

Literacy T-Chart – Frayer Model

CIP 15.0403 Electromechanical Technology/Electromechanics

Determine the meaning of symbols and vocabulary as they are used in a specific context.

Program Task:	PA Core Standard: CC.3.5.11-12.I
301: Identify and interpret electrical symbols, notes, details and components on schematics.	Description: Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Program Associated Vocabulary:	Reading Associated Vocabulary:
Electrical units Capacitor Resistor Inductor Current Voltage Ohm's law Switch symbols Ground symbols Resistor symbols Capacitor symbols Diode symbols Transistor symbols Toggle Relay Batteries Switches Voltage sources Current sources Closed loop	Essential characteristics Non-essential characteristics Examples Non-examples

Program Strategy:

Use the Frayer Model strategy to ensure that students develop a deep understanding of key concepts.

After introducing the Frayer Model strategy and before starting the assignment, present the following prompt to the students:

A new state-of-the-art exercise suite is needed for your school. Your electromechanical team entered a “bid” and won the “contract” to design and build the electromechanical schematic for the new rooms.

As a review before beginning this project, study the vocabulary terms needed for this project. Group the terms in ways that make sense to develop a list of key terms.

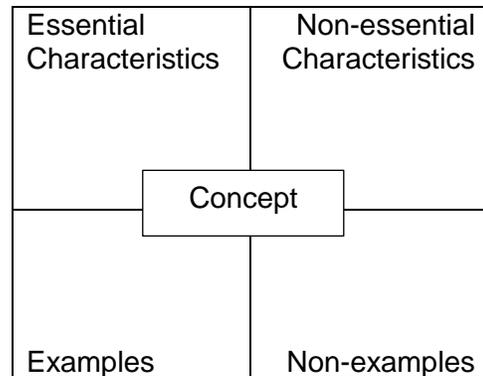
For each key vocabulary term, complete a Frayer Model graphic organizer. Ensure that you use all of the vocabulary terms in your organizers.

As additional practice, provide samples of different electrical/mechanical schematics. Use these and identify each of the vocabulary terms visible on the schematics and note other terms necessary for developing the diagrams that are not visible, but necessary for accuracy.

After demonstrating that they understand key vocabulary, have students work in teams to develop the schematics for the new rooms.

Literacy Strategy:

Frayer Model is used only for key vocabulary concepts. Students begin the graphic organizer before reading, but will re-visit it as they learn additional information. This is especially useful as students read multiple texts on the same concept and collect varying information.



Whole Group

Show the model for the whole class and briefly discuss what goes into each section. Add a simple concept that all students should have some experience with (e.g., toy, dinner) and ask them to jot down notes for what they think each quadrant would contain.

After a minute or two for thinking, facilitate student responses for items to go into each quadrant. Guide their thinking by asking questions of some entries: Is dinner served at a time other than night in some sections of the country? Does a toy have to be reusable? This phase of the lesson should take no more than 10 minutes.

Guided Practice

Distribute a short reading (one or two paragraphs) about a topic studied earlier in the year or that is generally known, but not part of this lesson (e.g., democracy, photosynthesis). Direct students to read the passage individually and complete a Frayer Model. Ask students to collaborate with a shoulder partner to determine what should be in the Frayer Model. Then ask pairs to contribute to the whole class model. Challenge students with questions to make sure that they are adding only what has come from the reading.

Application

Identify key concepts for the current unit or project. After reading provided or student-identified texts, have students complete Frayer Model templates for each key concept.

Program Strategy:	Literacy Strategy:
	<p>Students should keep their on-going Frayer Models in their class notebooks or folders. Periodically, check student work to determine if they are adding to their understanding of the concept by reading or class experiences.</p> <p>In debriefing, use the following questions:</p> <ul style="list-style-type: none"> • How did you (your group) complete the categories? Think about your thinking – Why did you categorize them the way you did? • Why will it be important to know which characteristics are essential and which are not? • Why is it important to identify non-examples that could be confused with examples? <p>Listen for:</p> <ul style="list-style-type: none"> • Justification for categories. • Understanding why knowing the difference in the terms is important. • Understanding that some students had background about the concept that may be accurate or not. • Relying only on the texts for information. • This activity is teaching reasoning skills of classification and deduction.

Instructor’s Script – Frayer Model

In engineering, electromechanics combines electrical and mechanical processes drawn from electrical engineering and mechanical engineering. Devices which carry out electrical operations by using moving parts are known as electromechanical. A manually operated switch is an example of an electromechanical component.

To understand and construct electromechanical schematics students must be able to correctly identify, interpret and apply numerous pictograms (symbols) to represent electrical/electronic and mechanical devices in a schematic diagram. These symbols are to a large extent standardized across the country.

The Frayer Model provides a visual map for students to distinguish between the various kinds of electrical and mechanical symbols and the context for each one. Discussing examples and non-examples is especially useful for students with different learning styles.

Being able to correctly characterize key concepts is an important skill. Thinking deeply about what defines processes, equipment or products is essential to many advanced development processes.

Common Mistakes Made by Students

Students often consult a dictionary or glossary for the meaning of words and then accept only the first definition without considering whether it works in the context.

Readers have learned to skip unknown or difficult words because they sometimes are “filler” and not essential for comprehension. In technical reading, students need to understand all key words because they can impact the procedures or products described.

CTE Instructor's Extended Discussion

The purpose of the Frayer Model is to raise awareness and build prior knowledge. The two categories of examples and essential characteristics are usually straight-forward and students may have little difficulty in completing them. However, the categories for non-examples and non-essential characteristics are somewhat more difficult. Some groups might place terms in one category and others in a different one and both may be correct, depending upon how students were picturing the item, but it is very important to identify incorrect answers as these may lead to safety issues in electromechanical applications.

Taking note of how students categorize the terms can provide the segue to instruction. What is important is that students discuss the new terms while they are grouping them and in the process become aware of the new terminology and hopefully build on their prior knowledge.

Sample Questions

Career and Technical Concepts

Question	Answer
An essential characteristic of a toggle switch is that it A. Has on-off positions. B. Is a rock switch. C. Is low voltage. D. Is a lever switch.	A. Has on-off positions

PA Core Reading Concepts

Question	Answer
Read the paragraph below and then answer the question that follows: Architecture is both the process and the product of planning, designing, and constructing buildings and other physical structures. Architectural works, in the material form of buildings, are often perceived as cultural symbols and as works of art. Historical civilizations are often identified with their surviving architectural achievements. Which of the following is a non-essential characteristic of architecture? A. Process of planning, designing and constructing buildings B. Views buildings as cultural symbols C. Includes constructing buildings and physical structures D. Blueprints of important buildings	B. Views buildings as cultural symbols