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R+M= S Reading plus Mathematics equals Success

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R + M = S

Reading plus Mathematics equals Success

Dr. Peggy Gaskill

Reading a mathematics textbook is quite different from most of the reading students do on a regular basis. Students must make adjustments, if they have acquired only a once-straight through approach to reading.

Although many of the most current mathematics textbooks have attempted to minimize the amount of reading and have lowered reading levels, there are still special reading skills required for the successful reading of mathematics.

While non-readers, those students reading below the third or fourth grade reading level, present an entirely different set of problems, most other students have difficulty reading mathematics. To these adequate readers I would pose this question: "What is it that bothers you most about your reading of mathematics textbooks?" After recording their responses on the chalkboard, add these if they have not been listed.

1. Explanations are read as if reading a novel.
2. The reading is bypassed completely and students go to the problem directly.
3. Important terminology is ignored.
4. Passages are read only once.



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Since many of our students have not learned to read mathematics textbooks, we as teachers usually read and interpret instructional materials for them, relying on the text as a source of teaching ideas and problems. For the student who is deficient in basic reading skills, we will have to continue doing this. However, for the more able reader, we must help them gain more independence and self-direction.

Students must be taught how to read mathematics. It is not a skill that they learn automatically as they learn to read common English. In the reading of mathematics, comprehension, not speed, is the aim. Mathematics requires slow, careful reading for the exact meaning and implication of every word.

Perhaps the following instructional hints can be helpful to teachers as we teach students to "**READ MATHEMATICS.**"

Reading Speed

1. Choose a selection containing compact symbolism (i.e., $8 + 3 = 11$). Ask students to translate the selection into words. Compare the lengths of both forms of the information. Ask why it often takes longer to read a selection in the language of mathematics.

2. Choose a selection containing a question to be answered. Allow students to read the selection once. Ask them to answer the question. Can they do so? If they can, why? If they cannot, what do they need to reread? Help them find the necessary information.

Ordering Symbols

1. As each new combination of symbols is studied, point out how it is read. For example, $4 \overline{)18}$ may be read "four into eighteen" (left to right), or "eighteen divided by 4" (right to left). On the other hand, $18 \div 4$ is read

"eighteen divided by four" (left to right only).

2. Identify trouble spots in reading order and supply further examples and practice until difficulties are cleared up.

Reading with Paper and Pencil

1. Have half of the students read the following passage without paper and pencil and the other half with paper and pencil. Find out which group took longer and which comprehended better. Then select similar passages which require reading with paper and pencil.

A field in the shape of a rectangle is to be fenced. Find the number of yards of fencing needed if the length of the field is 107 yards and its width is 44 yards. Do you have enough information to find the area of this field?

2. Encourage students to take out paper and pencil whenever they take out their mathematics textbooks.

Reading Graphic Materials

1. Have students create their own graphic materials using information which appeals to them. For example, make a table of favorite music groups based on a class survey.

2. Give students tables and graphs with oral directions on finding title, categories, elements in categories, and other important details. Ask specific questions about details of the graph. Find out if there are any influences they can make from the graphic material which go beyond the data given.

Page Organization

1. Before beginning a chapter, have students do the following:

- Find the title of each lesson.
- Locate the definitions and principles which are highlighted in the chapter.
- Use what they have learned from **a** and **b** to state in a few sentences what they think they will be learning in the chapter.

2. If students miss problems on review pages, have them locate the pages in the chapter on which the concepts or skills are taught. Then have them find and work problems in the chapter exercises which are similar to the problems they missed.

Main Ideas and Important Details

1. Ask these questions often:

- What is the lesson all about?
- What is your purpose for reading the lesson?
- What questions helped you discover the main idea?
- What other clues helped you discover the main idea?

2. Give the student a list of principles and have them find the page in the book on which each principle is first stated.

Words with Many Meanings

1. Have students list five words which have both ordinary English and mathematical meanings. Help them with their choices if necessary. Then ask them to write a sentence illustrating each meaning. (i.e.: difference, operation, interest, power, etc.)

2. Give students a word, like **add**, and have them respond with words having the same stem, as **addition**, **additional**, **additive**. Be sure that they understand the possible meanings of each word and can use them properly in an ordinary English or in a mathematical sense.

Using Mathematical Words

1. Whenever a student has difficulty with word meaning, use one or more of the following aids to achieve understanding: context clues, graphic clues, word structure dictionary.

2. Use a mathematics word list as a guide for improving student familiarity with mathematical words.

Seeing and Understanding Symbols

1. Go through your textbook's list of symbols. Place each symbol on a separate index card. Have students test one another for the meaning of these symbols on a regular basis.

2. Divide students into working pairs. Each student makes up and writes a mathematics sentence in words. Papers are then exchanged with a partner and the sentences are interpreted into symbols. The paper is returned to the partner for correcting. Discrepancies are checked with the teacher. Expand this by sharing papers between pairs. Many can be developed for challenges.

Object, Idea, Words, Symbols

If a student is having difficulty using a concept, it is likely that understanding of the concept is weak. Use figures, drawings, and objects to help the student gain a better understanding of the concept. For example, if the lesson deals with similar figures, have the student draw three squares, three circles, and three equilateral triangles as examples of drawings with the same shapes. Then proceed to the representation of the concept using appropriate words or symbols.

2. To strengthen a student's grasp of object, idea, word, and symbol, give one of the following three to a student.

- objects which model the concept
- words which name the concept
- symbols representing the concept

Have the student provide the missing two ingredients.

Problem Solving

1. When a problem is to be solved, ask questions like

What are you to find?

What information is given?

Do you need all the information?

Is needed information missing?

How could you solve the problem?

Could you solve it another way?

2. Have students describe to one another the methods they used to solve a problem. Help them see how various methods may lead to the same answer. Ask them to decide what they think is the best method for solution based on saving time and using the least number of symbols. Also consider the best method of solution based on understanding the solution.

Helps in Computing

1. Use concrete materials to demonstrate and clarify algorithms.

2. Give incomplete algorithms to be completed by students.

Searching for Meaning

1. When a student has difficulty determining the meaning of words and symbols in a passage, ask if there is anything on the page which might help. Prompting, such as "Look ahead," "Look back," "Will the drawing help?" "Do you see another sentence like it?" "Do you see a word the symbol could replace?", might be necessary.

2. If a student has trouble with meanings of symbols, make up an exercise deleting symbols for the student to complete. Other exercises can be constructed to delete other words or concepts for meaning searches.

Using Skills Together

1. Choose a specific page from a book. Ask questions such as:

What is on this page that helps you find the main idea?

Why do you need to read this page slowly?

If you do not know the meaning of a particular word, what can you do to understand it?

2. Speak the language of mathematics to students. Have them write down what they hear. Compare the way different students write the same information. Are there differences in using words or symbols, in ordering, in making charts or diagrams, in structure?

Teaching students to "**READ MATHEMATICS**" is an on-going process. There is no overnight success! But we do have an obligation to our students to increase their independence and self-direction so that they will be able to appropriately read their mathematics textbooks without constant teacher direction and explanations. They must learn that "Reading is a special skill to be learned in the mathematics classroom, as well as in the Language Arts classroom." In other symbols,

$$R + M = S$$

(Reading plus Mathematics equals Success!)

