Explicit Instruction for Mathematics Vocabulary

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Characteristics of Effective Vocabulary Instruction

- More than copying words and looking up definitions
- Unambiguous and contextual
- Multiple exposures
- Active engagement

Explicit Vocabulary Instructional Routine

1. Introduce the word and enter in Vocabulary Log
2. Introduce the meaning of the word
   - Student-friendly explanation
   - Determine critical attributes
3. Illustrate with examples
4. Verify students' understanding
   - Students distinguish between examples and non-examples
   - Students generate examples
   - Students show they know how to use the word

Four-Column Organizer for Word Mastery (Leno & Dougherty, 2007)

Word	Definition	Connect	Visual
malleable	Capable of being pounded or rolled into thin sheets without shattering		
brittle	Likely to shatter or break into pieces when pounded		
electrical conductor	Matter that allows electricity to flow through it easily		
insulator	Matter that does not allow electricity to pass through easily		
luster	The way matter reflects light from its surface. Can be shiny or dull.		

Student-friendly explanations

1. Contain known words
2. Indicate how word is used

- *Attention*
  - **Non-Example**: (1) The act or state of attending through applying the mind to an object of sense or thought. (2) A condition of readiness for such attention involving a selective narrowing of consciousness and receptivity.
  - **EXAMPLE**: When you give something your attention, you look or listen carefully

Examples/Non-examples

(Beck, McKeown, & Kucan, 2008)

- Students determine if statements represent example of target word and explain choice to a partner.
- Materials
  - Teacher-generated example statements
- Sample variation 1
- "If I say something that sounds **precarious**, say "precarious" when I give the signal. If not, don't say anything."
  - "Walking over a rickety bridge that goes over a deep canyon."

Students respond chorally

- "Now, 1s tell 2s why that statement showed precarious"

Partners explain, and teacher calls on one person to report out.

Examples/Non-examples
(Beck, McKeown, & Kucan, 2008)

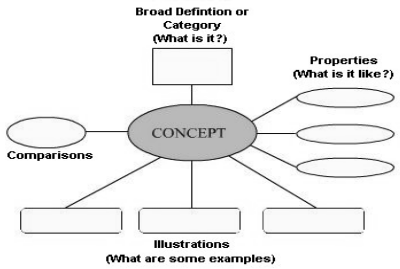
- Sample variation 2
  - "2s tell 1s which would make you scream **frantically**: a kitten purring or a rattlesnake rattling?

  Partners respond and explain; teacher calls on a 1 to report out.
- Sample variation 3
  - "Would you want the people who cook the school lunch to be **versatile** or **frugal**? Everyone?"

  Students respond chorally
  - "1s tell 2s why you want them to be versatile?

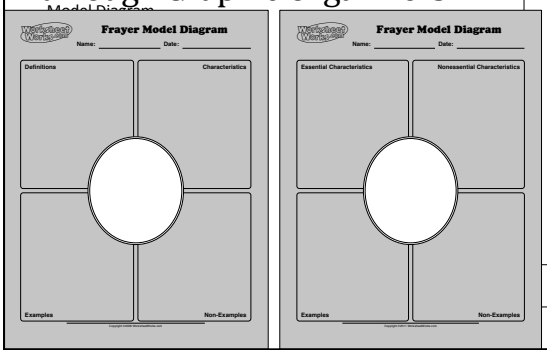
Students generate examples through Graphic Organizers

- Concept of Definition Map



Students generate examples through Graphic Organizers

Model Diagram



Dramatic Movement
(adapted from Alber & Foil, 2003)

- Kinesthetically "act out" the meaning of target words
- Teacher-demonstrated or student-generated
- Procedure
  1. Place target words in a hat/bow
  2. Student select word
  3. Act out (i.e., pantomime) meaning
  4. Other students guess what is being acted out
- Sample
  - "deciduous"
  - Student pantomimes being a tree with arms out, fingers spread. To show season change, sway back and forth, hands fluttering down to the floor. Then, stand tall with hands in fists.

Wordo
(Rasinski, Padak, Newton, & Newton, 2007)

- Vocabulary version of Bingo
- Materials
  - List of 16 words
  - Wordo card for each student/pair
- Procedure
  1. Write words on board
  2. Students may choose a FREE space on Wordo card, then write words randomly in remaining boxes
  3. Call out clue for each word
     - student-friendly explanation, synonym or antonym, sentence with target word missing
  4. Students mark answers on sheet with pens or removable pieces
  5. Winner gets four in any directions, becomes caller for next round

Odd Word Out
(Rasinski, Padak, Newton, & Newton, 2007)

- Students select word that is dissimilar from group and explain why it doesn't fit the group
- Materials
  - Teacher-generated worksheet
- Sample
  - A worksheet would include variations on this for all words being reviewed

Odd Word Out

Look at the four words. Write the word that doesn't belong on the line. Then write how the other words are the same.

premature
premed
premixed
prenatal

The word that doesn't belong is _____.
The other words are the same because
_____

Semantic Feature Analysis

(Pittelman, Heimlich, Berglund, & French, 1991)

- Link students knowledge with target words that are conceptually related
- Materials
  - Matrix for each student with words from the reading/unit
- Procedures
  1. Project matrix with vertical list of target words down left side
  2. Students suggest features to be written across top row
     - Teacher could have these filled out in advance
  3. Students complete matrix with a symbol for features that apply to each word
- Sample on next slide

SFA for ENERGY

(adapted from Richardson, Morgan, & Fleener, 2012)

A = Always applies **S = Sometimes applies** **N = Never applies**	**Renewable**	**Nonrenewable**	**Nuclear material**	**Naturally occurs**	**Manmade**	**Conservable**	**Pollutant**
Uranium^{235}							
Hydrogen							
Biomass							
Geothermal							
Hydroelectricity							
Wind energy							
Passive solar heat							
Active solar heat							
Oil							
Coal							
Natural gas							

SAFMEDS (Adapted from Graf, 2000)

- S – Say
- A – All
- F – Fast
- A – A
- M – Minute
- E – Each
- D – Day
- S – Shuffled

SAFMEDS are like flashcards:

- Text on both sides of card
- Learner sees what is on front of card
- Learners says what is on the back
- Use frequently to improve both speed and accuracy

SAFMEDS example Card

Front of Card

- The combination of speed and accuracy is _____ .

Back of card

- Fluency

Using SAFMEDS (Adapted from Eshleman, 2000)

1. Before starting, SHUFFLE the deck of cards
2. Feel free to STUDY cards before a timed session
3. Set timing sessions for 1 minute
   - You can time how long it takes to get through the entire deck, but repeatedly doing 1-minute timings is standard
4. The learner holds the cards
5. Set a timer and begin
6. For each card, SEE what is on front of card, then SAY what is on back out loud before turning it over
7. Place correctly answered cards in one stack, errors in another
8. Chart the number correct per minute
9. In general, top performance equals 50 terms stated correct in a minute

FIGURE 3.3. Math concept: Use of examples and non-examples.

Setting: Eighth-grade geometry
Situation: Vocabulary Instruction

Step 1: Introduce the word. (I do it.)

[Teacher displays the word.] This word is *chord*. What word? *Chord.*

Extensions—Multiple-meaning words: Introduce other familiar uses of the word.

You probably have heard the word *chord* in the past. In music, it is a group of three or more notes that are sounded together. For example, if you were playing piano, you might play three notes with the same hand at the same time. The group of notes would be a _____. *Chord.* On a guitar, the musician might press three fingers onto three different strings on the neck of the guitar to create a _____ *Chord.* In geometry, *chord* has an entirely different meaning.

Step 2: Introduce the meaning of the word. (I do it.)

Option 3. Have students determine the critical attributes embedded in a glossary definition. Please locate the word *chord* in the glossary. [Teacher monitors.] Read the definition with me: *A chord is a line segment whose endpoints lie on a circle.* Record the word *chord* in your vocabulary log. [Teacher monitors.] Let's break the definition into the critical attributes. First, a *chord* is a _____. *Line segment.* We know that a line segment is straight. Next, the endpoints of the line segment lie on a . *Circle.* Please list the critical attributes under the word.

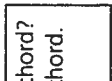
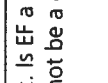
[Students' logs should be similar to this:]

chord
- *line segment*
- *endpoints lie on circle*

Step 3: Illustrate with examples and non-examples. (I do it.)

	The line segment AB is a chord. It is a line segment, a straight line with two endpoints, and the endpoints lie on a circle.
	The line segment CD is a chord. It is a line segment, and its two endpoints lie on a circle.
	The line segment EF is not a chord, because endpoint E is not on the circle.
	The line segment GH is not a chord, because only endpoint G lies on the circle.

Step 4: Guide students in analyzing examples and non-examples, using the critical attributes. (We do it.)

	Is AB a line segment? *Yes.* Are the endpoints on the circle? *Yes.* Is AB a chord? *Yes.*
	Is CD a line segment? *Yes.* Are the endpoints on the circle? *No.* Is CD a chord? *No.* Yes, even though it is a line segment, the endpoints are not on the circle.
	Is EF a line segment? *No.* No, it is not a line segment since it is not a straight. Is EF a chord? *No.* Correct. Remember, if either of the critical attributes are missing, it cannot be a chord.
	Is GH a line segment? *Yes.* Are the endpoints on the circle? *Yes.* Is GH a chord? *Yes.*

Step 5: Check students' understanding. (You do it.)

Option 2. Have students generate examples and non-examples. Please take out your slates. Draw a circle on your slate. Add three chords. Label them AB, CD, and EF. [Teacher monitors as students draw a circle with three chords.] Please check your partner's drawing. Be sure that all three lines are chords. [Teacher continues to monitor.] Hold up your slates. [Teacher examines slates.] Erase.

Now draw a new circle on your slate. Draw three new lines that are not chords. Label the lines AB, CD, and EF. [Teacher monitors as students draw three lines that are not chords.] Everyone, hold up your slates. [Teacher examines slates.] Ones, explain to your partner why each of your lines is not a chord. Twos, explain to your partner why each of your lines is not a chord.