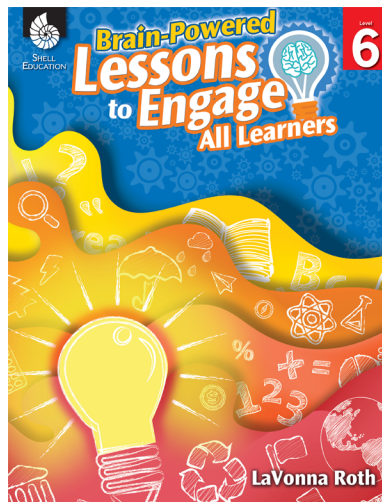# SHELL EDUCATION

Sample Pages from

Brain Powered Lessons to Engage All Learners
Level 6

The following sample pages are included in this download:
- Table of Contents
- Introduction excerpt
- Lesson plan

For correlations to Common Core and State Standards, please visit http://www.teachercreatedmaterials.com/correlations

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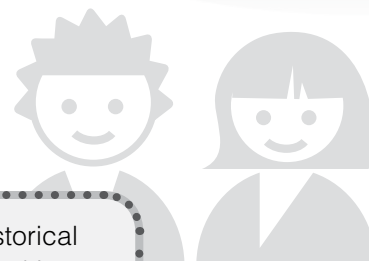
In this strategy, students compare and contrast two topics (e.g., stories, historical figures, types of clouds and shapes) using a T-chart and sticky notes. The goal is for students to analyze each topic and create a chart that represents their thinking. Thereafter, another group of students will evaluate whether it agrees with the original group's thoughts or, if not, if it is going to propose another way to think about the topic. The goal is for students to be able to think at a higher level by justifying either what each sticky note says and where each one is placed or if it qualifies to be on the T-chart at all.

Strategy Insight

Organization and thinking critically are key components in this strategy. Since we organize ideas in our brains systematically and create a neural pathway as more modalities are used, students increase their learning by seeing the information, sorting through what is important, organizing the facts by what is similar and what is different, and adding another level of value through student interaction (Van Tassell 2004). Each of these components plays an integral part in student engagement and retention (Covington 2000). It is another way for students to work with content at a level that is minds-on and hands-on.

Using sticky notes during this activity is important (as opposed to recording the similarities and differences on a sheet) because students' thinking will shift as they discuss and learn more. The sticky notes allow the graphic organizer to become manipulative, and it is a new way for them to see if they agree or disagree with their classmates and adjust accordingly.

Teacher Notes

◎ It is imperative that teachers observe during all stages of the lesson. This provides the feedback we need to determine the next direction of instruction. In addition, it allows an opportunity to guide students in their thinking, as some may struggle with concepts at a higher level. **Note:** Do not guide too much. A large part of learning is struggling through the process with a small amount of frustration but not so much that students give up.

◎ During discussions, students will likely discover that there can be more than one answer. That is where collaboration and cooperation pay off.

◎ For younger students, reconvene as a whole group and model the evaluation steps, using one group's chart.

Show It with Dough!
Strategy Overview

Our brains recall pictures quite well. This phenomenon is called the *Pictorial Superiority Effect* (PSE) (Medina 2008). Simply put, the brain grasps pictures and can recognize and recall a picture with far less effort than it takes to recall text.

Through the use of dough sculptures, students think about a concept and make a three-dimensional representation, often moving from abstract to concrete ideas. This is a higher-level skill since it requires extended thinking to represent something in a new way (Bloom 1956).

Strategy Insight

Many concepts we teach are quite abstract, particularly as students progress in grade levels. This strategy often requires students to visualize the concept on a concrete level rather than an abstract level. Thus, this strategy is at a higher level because students are being asked to demonstrate their learning in a new way. Additionally, we are asking students to connect their visual representations to what they already know; therefore, we also incorporate activating prior knowledge and experiences, which in turn ties in to something personal. This strategy can also impact other content areas and allows students the opportunity to use their creativity in an expressive way.

Teacher Notes

◎ Walk around as students create their sculptures and ask them to think about what they are making and why. Consider doing this very quietly so others do not hear what they are creating, or use written communication.

◎ Place student sculptures on cardboard so they are easy to move or display.

◎ After students add more detail to their sculptures and write their stories, display them where others can enjoy them.

I'm in the Pic
Strategy Overview

I'm in the Pic is a strategy that targets various modalities for storage of memory in the brain. The more students can experience this strategy the better, because each of our senses is stored in different regions of the brain (Medina 2008). The way we learn the information dictates where much of the memory is stored and connected.

We can compare using our senses and experiences to when you learned how to ride a bike. Try to recall the approximate time of day and location of that first bike-riding experience. This is called *episodic memory*, as it refers to an event (or an episode) in your life (Sousa 2006; Sprenger 1999). Your episodic memory deals with time and location. Now, let us add emotion to this memory. As you learned to ride, you experienced movement and wind blowing in your face.

However, providing actual sensory experiences for all content is not always possible. So try engaging students' senses through a *relational memory*. According to Willis (2008), relational memory is the process of connecting new experiences to something we already have in our stored memory. For example, you can connect the feeling of the wind in your face while riding in a car with the windows down to the feeling of the wind blowing in your face while riding a bike.

Strategy Insight

Students are shown a picture and then asked to imagine that they are in the picture. They are asked to describe what they see. When teachers are working with students on this skill, they should keep asking, "What else do you see?" This reminds students to pay attention to detail. Since paying attention is a skill that has to be taught, teachers can work with students by giving them practice that is engaging, particularly if they choose pictures that are colorful, unusual, close up, or intriguing (Jensen 2006). The right brain creates the gist, or context of experiences, and the overall meaning of events (Siegel 2001). As students pay attention to the details, the teacher should be prepared to be amazed at what students can pick out! The teacher can continue the strategy by asking students to consider what they might touch, hear, smell, or taste. If students say, "I think it would sound loud" when looking at a picture of a busy city with cars bumper-to-bumper, then the teacher can ask, "What do you see that supports your thinking?" It is beneficial for students to do the thinking and articulate the reasoning behind their thinking. The goal is to increase engagement, improve their attention to detail, tap in to the emotions of what it would be like to be in the picture, and use multiple senses to help remember.

Teacher Notes

◎ At the start of the lesson, use a picture that is engaging and one that students have experience with as you walk through the process.

◎ Understand that modeling is required for students to learn how to identify background knowledge, relate it to what they know, or imagine the experience of what it would be like to be "in" the picture.

Response Cards
Strategy Overview

This strategy allows the teacher to receive a response from each student within a short time frame, and it provides the feedback you need to drive instruction. Once students have responded, they discuss their thinking with a partner. This is the teacher's opportunity to listen in on their conversations. If they got the answer right, was it for the right reason? If it was wrong, where did their thinking go astray?

Post higher-order thinking question stems around the room. Teach students how to use these stems to ask questions. If teachers want to raise the level of inquiry and understanding, students need the resources to do so, which include modeling how to ask a question that taps into thinking and then allowing them to question (Hunter 1993). By doing this, students become more metacognitively aware by figuring out the connections they made (Baker 2009). What did they know beforehand that helped them connect the question asked to their response? If they were struggling between two answers, what were they thinking that caused them to choose one answer? Another great technique to encourage depth of thinking is to ask open-ended questions, such as *Why?* or *How do you know?* (Sprenger 1999; Willis 2006). When students provide an answer followed up by *why* or *how do you know*, their initial reaction may be that they are wrong, which sends them into a thinking mode to figure out where they went wrong. Share with students that they may not be wrong; encourage them to think their answers through.

Strategy Insight

Response Cards are an alternate way to formatively assess students' thinking without using whiteboards. Since our brain's attention piques with novelty, Response Cards allow students to give teachers feedback in a different way. Students think independently, respond, and then show their answers. Students receive premade Response Cards that have answers on them, or older students can write the answers themselves. Answers on the Response Cards should be written in the same location so they can quickly be seen and checked for accuracy.

When students share their answers, it is important they justify their thinking. This allows them to make connections and take the strategy to a higher level. The teacher should listen to students as they talk with others to see if their thinking is correct. This gives the teacher an insight into students' thinking. Plus, knowing they hold them accountable helps with classroom management.

Teacher Notes

◎ When students share their thinking with partners, it is important to listen in to see if there are any misconceptions or to find out who is struggling with the concept.

◎ Encourage students to know it is acceptable to question authority in a respectful manner. Just because something is said by an authority figure does not mean it is always right.

Matchmaker
Strategy Overview

The importance of movement and having students get up out of their seats cannot be emphasized enough. Thus, here is another strategy that allows our students to do so. *Matchmaker* also provides students an opportunity to get repeated practice in an environment in which the repetition is guided and correct. This means that when students practice repeatedly, the likelihood of recall increases. A key factor here is that it must be correct practice. When students do this activity with one another, they are getting a chance to see repeated practice with automatic feedback provided about whether they are correct or not.

Strategy Insight

Every student is given an address label to wear. Each label is a vocabulary word, a concept, a formula, etc. On index cards are the matching definitions, illustrations, examples, synonyms, etc.

Students wear the address label and stand in a circle with the index cards on the floor in the middle. Students hold hands and bend down to pick up an index card with their connected hands. Without letting go, they have to get the card they picked up to the correct person, according to his or her address label. This strategy can be repeated as many times as you wish to help students practice.

Teacher Notes

◎ An alternative to this is for students to not hold hands when they pick up a card. However, energy and engagement increase with the added challenge of holding hands and not letting go.

◎ Be sure to listen in and encourage students to discuss disagreements or to have them respond to a reason why a particular card goes with another card.

Just Say It
Strategy Overview

Working together and hearing thoughts and language are beneficial to all learners, but can be especially beneficial to English language learners. *Just Say It* permits students to not only use what they have read, written, or heard but have a chance to use listening skills for the content as well. A challenge layer to this strategy is having students hold back on a response for a period of time. This allows the other student to say what he or she needs to say before the other student inflicts his or her opinion or factual information upon them. It teaches the skill of patience, listening, and being open to others' thoughts at the same time.

Strategy Insight

Students are to respond to their partners, providing feedback and information on a given topic (e.g., a writing prompt, thoughts, an idea). Have students sit facing their partners (sitting at desks is preferable). Identify Partner *A* as the person closest to the front of the room and Partner *B* as the person closest to the back of room. Have Partner *A* start. Partner *A* shares his or her thinking with Partner *B* as Partner *B* only listens for 30 seconds. After 30 seconds, Partner *B* responds to Partner *A.* They then switch roles—Partner *B* shares while *A* listens. Then *A* provides insight or feedback. Students should record (during or at the end) what their partners say for further consideration, and use that to write about the topic.

Teacher Notes

◎ You may wish to shorten or lengthen the time each partner has, depending upon the topic and age.

◎ Using a timer, a train whistle, or a bell is a great way to help partners know when to switch, since conversations may get lively or partners may tune out other nearby sounds.

Reverse, Reverse!
Strategy Overview

Reverse, Reverse! is meant to be a challenging strategy. When students are under stress, there will often be not only a chemical but a physical change in the brain. Students must learn the skills to deal with stress, but in a safe and friendly environment. In this strategy, students will practice the speed and fluency of facts, but they will do so under pressure—a pressure that you can adjust or increase, depending upon the topic and age level of your students.

Strategy Insight

Students sit or stand in a circle. They are given a topic and asked to brainstorm what they know about it. One student begins by sharing a fact about the topic. Going clockwise, the next student must quickly say another fact related to the one just stated. If the student pauses more than five seconds or states an incorrect fact, the student that just finished must state the next fact (reversing the direction of participation). One student sits out to judge the facts and make sure rules are followed. Continue until participation stalls. For example, a math activity using this strategy can include counting by threes. The first student says, "3;" the next student says, "6;" the next says, "9." If the following student says, "13," the rotation reverses to the previous student, who must say, "Reverse," and must also say the correct answer, "12." The responses are now going counterclockwise. An example of using this strategy in social studies can include the three branches of government. The first student might say, "Legislative branch;" the second says, "Makes the laws;" the third student says, "Congress;" and the fourth says, "Checks and balances." The judge (student sitting out) can halt the flow to ask how the response relates to a previously said fact. If justified, the round continues. *Reverse, Reverse!* continues until a predetermined amount of clock time or number of times around the circle has been met.

Teacher Notes

◎ It is important to set the stage for students to feel safe when using this strategy. You may wish to take out the reverse portion at first and work on just the speed. Add the extra layer of difficulty for novelty and time-pressured practice.

◎ For younger students, you may choose to not have the next student say, "Reverse," but instead state the correct fact.

Express Yourself

![brain icon] **Brain-Powered Strategy**	🖩 **Standard**
Kinesthetic Word Webs	Identify parts of an expression using mathematical terms

Vocabulary Words

- coefficient
- expression
- operation
- variable

Materials

- *Math Term Definition* (page 36)
- *Math Term Cards* (pages 37–38)
- *Math Term Web* (mathtermweb.pdf)
- *Terms Used in Math Expressions* (page 39)
- construction paper
- dictionary or textbook glossary
- chart paper
- highlighters
- index cards

Preparation Note: Prior to the lesson, cut apart the *Math Term Cards* (pages 37–38). Additionally, on a sheet of construction paper, write *Main Topic Title Card*. You may wish to print out the mathtermweb.pdf from the Digital Resource CD or have students recreate it in their groups for Step 10.

Procedures

Model

1. Divide students into five groups, and assign each group one of the following terms: *coefficient, expression, operation, variable*.

2. Distribute the *Math Term Definition* activity sheet (page 36) to each group, and have students look up the definition of their assigned terms in a dictionary or a textbook glossary. Ask students to create examples that illustrate their terms.

3. Allow each group to share its definition and example with the class, and record the information on chart paper. Connect each word and definition to the main topic *Terms Used in Math Expressions* by drawing lines to create a visual web.

Apply/Analyze

4. Distribute a *Math Term Card* to each student. You may wish to use the enlarged versions of these cards found on the Digital Resource CD (filename: mathtermcards.pdf). Explain the *Kinesthetic Word Webs* strategy. (For detailed information on this strategy, see page 12.) Have students walk around the room and find students with cards that relate to their cards. These cards may be related words or definitions.

5. Once a group of students has found all of the related words, with no duplicates, have students form a *Kinesthetic Word Web*. There should be three separate *Kinesthetic Word Webs*, one for each set of cards.

Express Yourself *(cont.)*

6. Discuss how each web has three layers (main topic, key vocabulary, definitions).

Evaluate/Create

7. Collect all of the *Math Term Cards*. Remove several of the cards. Replace them with wild cards (blank index cards).

8. Repeat Steps 4–6. Have students with wild cards write examples, definitions, or nonexamples on their cards and join the appropriate webs. Those with nonexamples may choose to stand near the groups for which they are nonexamples or across the room to show that they do not belong at all.

9. Debrief with the following questions:

- How did you decide which group to join or not join?

- Was it easier or harder with some of the blank cards? Why or why not?

- What terms or examples can you add?

10. Using the same groups from Step 1, assign each group a different vocabulary word. Have students recreate the web below on a separate sheet of paper, or you may wish to distribute the *Math Term Web* activity sheet found on the Digital Resource CD (filename: mathtermweb.pdf) to each group. Have students complete the web as a group.
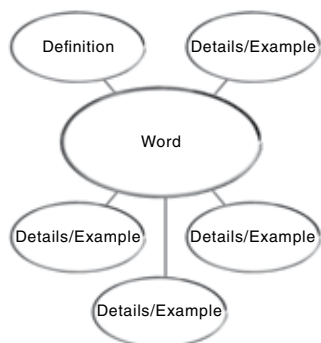
11. Distribute a set of blank index cards to each group, and ask students to record the content from each oval on their webs on separate index cards.

12. Collect all of the index cards and randomly redistribute them, one to each student. Have students walk around and find other related cards. Tape the construction paper titled *Main Topic Title Card* to a chair in the center of the room. Have students form a class *Kinesthetic Word Web* with the main topic in the center.

13. Distribute the *Terms Used in Math Expressions* activity sheet (page 39) to students. For each vocabulary word, have students create a sample mathematical example and circle or highlight the term representing each vocabulary word in the example.

14. Create a math word wall in the classroom and display the words, their definitions, and students' examples on the wall. Encourage students to add to the word wall and use it as a reference source in future lessons.

Name: _____   Date: _____

Math Term Definition

Directions: Write your assigned math term in the first box, and write the definition of the term in the middle box. In the last box, write an example of how this term is used in mathematics.

MATH TERM:

DEFINITION:

EXAMPLE:

Math Term Cards

Teacher Directions: Cut apart the cards below and randomly distribute one to each student.

numbers, symbols, and operations grouped together to show the value of something	**expression**
a mathematical practice such as addition, subtractraction, multiplication, and division	**operation**
a symbol for an unknown number in an expression	**variable**

Math Term Cards *(cont.)*

a number placed before a variable; it is multiplied by the variable
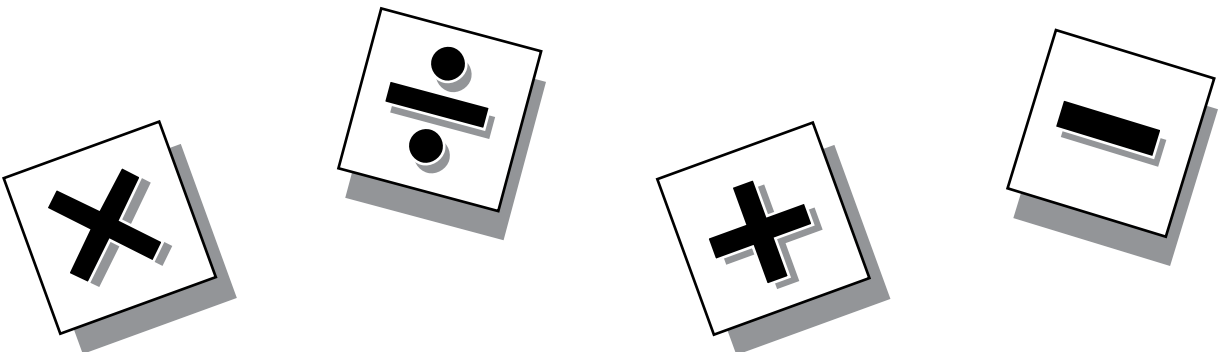
coefficient

Terms Used in Mathematical Expressions

Name: _____ Date: _____

Terms Used in Math Expressions

Directions: For each term listed below, write two mathematical examples containing the term. Circle or highlight where each term is represented in the example.

Term	Example
expression	
operation	
variable	
coefficient	

Name: _____ Date: _____

Before, During, and After

· ·

Directions: Write your assigned topic on the line below. Research your topic, and record notes in the appropriate boxes below.

Topic: _____

After World War II	
During World War II	
Before World War II	