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ABSTRACT

Generally, reading is perceived as consisting of identifying words and increasing comprehension skills, but there are a plethora of additional symbols which students need to read and comprehend meaningfully. This paper first discusses reading across the curriculum, emphasizing abstract words, and then considers symbols peculiar to diverse academic disciplines. The paper discusses reading map and globe symbols, reading symbols in mathematics, and reading symbols in science. (NKA)

Meaning in Reading Symbols Across the Curriculum.

by Marlow Ediger

MEANING IN READING SYMBOLS ACROSS THE CURRICULUM

Symbols abound in each curriculum area. These symbols need to be understood by pupils within the context of reading. Generally, reading is perceived as consisting of identifying words and increasing comprehension skills. But, there are a plethora of additional symbols which pupils need to read and comprehend meaningfully.

Reading across the curriculum, emphasizing abstract words, will be discussed first, followed by symbols peculiar to diverse academic disciplines.

Reading Abstract Words

When reading abstract words, the following word recognition techniques become important and are developed individually by pupils as optimal achievement permits:

* context clues whereby the reader attempts to identify an unknown word by having it fit in as it relates to other words in the sentence.
* phonics in which the pupil attempts to identify an unknown word by associating a sound with one or more letters of the alphabet.
* syllabication skills in which an unknown word is divided into selected syllables and then recognized.
* onset and rhymes where a word not identified is divided into an initial consonant followed by the rest of the word, e. g. "s .. elf," "p ... ayment," "d ... ogmatic." To divide an unknown word into these parts aids in identifying the unknown.
* context clues whereby the learner perceives the shape of the word for identification purposes. Unknown words then can provide clues with longer as compared to shorter words, as well as taller letters versus shorter letters (Ediger, 2003, 71- 76).

Hopefully the above named approaches will assist the pupil to have an increased number of words become sight words and to be recognized immediately in fluent sequential reading of subject matter.

Reading Map and Globe Symbols

In ongoing social studies lessons and units of study, pupils are asked to read abstract map and globe symbols. A legend will provide the meaning of each symbol on the map/globe. Thus, a pupil sequentially will need to learn to read

the abstract symbols for rivers, highways, lakes, political boundaries, seas, mountains, plains, plateaus, and time zones. A river, for example, will be represented with a wavy line.

Pupils also need to be able to read different colors on a map/globe to understand elevation features. When looking at a region on a map/globe, the pupil will attach related meanings by looking at the legend. For example, a blue color will indicate a body of water such as the Atlantic or Pacific Ocean.

There are salient words in geography which pupils need to learn to read. These include the following:

1. meridians, parallels, degrees, Tropic of Cancer and Tropic of Capricorn, latitude and longitude.
2. cardinal and intermediate directions, North Pole and South Pole, sea level, desert, rain forest, regions, place location,
3. tornados, hurricanes, earthquakes, and floods.

The geography teacher needs to establish vital objectives of instruction as to which map and globe symbols pupils should learn to read. These objectives need to be arranged sequentially for teaching purposes. It is easy to omit relevant objectives in reading unless they are written down and then implemented (See Parker, 2001).

Salient concepts in history, political science, economics, and anthropology/sociology should also be identified and taught in a manner which provides for individual differences in the classroom.

Reading Symbols in Mathematics

Salient mathematical abstract concepts need to be taught in context. These concepts should provide relevant learnings for pupils in order to understand the language of mathematics. The teacher needs to observe that pupils individually find the mathematical concepts to make sense. A variety of concrete, semi-concrete, and abstract materials must be used as learning opportunities for pupils to achieve objectives. Diverse assessment procedures need to be used to appraise learner achievement and progress.

The following symbols/words, among others, need to be read by pupils and taught inductively/deductively, in a sequential manner as pupils achieve in a developmental mathematics curriculum:

1. greater than (>), less than (<), + , - , x , %.
2. sum, factors, product, addends, minuend, subtrahend, difference, quotient, dividend, divisor.

3. length, width, area, parallelogram, square, triangle, rectangle, solid, cube, sphere, hemisphere, weight, metric system (liter, kilogram, meter, centimeter).

Each of the above need to be taught in a manner whereby pupils may establish meaning to what is being taught. Depth teaching needs ot be emphasized. Applying each concept in functional settings increases the retention rate of learning for pupils (Ediger and Rao, 2001, Chapter Six).

Weiker wrote the following:

Teachers must be empowered with confidence, knowledge and skills to present mathematics and science education effectively to all pupils. Teacher training programs should strive to provide teachers with a solid knowledge base and an understanding of how pupils learn mathematics and science as well as appropriate instruction methods and skills to apply their knowledge. School districts must be required to employ qualified mathematics and science teachers to ensure a background of content knowledge and scientific understanding. Professional development should be encouraged throughout a teacher's career. Teachers should continually expand their content knowledge, become familiar with research based teaching methods and apply best teaching practices within their classrooms.

Science Concepts and the Learner

Science concepts for the learner need to be salient for pupils to learn. Careful selection of these concepts is vital. Proper order of contextual teaching of each will assist pupils to inculcate their meanings.

Earth sciences will stress the following concepts, among others, which pupils needs to identify in reading and understand their meanings:

1. classification and content of rock formations
2. minerals in the earth's crust
3. resources of energy and its categories
4. plate tectonics, earthquakes, and volcanoes
5. weathering and formation of the soil
6. erosion, deposition, and fresh water
7. oceanography and water movement
8. weather, climate, the atmosphere
9. the planets, gravity, and the solar system
10. exploration of space (See Holt Science and Technology, 2002).

For each of the above numbered phrases, pupils need to learn to read and attach meaning to these vocabulary terms. In number one, for example, the vocabulary terms of igneous, metamorphic, and sedimentary (rock) will be read with related explanations of each.

Life science concepts provide challenge for pupils to expand their knowledge base as well as to read increasingly complex ideas. The following are examples of vital concepts:

1. cells, monera, viruses, protists, fungi, invertebrates, life cycle of vertebrates,
2. fish, amphibians, reptiles, birds, mammals.
3. nutrition, digestion, respiration, circulation, excretion, heredity (Bough and Schwartz, 1994).

The above are selected life science concepts which pupils will meet in print to read meaningfully. If pupils, for example in number one above read about "viruses," they will read about the many kinds and mutations which cause new and recurring kinds of sicknesses and respiratory diseases such as SARS, West Nile, and New Castle.

Physical science concepts taught within the framework of experiments and demonstrations assist pupils to use what has been learned. The following taught sequentially, through a variety of learning opportunities, should assist pupils to find physical science practical as well as fascinating:

1. the elements, molecules and atoms
2. heat energy, effects of heating, insulation
3. evaporation, refrigeration, solar energy
4. simple and complex machines, friction
5. magnetism, static electricity, current electricity, electro magnets
6. sound, speed of sound, vibrations
7. light, shadows, rainbows, shadows, mirrors
8. lenses, the eye' retina (See McLaughlin and Thompson, 1999).

Formulas in chemistry might provide difficulties for pupils in reading such as C6 H12 O6. The Periodic Table of Elements contains abbreviations for each element found on the planet earth. Thus "C" stands for carbon, H stands for hydrogen, and O stands for oxygen. The subscripts 6, 12, and 6, stand for atoms of each chemical involved in the formula, representing sugar. These learnings provide highly complex understandings for pupils! (See Fredericks, 2003 for approaches to use in science reading

instruction).

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