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ABSTRACT

The need for teachers to be proficient in diagnosing pupil difficulty in mathematics is advocated. Some facets of student behavior to be observed by the teacher are noted, including reversals, lack of retention, and lack of differentiation. All are characteristics associated with dyslexia. Problems of dyslexic pupils are noted and some general suggestions for drills and other types of practice are given. (MNS)

DYSLEXIA, DIAGNOSIS IN THE MATHEMATICS CURRICULUM

by

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Dyslexia, Diagnosis in the Mathematics Curriculum

Mathematics, one of the three r's, is considered by many to represent a basic in the curriculum. The basics are conceived to contain essential content for all learners to attain. Essentialists for many decades have perceived ted necessary content in mathematics that every student needs to achieve.

There are definite problems involved in guiding students to achieve the basics in mathematics. The balance of this paper will discuss problematic situations experienced by students in the curriculum.

Diagnosis and Remediation

The teacher of mathematics needs to be proficient in diagnosing pupil difficulty in mathematics. Careful observation by the teacher of each problem area needs to be noticed and recorded. Which facets of student lack of progress needs to be observed by the teacher?

Pupils interchange the sequence of numbers in performing operations of addition, subtraction, multiplication, and division. Thus, instead of writing the numerals 137, the student may write 317 or 731. Two numerals may then be written from right to left progression, or all three numerals might be reversed in writing. Other reversals may also be in evidence.

A related problem to interchanging the order of numerals is for pupils to make reversals in forming selected numerals. Thus, the numeral 3 is written as $\mathcal{E}$, or a 7 as Γ. A reverse progression is involved in writing these numerals. The mathematics teacher needs to analyze specific kinds of errors and assist pupils to overcome the

identified deficiencies. The making of reversals may be called dyslexia. Mathematics educators have also called this phenomena dyscalculia.

Dyslexic pupils may reverse the minuend and subtrahend in subtraction. Thus in subtracting 42 - 16, the pupil may subtract two from six, instead of the usual regrouping, renaming procedures involved in subtracting 16 from 42. It might be in the tens column that that pupil perceives correctly that the subtrahend is subtracted from the minuend.

Learners experiencing dyslexia are prone to forget what was studied previously. Retention of previously presented fa s, concepts, and generalizations is at a low rate. The mathematics teacher may feel that the dyslexic pupil each day is basically starting from scratch. There appears to be very little recall ability of the student. Sequence in achieving new learnings is then hindered.

The pupil with dyslexia may lack clarity of thought in differentiating among the diverse operations of addition, subtraction, multiplication, and division. When the operation of addition is called for, the pupil may subtract instead. Confusion is in evidence as to which operation on numbers is needed in a given situation. The teacher may feel that the pupil is not trying, is inattentive, or is rebellious in failing to remember if adding, subtracting, multiplying, or dividing is being called for in drill or practice situations.

Dyslexia shows up at an early age for elementary age pupils. Selected learners then have difficulties in matching objects in one to one correspondence. There seemingly is difficulty in perceiving objects within a set or sets. Dyslexic pupils may also have problems in

arranging sticks, or other objects, sequentially from the longest to the shortest. These learners reveal difficulties, too, in writing, correctly, numerals in ascending order of value.

A pupil with dyslexia tends to confuse operational signs in arithmetic. The greater than symbol (>) is interchanged with the less than (<) sign. These pupils generally read the "greater than" and "less than" symbols from right to left instead of left to right. Confusion is further in evidence when dyslexic pupils are asked to differentiate diverse geometrical figures. Reproducing a triangle, square, rectangle, pentagon, among others, presents additional problems for the dyslectic child. Also, numerals that have similarities in appearance provide difficulties for these learners to differentiate. Thus the numerals "2" and "3" are more difficult to discern as compared to "2" and "8".

Dyslexic pupils have greater problems in learning from oral, abstract, and semi-concrete situations as compared to actual concrete materials. Real objects utilized in addition, subtraction, multiplication, and division are easier to learn from as compared to pictures representing sets involved in these four basic operations. The abstract, written symbols or oral presentations, are even more complex. Shifting from one operation, such as addition to a different operation (subtraction) can be confusing to the dyslexic. The inverse operation of subtraction seemingly is a completely different process as compared to the operation of addition on numbers for these pupils.

Solving word problems presents problems to the student with dyslexia. Words may be read from right to left instead of left to right. Words might also lack proper sequence in the act of reading.

Thus, selected words may be interchanged within a sentence. These pupils have difficulty retaining the mental image of many words. It is difficult for learners with dyslexia to associate sounds (phonemes) with symbols (graphemes). Other word attack skills lacking in the pupil's repertoire include using syllabication, structural analysis, context clues, picture clues, and configuration clues. Reading of abstract word presents problems to the dylexic pupils. Further problems experienced by pupils with dyslexia in reading word or story problems include knowing which operations to utilize, remembering the content, and ordering number to use in solving the problem.

Dyslexic learners need assistance to attach meaning to what is being learned. Understanding subject matter in the mathematics curriculum is salient. The interests of learners in each sequential step of learning needs to be emphasized. Securing the attention span of pupils with interesting activities and learning opportunities is important. Purpose in achieving is a must. Each pupil needs to perceive reasons for participating in ongoing lessons and units. Pupils individually are at different levels of achievement. Successful experiences for dyslexic learners is highly important. Reinforcement of successful endeavors is a must. A patient, understanding teacher is needed to teach dyslexic pupils.

In Closing

There are definite pointers for mathematics teachers to follow in working with dyslexic pupils. These include the following:

1. Pupils must utilize diverse senses to achieve and accomplish objectives. Thus, visual, auditory, and kinesthetic methods of learning must be utilized by the dyslexic pupil.

2. Learners need to write letters and numerals from left to right. Drill and practice are necessary in these kinds of learning activities. Sandpaper, cork, and plastic letters and numerals should be used in giving the pupil to trace with the finger each abstract symbol from left to right progression only. Pupils individually must be assisted to avoid a right to left movement.

3. Students need encouragement to persevere and not give up in achieving specific goals.

4. Drill and practice on vital sight words in mathematics story problems is important. Reinforcement of correct responses in word recognition needs to be in the offing.

5. A minimal number of stimuli should be in existence in any given learning opportunity. Thus, after a word has been reversed in writing or in oral pronunciation, the involved pupil needs to trace that word moving from left to right only. An excess number of words at a given time to master by a dyslexic pupil presents an excessive number of stimuli.