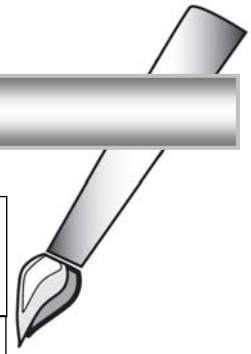


ROUNDHOUSE DIAGRAM

“The lowest form of thinking is the bare recognition of an object. The highest, the comprehensive intuition of the man who sees all things as part of a system”.

Plato



O verview

Roundhouse Diagrams are named after the crescent-shaped buildings that resemble a Roman amphitheater. Historically, the Roundhouse railroad system was the focal point for trains to back into their appointed stall and was used for repair, resting and rotation for a fleet of locomotive engines. This central turntable is an analogy used to develop a connection to the eye-brain system. For example, the figure is circular which is pleasing to the brain because our field of vision using both eyes is circular. The innermost circle uses a ‘yin and yang’ symbol in an area which houses the central theme captured in the total diagram. Concepts can be broken down using the ‘and’ and ‘of’ words or the *wavy* line may be used for opposing comparisons in the main title of the diagram. The seven wedges or sections in the outer circle of the figure are used to place the main ideas being explored by the learner. George Miller, a cognitive psychologist (1956) coined the idea that the normal human memory system retains seven chunks of information easily if connections are created within each section as well as from one section to the next. Many subsystems are connected within to construct a larger system.

James Wandersee introduced the diagramming technique to his graduate students in 1994 asking them to introduce and analyze abstract scientific concepts contained in this conceptual framework. The Roundhouse diagramming strategy provides a rich learning environment because the learner obtains the main ideas from the subject content and creatively connects a picture to aid in triggering the memory of that concept. This cause – effect relationship between the icon and the concept is a powerful tool for transforming an abstract idea into a concrete visual graphic enhancing the long-term memory process. Roundhouse coupled with Paivio’s dual learning theory (1986) embraces the idea that pictures intertwined with the verbal or written notion enhances the information processing systems in the brain. Burke (2001) gives an account of how images have historically described human activity as far back as etchings in caves and on tombs during the Egyptian period.

Due to the iconic character of this visual organizer it can be used across the curriculum with any subject content. To date, there have been four successful long term research studies performed with a variety of populations including gifted middle school (Ward & Lee, 2006), high school (Hackney & Ward, 2003), middle school at-risk (Ward 1999, Ward & Wandersee, 2002), and a middle school special education self-contained classroom.

IMPLEMENTING THIS ACTIVITY

1. Under goals on the bottom of the diagram write your reason or objective for constructing your Roundhouse Diagram. In other words, what is the 'big picture' or theme you are addressing in the figure?
2. Create a title focusing on this central theme and place it in the innermost circle of the Roundhouse diagram. Use of the 'of' word for the main title. For instance, The Cycle of Water may be the superordinate concept. Use the 'and' words to break down the title into the subordinate concepts, such as evaporation, condensation, precipitation, and water vapor. Learners seem to better grasp concepts when lined up from general to specific.
3. Brainstorm and research the content and determine the main ideas you are exploring. Break your schema down into seven chunks of information. Basically you are going to sequence and classify each chunk into each wedge or section beginning with the top center section. The concepts should be paraphrased into as few words as possible without losing the meaning.
4. Repeatedly analyze your diagram. Check your sequence and ask your self what comes first? Then what comes next? And so on.
5. Brainstorm again and this time, come up with icons or several symbols that will help you to recall the concepts in each wedge. Make direct connections of the concepts to the pictures. Be creative. The picture does not have to be literal. For example you can draw *coins* to represent the concept of *change*.
6. Evaluate your diagram and be sure each section relates to the next section so that the central theme is well depicted. Now write a paragraph giving details of the concept you just analyzed so that you are able to explain your diagram to others. Research reveals that constructing your own perception of a concept and teaching to others is a sure way to remember what you have learned (Dwyer, 1972).

ASSESSING THIS ACTIVITY

1. Create a rubric that will guide your students as a checklist. For instance ask questions such as; Is the goal stated clearly? Is the sequence correct? Does each section relate to the next section clearly? Is the content accurate? Were the main ideas revealed? Were the concepts meaningful? Were the pictures and symbols connected well to each concept?
2. Another suggestion could be to look at the creative aspects of the diagram. Were the ideas fluent? Were the concepts unique? Did the student elaborate on each concept?
3. Roundhouse diagrams can be used to find out what a student knows prior to an investigation. An instructor can use a Roundhouse diagram as an advanced organizer or overall picture used in instruction or to teach a concept. The teacher can then have the student recreate the diagram as an assessment to see if they remember the information they analyzed and constructed. The assessment can be used as a pre- and post-test to

determine how much information was learned by each individual after teaching the entire concept to the class. Roundhouse can be used in groups and used to teach other groups the same content with comparisons of different student perceptions of information learned in the class.

CONTENT AREA APPLICATIONS

1. Science – Great for cycles such as life cycles, water cycle, nitrogen cycle, oxygen cycle, the carbon cycle, the Greenhouse Effect, etc. It is also very useful when teaching abstract ideas such as photosynthesis, convections, conduction, radiation or any energy transfer process. Use it to describe the scientific method – define the problem. What is your hypothesis? Predict what you think will happen. What is your experiment? What were your results? What was your conclusion? Were the results what you thought would happen? What was different?
2. Social Studies – A wonderful research tool to explore cultures such as the Native Americans of North America. A suggestion for the seven sections may be what location on a map? What they used for homes? How their clothes looked? What food they ate? How did they communicate? What transportation did they use? Another suggestion would be to study a country. What is the language? What is the major religion? What is the major sport? What are the major imports and exports? What are the geographical features? What is the population?
3. Reading – Read a story and check for comprehension. What is the title of the story? Who were the major characters? Where did the story take place? What major event happened first? What happened next? What was the conclusion? Use it to sequence the events of a story. Use it to describe the major features of the main character.

MANAGING THE ACTIVITY

1. Prepare the Roundhouse Diagrams for each student to use individually.
2. Prepare a poster to use in a group setting.
3. Prepare a rubric or checklist so students know your expectations for each diagram.
4. Prepare a template to use in WORD or PowerPoint on the computer. Let the students use clipart for the icons. Animations also work beautifully.

REFERENCES

Burke, P. (2001). Picture history, in *History Today*, 51(4).

Dwyer, F. M. (1972). *A guide for improving visualized instruction*. University Park, Pennsylvania.

Hackney, M. & Ward, R.E., (2002). How-to-learn biology via Roundhouse diagrams. *The American Biology Teacher*, 64 (7): 525-533.

Miller, G. (1956). The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information. *The Psychological Review*, 63(2): 81-97.

Paivio, A. (1986). *Mental Representations*. New York: Oxford University Press.

Plato (1941). *The Republic*. Trans. F. M. Cornford. Oxford: Oxford.

Trowbridge, J. E. & Wandersee, J.H. (1998). Theory-driven graphic organizers. In J.J. Mintzes, J. H. Wandersee, & J. D. Novak (Eds.), *Teaching Science for understanding: A human constructivist view (Vol.3): 95-131*. San Diego, CA: Academic Press.

Ward, R.E. & Lee, W. D. (2006). Understanding the Periodic Table of Elements via iconic mapping and sequential diagramming: The Roundhouse Strategy. *Science Activities*, (Accepted for publication in Winter issue 2006).

Ward, R.E. (1999). *The effects of Roundhouse diagram construction and use on meaningful science learning in the middle school classroom*. Unpublished doctoral dissertation, Louisiana State University, Baton Rouge.

Ward, R.E., & Wandersee, J.H., (2001). Visualizing science using the Roundhouse diagram, *Science Scope*, 24 (4): 17-21.

Ward, R.E., & Wandersee, J.H. (2002). Students' perceptions of Roundhouse diagramming: A middle school viewpoint, *International Journal of Science Education*, 24 (2): (205-225).

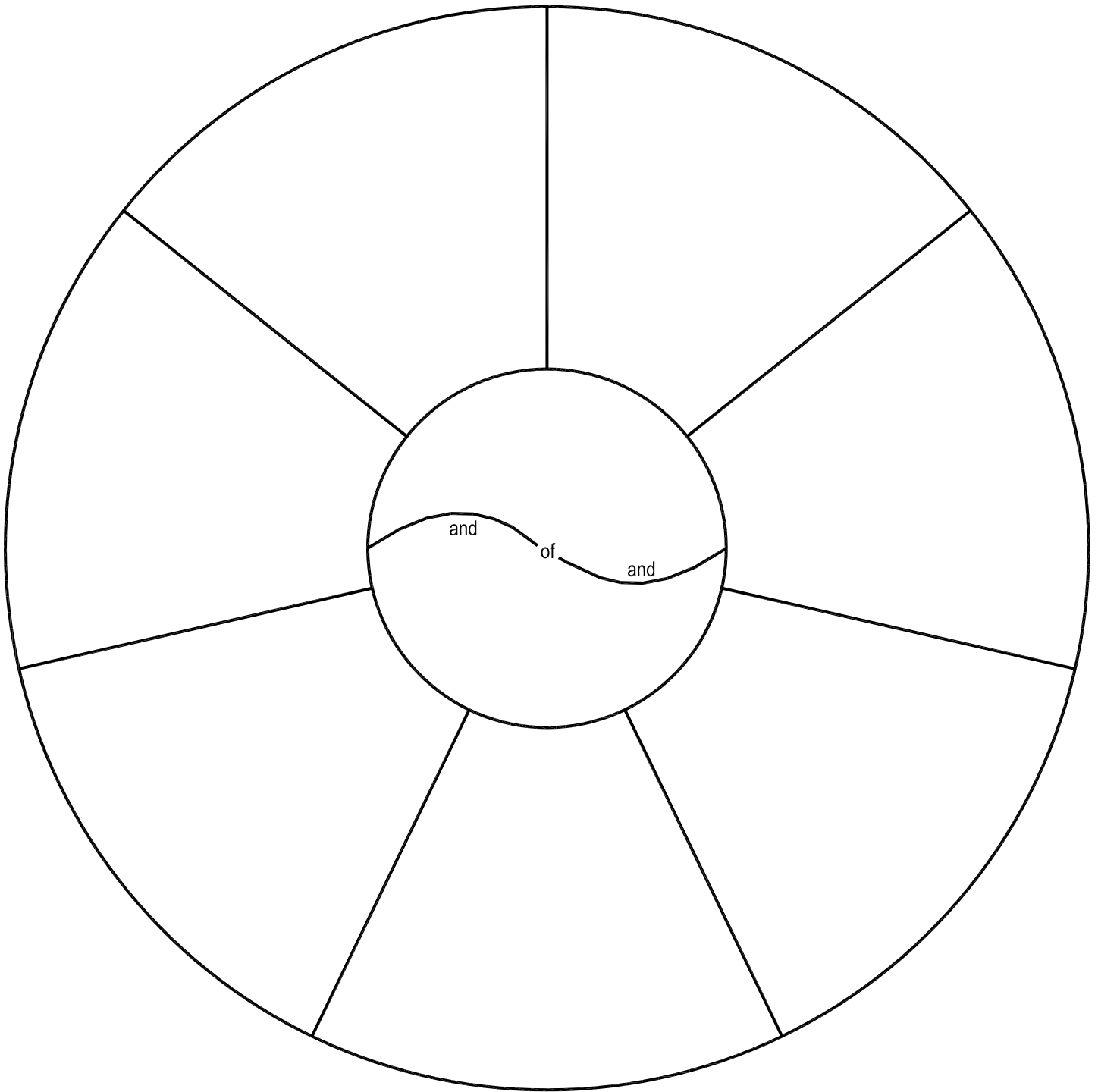
Ward, R.E., & Wandersee, J.H. (2002). Struggling to understand abstract science topics: A Roundhouse diagram-based study, *International Journal of Science Education*, 24 (6): (575-591).

<http://quantumtour.com/tour/00000013/> - a virtual tour of the Roundhouse Railroad Museum.

Biographical Statement –author of ROUNDHOUSE DIAGRAM

Robin E. Ward, Ph.D., is an assistant professor in curriculum and instruction at the University of Louisiana at Lafayette. She is currently researching the development of visual information processing and memory retention in normative, at-risk, gifted, learning disabled, mild mentally disabled, and behavior disordered populations. Address: Robin E. Ward, University of Louisiana at Lafayette, Department of Curriculum & Instruction, P.O. Box 42051, Lafayette, Louisiana 70504-2051 (e-mail rward@louisiana.edu).

THE ROUNDHOUSE DIAGRAM



Goals: