

ASCCC Instructional Design and Innovation Institute 2017
Julie Land, El Camino College, Session Facilitator

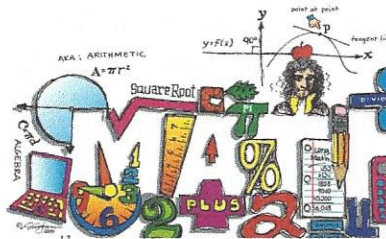
Using Movement with Math Word Problems

Workshop participants will receive math word problems containing phrases which students have found especially challenging. Participants will be invited to experience the movement activities used in the El Camino College Special Resource Center's "Educational Development 38: Increased Learning Performance: Mathematics," i.e., movement to facilitate understanding and retention.

The purpose of the activity is to facilitate the following:

1. "Translation" from verbal language to the correct symbolic language
2. Appropriate placement of symbols
3. Identification of appropriate procedure and order of operations
4. Student engagement and collaborative learning
5. Memory enhancement
6. Transferable skills, incl. self-monitoring

While no one teaching method can be guaranteed, movement, which seems to be somewhat underutilized in college classes, may be a very effective tool for teaching elusive concepts. Today's examples have been well received by students from a wide variety of cultural backgrounds and ability levels. Thank you to all participants for being open to these suggestions and for sharing your own ideas on using movement as a teaching tool.



Distance, Rate, & Time Problems

(Using Color & Movement to Help You Recall the Formulas)

The formula **Distance = Rate x Time** expresses one of the most frequently used relationships in mathematics. Master this set of formulas to boost your problem-solving confidence, accuracy, and speed.

1. To find the **distance**, multiply the **rate** by the **time**.

Sample problem: How far (what **distance**) can the cross country team run in 4 hours (**time**) at the **rate** of 6.5 miles per hour? Formula: **d = rt**

2. To find the **rate**, divide the **distance** by the **time**:

$$\text{Rate} = \frac{\text{Distance}}{\text{Time}}$$

(Note: **Distance** is on top.)

Rate is **distance** (miles, feet, kilometers, etc.), divided by **time** (hours, minutes, seconds, etc.). **Rate** can be written as a fraction. The numerator (top part of the fraction) is the **distance**; the denominator (bottom of the fraction) is the **time**, as in **25mi./1hr**, or 25 mph (miles per hour). We divide the **distance** by the **time** to get the **rate** of speed, for example, how many miles per hour.

Sample problem: What is the **rate** of speed of a racecar which travels a **distance** 540 miles in 6 hours **time**? Show your answer as a fraction and in mph form.

3. To find the **time**, divide the **distance** by the **rate**:

$$\text{Time} = \frac{\text{Distance}}{\text{Rate}}$$

(Note: **Distance** is on top again.)

When using this equation, it's important to keep the **time** units alike. For instance, if the **rate** given in the problem is in miles per hour (mph), then the **time** must be in hours and the **distance** in miles. If the **time** is given in minutes, you may need to convert the minutes to hours (one hour = 60 minutes).

Sample problem: How long (how much **time**) will it take a horse to go a **distance** of 80 miles if it gallops at a **rate** of 10 miles per 30 minutes?



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Suggested Study Strategies for Students Based on Learning Style(s)

The following strategies have been compiled from a number of sources, notably from the High Tech Center Training Unit of the CA Community Colleges, known as HTCTU. Students are typically presented with this type of list following a learning styles assessment. Instructors may find the information helpful as they consider adding to their instructional approaches.

Visual Graphic (This learning style prefers pictures, charts, diagrams, color, shape, etc.)

- Make a map or flowchart of the information you need to learn, using arrows, circles, etc.
- Use software such as “Inspiration” to make a concept map (bubbles, lines, and pictures).
- Make flashcards for yourself with symbols and drawings.
- Use different color highlighters to identify the main idea and the supporting details.
- Put “sticky notes” with symbols and a few words in visible places: frig or bathroom mirror.
- Watch DVDs about the subject you are learning.
- As you take notes, allow yourself to draw images or symbols to represent what you’re hearing.

Visual Text (This learning style prefers to read words.)

- As you read, take notes and make an outline; review these frequently.
- Write a summary of the lecture or chapter, either by hand or on the computer.
- Make flashcards using key concept vocabulary and phrases.
- Send yourself text or E-mail messages to help you remember the important items.
- Use acronyms, such as “Please Excuse My Dear Aunt Sally” (PEMDAS) for the order of operations in math problems: Parentheses, Exponents, Multiplication, Division, Addition, Subtraction.
- Put “sticky notes” with key words and phrases in visible places: frig or bathroom mirror.
- Write and answer Q & A (questions & answers) based on the information you need to learn.

Auditory (This learning style prefers to hear the sounds of words, pitch, inflection, etc.)

- Sit near the front of the classroom so that you may listen more easily.
- Read the assigned chapter aloud; talk to yourself, as in, “Oh, I get it; this virus causes these diseases.”
- Record yourself reading aloud and/or record your summary of the chapter.
- Cue yourself aloud, as in, “Now I’ll start the essay assignment.”
- Create rhymes, tunes, or rhythms to help you remember information, formulas, equations, etc.
- Discuss the lesson with other students; form study groups and quiz each other aloud.
- Record the lecture using appropriate technology (as permitted or as an approved accommodation)
- Use “text to speech” tools, such as Read & Write Gold or K3000, if available to you.
- Talk your way through the steps of math problems; use talking “apps” to help you remember.

Kinesthetic or Tactile (This learning style prefers movement or touch.)

- ___ Participate in class as much as possible; pat your leg quietly as a reminder to pay attention.
- ___ Highlight or underline your textbook and notes in an energetic way.
- ___ Cut up materials and put them back together, such as a copy of a map or diagram.
- ___ Make flashcards and move them around in sequence on the table or on a vertical board.
- ___ Move your body or move around the room as you review flash cards or other materials.
- ___ Use chess pieces or other “manipulatives” to explain math, such as variables, or for adding and subtracting on both sides of the equation.
- ___ Walk yourself through the steps of a math problem.
- ___ Spell challenging words with Scrabble letters; use physical models for science classes.
- ___ Use wide masking tape & color markers on the floor to make timeline charts; walk on them.
- ___ Take breaks that involve physical activity.



Word Salad:

Complex Words = Roots + Affixes

A complex word is like a green salad, which usually has lettuce as its main ingredient or “root,” along with some tasty, colorful “add-ins” or affixes. For today’s activity, you will use one of the complex words listed on page 2, given to you on a word strip card. The reason for calling your word “complex” is that it has a root and one or more affixes. An affix before the root is a prefix; an affix after the root is a suffix. Enjoy!

Working in pairs or small groups, you will come up with the following:

1. Word Root, which may or may not be a complete word
2. Place or Language of Origin—probably Greek or Latin
3. Prefix (comes before the word root): the meaning of the prefix
4. Suffix (comes after the word root): the meaning of the suffix
5. Meaning of the Word: there might be more than one meaning
6. Original Sentence using the word

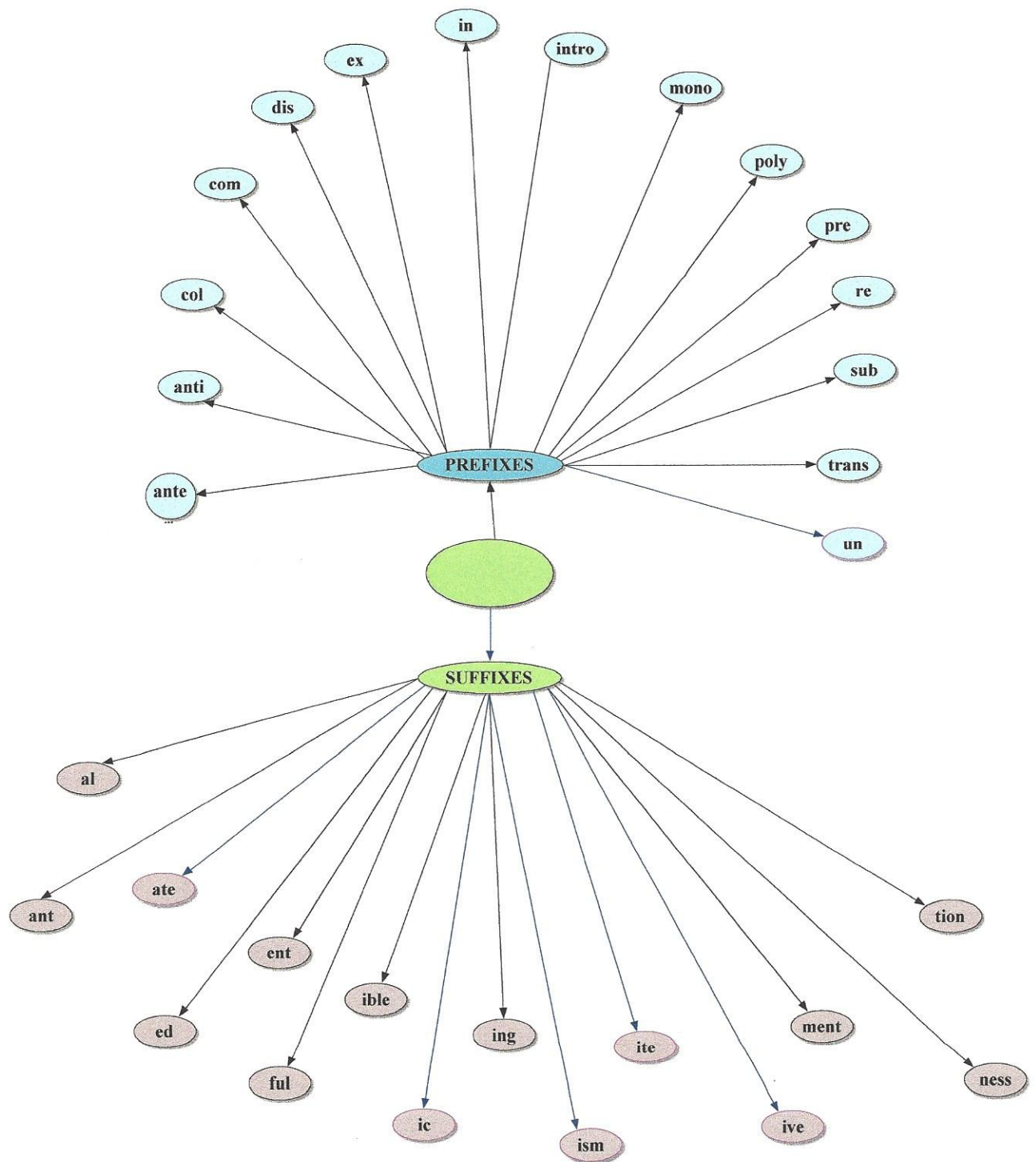
Each pair or group will then present to the class:

- a. Your word: first whole, then cut up into prefix, root, and suffix
- b. The rebuilt word: prefix / root/ suffix, using Inspiration Software
- c. Meaning of the word
- d. Your original sentence

Complex Words (alphabetical order, top to bottom)

Like a green salad, each of the following complex words is made up of a root and affixes. The root is underlined; the affixes (prefixes and suffixes) are on the next page. A prefix comes before the root of the word; a suffix comes after. On page 4, you'll find your small group assignment and suggested websites for word root definitions.

1. antecedent
2. antioxidant
3. collaborate
4. comportment
5. distasteful
6. expedite
7. inaudible
8. introspection
9. monotheism
10. polyphonic
11. preventive
12. resounding
13. subliminal
14. transacted
15. unfitness



Partnered Activity, Inspiration Software: 2—3 Students per Group

Websites: www.dictionary.com <https://www.learnthat.org/pages/view/roots.html>

Your group's complex word: # _____

Prefix: _____ Root: _____ Suffix: _____

a. Write the **prefix** and its meaning

prefix meaning

b. Write the **word root** and its meaning

root meaning

What **language** did the word root come from? (Find this on either website.)

Latin _____ Greek _____ Other (please write) _____

c. Write the **suffix** and its meaning

suffix meaning

C. Write an original sentence using the word your group was given.

D. What is another complex word which uses that word root? _____
(The websites listed above may help.)

E. Go to the Inspiration page, which has been pre-loaded for you. Put your word root in the center bubble. Drag the prefix and suffix to form the word. In addition, practice forming some of the other words on page 2 of this handout.

F. In any time remaining, play the following on-line game with word roots:
<https://www.quia.com/mc/65969.html>

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Thank you for participating in today's breakout session, "Beyond Words: Making Concepts Real through Movement." You are invited to brainstorm on your own or with a partner for ideas on using appropriate movement, with or without props, to teach a concept which students seem to find especially difficult to understand.

1. _____
Course or Subject

2. _____
Level: Pre-req, entry level, more advanced

3. _____
Elusive concept*

4. _____
Specific barrier, such as a hidden step, phrase conversion, inference, etc.

*This may involve language challenges, sequencing of information, memory for procedures, spatial relationships, directionality, classification, rules & exceptions, etc.



Use this side of the page to list, draw or diagram appropriate movements students might perform to enact a concept which has been hard to understand and/or to retain. Include any props which might be needed, preferably easy-to-use props. Include color in your plan where possible. Relate the movements to words. Thank you for sharing your ideas.

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RESEARCH ARTICLES: The following articles are shared, thanks to Claudia Striepe, Librarian, El Camino College.

1. It Does Matter How We Teach Math. Rodrigues, Kathleen J. *Journal of Adult Education*, v41 n1 p29-33 2012 <http://files.eric.ed.gov/fulltext/EJ991442.pdf>

Abstract

This paper describes application of innovative practice and procedures in relationship to recognized principles and theory of adult education used in college math instruction. Adult learning principles provide the theoretical constructs and foundation of the practice supporting a learner-centered approach to learning. The purpose was to explore the needs of learners and the learning contexts that would help them achieve higher dimensions of critical thinking and cognitive development. Based on Knowles' six assumptions of andragogy, curriculum was designed to provide college math students meaningful learning experiences, critical thinking skills, and application within the context of the classroom. Creativity and hands-on learning proved to be beneficial not only to tactile and kinesthetic learners but to others in the classrooms as well. Additionally, math anxiety is addressed and how such anxiety can and does have a debilitating impact on learning math in the classroom. Using adult learning principles and best practices in undergraduate math education, keys to opening the door for student success are application, recognizing math anxiety in students, creativity, hands on learning, and incorporating characteristics of effective teachers.

2. Assessing Learning Styles to Improve the Quality of Performance of Community College Students in Developmental Writing Programs: A Pilot Study. Regina A. Rochford. *Community College Journal of Research and Practice*, v27, 2003, Is. 8, p665-677, published online Feb. 2011:

<http://www.tandfonline.com/doi/abs/10.1080/713838240>

Abstract

Why are many community college students unable to exit remedial college preparation programs and advance into credit courses? Many educators have grappled with this question for years. While many fads and new techniques have been tried, few have been successful, except for learning styles, a research-based approach that has demonstrated statistically significant results. Learning styles refer to the way students concentrate on, process, internalize, and recall new and difficult information. Most people have learning-style preferences, but individual preferences differ significantly and the stronger the preference, the more important it is to provide compatible instructional strategies, especially among less academically successful students whose preferences may be quite different from successful students. With this in mind, two experiments were conducted at an urban community college experiencing difficulty getting remedial students to pass the ACT Writing Skills Test. In both experiments, the majority of students passed the standardized test and improved their scores significantly.