give each student a different section or puzzle piece. Have students try to sequence the fable by putting the pieces together. Once they have assembled a sequence, have the students tell their story. As another option, give different groups of students the same story and see if the sequence and story is the same or different.

• **Story circle** - Have students sit in a circle. One person begins a story and stops after two sentences. The next person in the circle continues the story by adding two additional sentences until everyone has had a chance to contribute.
• Local interviews - Have students interview older people in the community to identify historic local, national, or global events. Students might obtain photographs from historical periods to illustrate their stories as they retell what they learned from older people. As a variation, students might role play characters in that particular historical period.

• Family stories - Have students tell stories of their family history. This might include descriptions of the number of family members and where they currently live or historical reference as to when their family came to this country. Students might interview family members to prepare for a story of family history.

• Storytelling for younger students - After students have practiced their storytelling skills, they might perform their stories for younger students or other classes.

• 1001 Nights Festival - The legend of Scheherazade, the great storyteller, is that she told stories to a sultan for 1001 nights. Following this example, divide a story into short segments and tell stories over a period of time, peaking students' interest to return to the story in subsequent sessions.

• Group story creation - This is an activity that can engage several classes working together. Use a picture or painting as a trigger to stimulate a story. This same image is shared with several classes. For example, all fifth grade classes in the school might work collaboratively. The first class writes one paragraph to begin the story. The paragraph is then passed to another class that brainstorms and creates a second paragraph of the story. This two-paragraph story is then passed to another classroom, and the cycle continues until the story is completed. The classes might come together and listen to their collaboratively developed story.

• Story from music - Have students search and analyze musical lyrics to find a story. Challenge them to expand upon the story illustrated in the musical lyrics. In a presentation, students tell their story as well as play the music. This makes an excellent group project.

• Broadcasting stories - Once students create excellent stories, they might be broadcasted as presentations across the entire school community.

• Multiple adjectives - This exercise helps students practice using descriptive adjectives for storytelling. Have students sit in a circle and pass an object, such as a stone or ball, around the circle. Have a student identify one adjective to describe the object before passing the object to another student. The next student must identify a different adjective before passing the object around the circle.

• Story of invention - Take simple objects from the classroom, such as a pencil, paper clip, shoe, or piece of paper. Challenge students to create a story about how that object was invented and created for the first time.

**Digital Storytelling**

With the introduction of low cost, easy-to-use technology tools, teachers and students can enhance their stories with recorded audio and video. This has emerged into a separate strand of strategies known as digital storytelling. The Center for Digital Storytelling (CDS) is an international non-profit
training, project development, and research organization dedicated to assisting people in using digital media to tell meaningful stories from their lives. Their focus is on building partnerships with community, educational, and business institutions. Using methods and principles adapted from digital storytelling workshops, the organization hopes to develop large scale initiative in health, social services, education, historic and cultural preservation, community development, human rights, and environmental justice arenas.

The Center for Digital Storytelling (www.storycenter.org) offers Seven Elements of Digital Storytelling:

- Point of View
- A Dramatic Question
- Emotional Content
- The Gift of Your Voice
- The Power of the Soundtrack
- Economy
- Pacing

☐ ☐ Your stories are related to learning objectives.
☐ ☐ Your stories have a specific learning intent.
☐ ☐ Your stories use expressive language and gestures.
☐ ☐ Your stories have a clear beginning and end.
☐ ☐ Your stories are kept to an appropriate length.
☐ ☐ Students are asked to analyze and reflect on your stories.

**Student Stories**

☐ ☐ Students understand the difference between story and memorization.
☐ ☐ Students use expressive language, gestures, and exaggerated voice for characters.
☐ ☐ Students speak loud enough for other students to hear.
☐ ☐ Students maintain a proper pace in telling the story—not too fast or too slow.
☐ ☐ Students’ stories have a clear beginning and end.
☐ ☐ Students’ stories keep attention of peers.
☐ ☐ Students’ stories are appropriate in length.
Summarizing

What Is Summarizing?

Summarizing is restating the essence of text or an experience in a concise form that retains meaning and important information. Summarizing and note taking require the ability to synthesize information by putting it into a new format. To summarize, a student must analyze information and organize it in a way that captures the main ideas and supporting details as well as restates it in the student's own words. Summarization is high-level, rigorous thinking because it requires analysis and synthesis, and research shows that it is among the most effective teaching strategies in increasing student achievement (Marzano).

Fiction and nonfiction texts, media, conversations, meetings, and events can all be summarized. Students initially want to retell everything they have read, seen, or heard. However, summarizing is more than retelling; it involves analyzing information, distinguishing important from unimportant elements, and translating large chunks of information into a few short cohesive sentences.

Why Is Summarizing Important?

- Summarizing allows both students and teachers to monitor comprehension of material.
- Summarizing helps students understand the organizational structure of lessons or texts.
- Summarizing is a skill at which most adults must be proficient to be successful.

Summarizing integrates and reinforces learning of major points. This not only facilitates recall of the information but also allows the student to see connections and patterns in information. Ultimately this helps students use the knowledge when called for in other applications.

Students can summarize information in different ways including deleting information not important to the overall meaning of the text, substituting some information, and keeping some information. As students practice these strategies, they enhance their ability to understand specific content for learning.

Teaching Summarizing to Students

Before instructing students on specific strategies or procedures, consider the following items suggested by Rick Wormeli for summarizing success.

Activate Student's Background Knowledge- Students bring their own prior experiences and knowledge with them for every reading activity. Students' own viewpoints and thoughts on particular topics can lead to a variety of interpretations of the text or experience. Ensure that students have enough background information about the topic and activate that knowledge so a breakdown in understanding does not occur. You might have a class discussion or watch a related video clip to activate background knowledge.
Prime the Student's Brain (Setting Purpose) - Along with activating students' prior knowledge, offer students a specific reason or goal for reading a piece of text. Students who are given a purpose for reading are much more likely to retain information than those who are not. Also help students prepare for reading by advising them how to create their own purpose.

Identify Text Structure - Authors structure text based on content and topic. Students' familiarity with different structures can lead to a better understanding of how the material is presented and of the material itself. Some well-known text structures include enumeration, chronological order, compare and contrast, cause and effect, and problem and solution.

Following Clues - Help students become conscious of text by instructing them about the kinds of clues they should be looking for within the text. This may help with comprehension as well as summarization of the text. For example, detecting and noting the topic sentence can be extremely useful for determining the main idea of the piece. While sometimes located at the beginning of the paragraph, the topic sentence can also be in the middle or simply implied through fragments of text. The first and last sentences can also contain clues to the main points of the text. Coach students as they practice analyzing a text for topic sentences.

Offer Tools - Helping students become conscious and engaged about what they are reading is an important aspect of reading for meaning and summarization. "Good readers read text passages at least twice: once to get the general overview and then again to determine what is salient." Provide students practice and time to reread text to help them better understand the purpose for the reading.

Strategies such as making notations and marking the text help students record their thoughts while they read. These notes can help students gain insight into what is really important in the text and how they feel about it.

The following are several summarization tools and approaches.

Follow the Rules

One strategy for teaching students to summarize is to give them a consistent set of rules to follow. The following generic rules may be used for summarizing:

1. *Skip* unnecessary material.
2. *Delete* redundant material.
3. *Substitute* an overall term for lists.
4. *Select* a single topic sentence to begin the summary.

These rules closely follow the thinking process in summarization: *skip* and *delete* the less important information, *substitute* to shorten information, and select most important information. Students need to practice using these rules with close supervision to gain proficiency and develop study habits. When introducing summarization and these rules, create a game to see who can use the least number
of words and still retain meaning. Use student peers as judges to evaluate whether or not a summary captures the meaning of the original text.

Retelling to a Specific Audience

Summarization may feel like busy work to students since they are usually summarizing information for you that you already know. Develop more authentic assignments in which students summarize information for a specific audience: a student who has not read the material, a younger student, or another adult with a specific interest. The student will practice summarizing information as well as making connections with the needs and interest of the audience. This real-world application of summarization may be much more motivating and helpful for students.

The following are rules for summarizing for an audience:

- **Make a connection** - Why is this material important to this audience?
- **Summary** - What is a brief description of the information and the most important aspects?
- **What next** - What are some specific suggestions for next steps? To locate further information? Learn more? Take some action?

Work with the Summary Frame

Summary frames are specific applications to give to students to use in specific summarizing activities. The following are types of frames that could be used in various teaching situations (Marzano). It is often useful to create a template or form for students to use with the appropriate frame.

- Narrative Frame
- Definition Frame
- Argument Frame
- Problem/Solution Frame
- Conversation Frame

**Narrative Frame** - The narrative or story frame is common when summarizing fictional writing and contains the following elements:

- Characters - Who are the main characters and what distinguishes them from others?
- Setting - When and where does the story take place? What are the circumstances?
- Initiating event - What prompts the action in the story?
- Internal response- How do the characters express their feelings?
- Goal- What do the main characters decide to do? Do they set a goal and if so, what is it?
- Consequence - How do the main characters try to accomplish their goal?
• Resolution - What are the consequences?

Definition Frame - The purpose of the definition frame is to describe a particular concept and identify related concepts. Definition frame should contain the following elements:

• Term - What is being defined?
• Set - To which general category does this item belong?
• Characteristics - What characteristics separate this term from other things in a similar category?
• Examples - What are some of the different examples of the item being defined?

Argument Frame - The argument frame contains information designed to support a point of view such as analyzing a historical event or current issue. It contains the following elements:

• Evidence - What information is presented that leads to the point of view?
• Claim - What statement or point of view is the focus of the information?
• Support - What examples or explanations are presented to support this point of view?
• Qualifier - What special circumstances or concessions are made about the point of view?

Problem/Solution Frame - Problem/solution frames introduce a problem and then identify one or more solutions to the problem.

• Problem - What is the problem?
• Potential solutions - What are the possible solutions?
• Best solution - What is the solution for best solving the problem?

Conversation Frame - A conversation is a verbal exchange between two or more people. Commonly, a conversation has the following components:

• Greeting - How do the members of the conversation greet each other?
• Inquiry - What question or topic was expressed or referred to in the conversation?
• Discussion - How did the discussion progress? Did either person state facts? Did either person make a request of the other? Did either person demand a specific action? Did either person describe specific consequences if the demand was not met? Did either person compliment the other?
• Conclusion - How did the conversation end? Was there any agreed upon follow-up action?

Teacher-Prepared Notes

Teacher-prepared notes are one of the most straightforward uses of note taking as a summary. They provide students with a very clear picture of what you consider important as well as a model of how notes might be taken. After the discussion of a piece of text, you might provide students a written or electronic copy of your notes. While you might think that handing out your notes only eliminates
work for your students, the final objective is student learning. In some instances giving students a well prepared set of notes is more effective than having students struggle with a poor set of self-written notes. In addition, students can use your notes to evaluate their own set of notes.

Exit Ticket

An exit ticket is an ideal strategy when you only have a few minutes at the end of class to informally assess student learning. Students summarize a concept or idea related to the class, and this serves as their ticket to leave the class. Generally students write their summary on a small card or slip of paper and hand them either to you or a designated student upon departing class. You can quickly read these exit tickets to gauge a level of student understanding. If time allows, students might read their exit tickets to the class. The following are examples of typical exit ticket questions:

- Name one important thing you've learned today in class.
- Write/ask one question about today’s content that has left you puzzled.
- Read this problem and tell me what you need to do first to solve the problem.
- Give me one example of how you would apply what you have learned today.

A good practice is to inform students in advance that there will be an exit ticket and provide them with a general description of what the exit ticket will be. This helps to prepare them for this activity and will lead to better responses.

Best Test

In this strategy, students are paired and grouped at the end of a unit to write what they consider to be the best test for that unit. Provide guidelines as to how many of each type of question to include. Students who create the test also write answers for every item. The student(s) whose test is selected receives an automatic "A" grade for the test and does not have to take it.

One-Word Summaries

Summarizing a topic into just one word can be a challenging task for students. They tend to think that more is better. When students are asked to develop a one-word summary, they must apply their critical thinking skills to investigate, read about, and analyze the topic. They must isolate the critical characteristics and come up with one good word that best fits the topic. After students have chosen their word, they must defend their word choice with a valid reason. What makes this a powerful strategy is not the choice of the one word but the development of the rationale. This strategy can be used as a classroom assessment for learning as students evaluate their own justification for word choice.

Think-Pair-Share

Think-Pair-Share is a summarization strategy that can be used in any content area before, during, and after a lesson (Lyman). The activity involves three basic steps. During the "think" stage, students
ponder a question or problem. This allows for wait time and helps students control the urge to impulsively shout out the first answer that comes to mind. Next, individuals are paired up to discuss their answer or solution. During this step students may wish to revise or alter their original ideas. Finally, students are called upon to share their ideas with the rest of the class.

Put a visual on the board or screen to remind students of the steps.

**Think-Pair-Share**

1. **Think** about your answer individually.
2. **Pair** with a partner and discuss your answers.
3. **Share** your answer (or your partner's answer) when called upon.
   
   A variation is to have students write during the first step.

**Write-Pair-Share**

1. **Write** your answer individually.
2. **Pair** with a partner and discuss your answers.
3. **Share** your answer (or your partner's answer) when called upon.

Another variation is Think-Pair-Square-Share. In this strategy, partners discuss answers with another pair before sharing with the class. This activity ensures that all students are interacting with the information. You can use this activity as a formative assessment as you walk about the room listening to student conversations.

☐  ☐  Students are given notice of expectations for summarization prior to introducing the information.

☐  ☐  Students understand the difference between summary and memorization.

☐  ☐  Students give consideration to the audience.

☐  ☐  Students are encouraged to avoid rote recall of information in summaries.

☐  ☐  Students are given a structure/frame for summarization.

☐  ☐  Students are encouraged to improve summarization over time.

☐  ☐  Students are expected to defend their summary.

☐  ☐  Students are encouraged to use their own words in their summary.

☐  ☐  Students practice both written and oral summaries.
Students are given positive feedback on effective summaries.

Students are given encouraging and constructive feedback to improve weak summaries.

Forms and graphic organizers are used to guide and record student summaries.

Students' stories are appropriate in length.
Teaching Others

What Is Teaching Others?

An ancient Chinese proverb says, "Tell me and I forget ... show me and I remember ... involve me and I understand." As you move your students to Quadrant D thinking, provide them with opportunities to think in complex ways and apply the knowledge and skills they have acquired. Teaching others allows students to deepen and apply knowledge. The process involves students learning from and with each other by sharing prior knowledge, ideas, and experiences. While peer teaching usually takes place within the classroom during the school day, teaching younger students may take place outside of your classroom or even outside of the school day. In general, teaching instruction so that students feel more comfortable with others is a way to move from teacher-centered instruction to student-centered their own learning. This strategy can be used at all grade levels in all subject areas.

Why Use Teaching Others?

A recent conversation about this topic with a high school teacher revealed some interesting information. He was becoming increasingly frustrated with his students' low performance on classroom-based assessments. One of his students approached him during an extra help period and said, "I figured out a way to help [name omitted] with his homework during lunch- time. I think I can help other kids in the class if there is a way to do that."

Instead of feeling inadequate as a teacher, he took the opportunity to create a study hall in his classroom. After a few years of refining the process, he has acquired many strategies to help students teach others. He has seen an increase in performance, not only on classroom-based assessments but also on homework and standardized tests. He shared the following positive outcomes that he observed in his students after implementing strategies for teaching others:

- Encouraged higher-level thinking
- Enhanced active engagement and motivation
- Developed collaboration skills
- Decreased disruptive behavior
- Improved critical reflection skills
- Increased responsibility of student learning
- Focused instruction to student-centered instruction

Opportunities for Teaching Others

When you use whole-group instruction in your classroom, the same set of students may consistently raise their hands to share their answers, ideas, or observations. Rather than becoming frustrated, you could channel their leadership ability to teaching others.
In small-group work in a classroom, at least one student in a small group or pair may take the role of tutor while the other students take the role of the learner. Some students respond well in this scenario, as they are passive learners who are willing to let others do the work. However, this can be detrimental to learning. Students who may take longer to process information can feel deflated because their voices are not frequently heard. Observing different group dynamics can help you know when the time is right to employ teaching others.

**Peer Teaching**

This process requires the most thought and planning. Peer teaching works best when you have developed relationships with your students and created an environment in which they feel safe. As you think about using peer teaching, reflect on the following:

- How well do my students relate to each other at this point in the school year?
- Do my students know how to achieve our common goals?
- Are students showing evidence that they are learning the material?
- Am I already providing collaborative learning opportunities to allow the students to learn how to build and maintain collaborative relationships?
- Are the students open to learning new ways of learning?

Use the following guide to help you get started.

<table>
<thead>
<tr>
<th>What to Do</th>
<th>Why Do It?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observe students in small groups or pairs.</td>
<td>Identifies those students who feel comfortable in a lead role and those students who are in need of assistance.</td>
</tr>
<tr>
<td>Create new pairs or groups of students based on observations.</td>
<td>Employs the best-case scenarios for identifying qualified peer teachers.</td>
</tr>
<tr>
<td>Meet with students who are identified as peer teachers.</td>
<td>Provides an overview of what to do during a peer-teaching session, why it is important, and how it will help.</td>
</tr>
<tr>
<td>Determine the content areas and process skills you want students to learn and how they will be implemented.</td>
<td>Narrows the focus for the peer teachers so they do not feel overwhelmed.</td>
</tr>
<tr>
<td>Help peer teachers design the lessons/activities.</td>
<td>Provides peer teachers with materials and involves them as co-creators of the learning; provides a timeframe for the lesson.</td>
</tr>
</tbody>
</table>

Perhaps the most important aspect of starting the peer teaching process is helping peer teachers design the lessons/activities. Think about small group activities that will not overwhelm the peer teacher.
Another important component of working with peer teachers is addressing non-content related issues:

- How can you gently correct students who are making mistakes without making them feel criticized or rejected?
- What are the best ways to provide positive feedback?
- What are the most effective ways to make all students in the group feel comfortable?

**Games**

One way to introduce students to the peer teaching strategy is to have the peer teacher play an educational game. This activity makes learning enjoyable and helps students feel more comfortable being taught by a peer. More information on games can be found in the chapter on games as a strategy. The following is an example from an elementary math class:

1. The peer teacher provides students with a three-column Table labeled as follows: Numbers Rolled, Sum, and Difference.

2. Students take turns rolling the dice. Depending on how many students are in the group and how much time is allotted, each student might be given the opportunity to take two or three turns.

3. For each pair of numbers, all students record the numbers rolled and write the correct equations for each sum and difference. The object of the game is to write as many correct equations as possible.

<table>
<thead>
<tr>
<th>Numbers Rolled</th>
<th>Sum</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 6</td>
<td>1+6=7</td>
<td>1-6 =-5</td>
</tr>
<tr>
<td></td>
<td>6+1=7</td>
<td>6-1=5</td>
</tr>
<tr>
<td>4, 3</td>
<td>4+3=7</td>
<td>4-3=1</td>
</tr>
<tr>
<td></td>
<td>3+4=7</td>
<td>3-4=-1</td>
</tr>
</tbody>
</table>

4. The peer teacher records the correct answers each time the dice are rolled. After a specified number of rolls, the peer teacher reads all of the correct equations aloud. The group members submit the number of correct equations to the peer teacher and the winner(s) is crowned.

5. From this activity the peer teacher should have a good idea about who needs remediation or re-teaching. He or she should report observations to the classroom teacher and come up with new strategies for future lessons and activities.
**Writing Round-Up**

This technique is designed for students who have been given a writing assignment.

1. Explain to the group that Writing Round-Up is about sharing work with other students. Agree upon guidelines that students will use to review and edit each paper, such as staying neutral and providing timely and appropriate feedback in a positive manner. Remind students that this is a review and edit process and should not be nasty or hurtful.

2. Assign the peer teachers to one or two students and inform the peer teacher that he or she will act as the facilitator. Allow students ample time to review and edit.

3. Circulate around the room as students review and edit to ensure that the critiques are fair and objective.

4. Allow students to take home their assignments to polish them up before they turn them into you for a grade.

**Presentations**

Remind students that creating a presentation is one of the best ways to teach others. The following example is from a social studies class.

1. Give each group of students a topic to research and present to the class. For example, if the class is studying the Civil Rights Movement, students may research high-profile people such as Martin Luther King, Jr. Provide students with specific names or areas of interest.

2. Students research the topic and find pertinent information. They discuss and agree upon the best way to explain and present the information to other students. Encourage the use of technology and visual aids. In addition, encourage students to use resources other than their textbooks. Remind students that they will need to cite all of their sources.

3. Provide students with a deadline for submitting the first draft of their presentation. Decide whether their first draft needs corrections or suggestions. Give students time in the classroom to plan their presentation so that you can monitor their progress and provide specific and timely feedback.

4. On the day(s) of the presentations, set ground rules for respectful behavior. Give each group a specific amount of time for their presentation, and assign a student to be the timekeeper.

5. After each presentation, give students time to reflect. Build in time for a question-and-answer session and tell students to brainstorm ideas and questions for the group who presented.
Small Group Instruction

- Give students an overview of a topic and provide each group with specific tasks. For example, give students the topic of the four seasons and ask them to come up with at least five questions about it. This brainstorming helps students learn from each other and also allows the teacher to assess prior knowledge. Students become more actively engaged in the learning process. Assign one student to be the group reporter and have him or her share the group’s ideas with the whole class. Assign another student to be the recorder for the whole class.

- Discern if students are creating relevant questions or if they need to be guided in a more specific direction. After the whole-group sharing is done, ask students to return to their groups and do more in-depth research about the topic. Remind them that they can use a variety of resources.

- Take the role of lead teacher and consolidate the information shared in the small groups. Use at least one idea from each group so that all students feel that they have made a contribution. Thank students for their hard work.

Peer Teaching: Strengths

Some strengths of peer teaching are as follows:

- Creates a rich cache of lessons to be used in the future
- Develops interpersonal and collaborative skills
- Facilitates a shared responsibility of teaching among students and the teacher
- Improves student confidence
- Improves retention skills and recall of information
- Provides students with ways to use their creativity
- Strengthens communication skills
- Strengthens problem-solving skills
- Peer Teaching: Challenges
- Some challenges of peer teaching are as follows:
- Individual learners might feel uncomfortable not having the "real" teacher facilitate the lessons and activities.
- Not all students who are initially identified as peer teachers turn out to be effective.
- Students might act more negatively because they do not receive direct consequences for negative behaviors from their peers.
- There might not be enough students who understand the content well enough to be considered a peer teacher.
Teaching Younger Students

Students who demonstrate a love of learning and a good command of a subject are good initial candidates for teaching younger students. Since many older students have younger brothers, sisters, or neighbors, most have some experience with being a teacher. When you decide to employ the strategy of teaching younger students, ask the selected students to reflect upon their knowledge of younger learners and their previous experience. The following are some guiding questions:

- With what age range of children have you worked?
- With what age range are you most comfortable?
- What subject do you think is most important to teach to younger learners? Why?
- What subject are you most comfortable teaching? Why? Describe how you would implement one lesson in this subject area.

Read through your students' responses and then have them write a description of younger students. If students have no experience directly working with younger children, ask them about friends, neighbors, or other relevant information they might possess. If students do have experience, ask them to identify the key characteristics they have observed. To help students learn compassion and empathy, ask students to reflect upon how they feel and what they think when they are in the position of learning something new. Remind them that these thoughts and feelings will be similar to the thoughts and feelings of the younger

What Skills Are Necessary to Help Younger Students Learn?

Older students have the charge of being the "expert other", so helping students prepare for teaching younger students should focus more on process skills than content knowledge. One such skill is communicating with younger students.

Younger students, especially those in primary grades, are particularly intuitive and can pick up on more non-verbal communication than most people realize. Guide your students to reflect on their communication styles, both verbal and non-verbal.

While the most successful students in your class may be obvious candidates for teaching younger students, remember that one result of teaching others is a deepened knowledge of the subject matter. Students who enjoy the challenge and opportunity to work with younger students often become more optimistic and confident students by growing in their knowledge of the subject matter and affirming how much they have learned. For example, a high school student who struggles with reading and lacks confidence may realize how much he or she knows when challenged to read with or to younger students. The student builds on proficiencies rather than focuses on deficiencies.
Another important skill for students to possess when working with younger learners is patience. Younger learners are typically more physically active and less able to concentrate for long periods of time. Students should create a learning opportunity that covers a variety of learning styles and has short, meaningful activities. Once you and your students make decisions about areas of content, keep in mind the following key ideas when creating lessons:

- Appropriately challenge students without being intimidating.
- Know the background knowledge of the students.
- Build on prior knowledge of the students.
- Be aware of the multi-sensory learning styles of the students.
- Make lessons fun and purposeful.
- Trade off active participation and listening. (When children become restless, be prepared to do something active.)

Students selected as peer teachers show evidence that they are learning the material.

I already provide collaborative learning opportunities to allow the students to learn how to build and maintain collaborative relationships.

Students show that they are open to learning different ways of learning.

I identify those students who feel comfortable in a lead role and those students who are in need of more assistance.

I consistently meet with students who are identified as peer teachers.

I provide an overview of what it means to be a peer teacher—what to do during a peer teaching session, why it is important, and how it will help.

I provide peer teachers with specific materials and involve them as co-creators of the learning.

I provide a timeframe for each lesson and help peer teachers with time management of the session.

Students demonstrate respectful behavior toward the peer teacher and each other.

Students identified for teaching younger students submit a reflection about previous experience.

Students show a positive attitude toward teaching others or teaching younger students.