Math Problems

Individuals who have difficulty with math usually exhibit one or more of the following: frequent errors in computation, weak quantitative concepts, difficulty remembering number facts and operations, omitting or skipping steps when solving problems. As children, these students struggled with learning the times tables and possibly still cannot remember most of them. Many of them counted addition and subtraction facts on their fingers and later in their heads. As adults, many of these individuals still must count or calculate many of these basic number facts. When they encounter word problems, these students usually guess whether to add, subtract, multiply or divide. They miscopy or transpose numbers and make many simple errors. These are often called “dumb errors”. I do not call them “dumb errors” because of the negative impact this term has on the self-image. By referring to these mistakes as “simple mistakes”, the student does not identify with the mistakes as a reflection of his or her ability.

The individual who has these problems with numbers is often fearful of math. He or she frequently reports having “math anxiety”. This anxiety leads to patterns of avoidance, resulting in the person avoiding numbers and math operations so the basic skills remain underdeveloped. However, there are often deeper roots to math problems than just anxiety and avoidance. The thought patterns of individuals who have learning differences can be the cause of some or all of their difficulties with math. The errors and problems with remembering numbers can cause a person to become fearful of math, which then results in avoidance.

The learning problems that interfere with the acquisition of math skills are many. They are frequently the same thought processes that limit the acquisition of other basic skills: visual, auditory, and tactile perceptual problems; processing problems like right/left discrimination and the racing mind; and communication problems such as poor handwriting. Take, for example, the individual who has a severe problem with motor control, sometimes called dysgraphia. No matter how hard this person tries, when he or she writes numbers, they may be indistinguishable from other numbers (a *4* or a *9*), of differing sizes, or not lined up properly for solving problems. No matter how many times or how hard he or she tries, the result is usually the same: errors and frustration. Here are some examples:

Figure 1.

Similar difficulties result from visual perception and organization problems. The individuals who have these problems have difficulty copying and keeping writing straight. Copying a math problem from a book or off the blackboard results in errors. Another person runs out of space on the page when doing long problems, or calculations run into each other causing confusion.

Figure 2.

Visual perception problems can make measurement difficult. The person may not be able to exactly line up a ruler or may not read it correctly. When a lack of understanding of fractions is added to this problem, the student who continuously makes errors in measurement, tends to avoid using measurements and never becomes proficient with these instruments.

The racing mind (frequently called ADD) is responsible for many difficulties in math. Triggering, a phenomenon in which the person's thoughts jump to the next logical response or thought, results in many errors. For example, a student, even using a calculator, will look at the number *12* and write or enter *13* because the thought "12" triggers the next number "13"! When adding a column of numbers, the student who triggers will jump from one number to another when he or she tries to hold the increasing sum in the memory.

8	The though process of triggering is as follows:
6	8+6 = 14, the person's thoughts jump to 15 + 9
9	= 24 + 9 = 33 and the person's thoughts might
9	jump again to 34 and when the 5 is added to 34,
+5	the person gets 39 for and answer.

Another example of triggering is frequently seen on objective tests (multiple choice). The person chooses the answer *B* among the four choices (*A*, *B*, *C*, *D*) and triggers to the next and marks *C*. The student who makes this mistake usually does not check back on the answer because he/she was confident that the answer was correct.

Reversals or number transpositions are common errors for people who have learning problems. A reversal of a number or an operation sign is not a perceptual problem, but rather a processing problem that results in confusion and memory difficulties. The student does not see numbers backwards or a + when it is an *x*, instead the person is not able to remember which direction the number should go when it is written or which sign represents which operation.

Figure 3.

Knowing which number to carry when adding or multiplying is another example of the right/left confusion.

14 +58	*The student with this problem will think 4 + 8 is 12, write a 1 under the 8 and carry the 2.*

Students who do not remember "odd and even" numbers have a right/left discrimination problem. Since odd and even in an "either/or" relationship, it is difficult for these students to remember which is which. Although this is difficult for people who do not have this problem to understand, the confusion caused by this "either/or" thinking leaves the student conceptionally stuck, unable to resolve the dilemma. Rather than rethinking the concept or approaching it in a different way, the student goes back and forth, trying to remember if the number is odd or even. This leads to frustration and guessing. When the student guesses odd or even, he/she has a 50% chance of getting it correct. If the guess is incorrect and someone points out the mistake, the student chooses the opposite, but still does not know why. This student may now be able to remember that a number is odd as long as he/she is using it, however, the next time the student needs to decide if the number is odd of ever, she may not be able to remember and guesses again.

The right/left confusion makes it difficult for students with this thought process to complete applied or word problems. These students, until they master the quantitative concepts or learn to diagram the problems, will not remember which operation to use, frequently guessing because they cannot figure it out. This same phenomenon will make it difficult for these students

to remember how to compute percentages (not sure if they should multiply or divide) and other operations that have an “either/or” relationship such as multiplication and division of fractions (Which one is inverted?).

Sequencing problems cause many problems in math. Operations are most often sequential. For example, the steps in long division must be completed in order to solve problems. Students can omit steps, add steps, or complete steps out of order, all of which result in errors. Students who have a racing mind naturally do things very quickly and often take shortcuts. These shortcuts frequently result in errors.

Many individuals with learning differences possess weak organizational skills. When these skills are lacking or underdeveloped, the result is frustration and delays. It can be as simple as the student not being able to find a pencil or a notebook, or more complex, such as not being able to organize the logic to solve a problem.

Even auditory perception and processing problems interfere with the development of math skills. Individuals with “blurred hearing” are not able to distinguish subtle sounds or sounds which are very similar. A student with this problem may not hear numbers correctly or have problems knowing if the teacher said “divide” or “divisor”. Frequently, students with “blurred hearing” will not understand directions and may not ask for clarification because of embarrassment or just being sure that what they heard was what was stated. These same auditory differences produce many reading problems. And although a student with a reading problem may not have difficulty learning and completing math calculations, that person’s reading problem can mean that he/she is not able to read directions, word problems, or the textbook. He/she is therefore dependant solely on the teacher or tutor for instruction.

Some Solutions to Math Problems

Individuals with weak math skills often approach math like a second language. Since they experience difficulty with quantities, they tend not to pay attention to numbers and quantities. Consequently, these individuals do not think in quantitative terms, just like the person who is learning a new language does not think in the second language until it has been mastered. Learning math like a second language means that the student is simply memorizing facts and operations without understanding and incorporating them into everyday thoughts. These students need to increase their quantitative observations. They should pay attention to numbers and quantities in their environments and learn the numbers associated with

objects. Instead of just seeing a table, the student should know that most tables are 30 inches from the floor, that many tiles are 9 or 12 inch squares, etc.

There are a number of techniques that can be used to overcome the problems caused by the perceptual, processing and communication differences described above. The first is the use of graph paper. Students who have difficulty with motor control and visual perception should always complete their math work on graph paper sized to their handwriting. If the squares of the graph paper are too small, the students will not be able to fit the numbers into the spaces, and if they are too large, the students will frequently try to squeeze two numbers into a space.

Weighted learning and mnemonics are helpful for reversals, confusion and memory problems. When items are similar, a mnemonic for each can be just as confusing as the items themselves. This can be avoided by weighting one side. For example, with odd and even numbers, the student does not learn both odd and even numbers, but only even numbers. Therefore if a number is not even, it is odd. Mnemonics are memory aids that use the association of common items to the new or confusing information to be learned. This can be applied to the learning of new number facts, operations and concepts. Some examples for learning basic number facts would include: 6 + 6 = a dozen, a dozen is 12; 8 + 8 = 16 because the eight can remind you of a race track and in most states you must be 16 to drive; 5 6 7 8 is a reminder that 7 x 8 = 56.

Frequent and careful checking of one's work is necessary for individuals with learning problems. This often takes more time, so on tests these individuals should be accommodated with more time. When completing assignments, students should be encouraged to review previous chapters and assignments to ensure that they have not forgotten anything and to refresh their memories.

Time on task and repetition are taken for granted as part of learning. But, for students who have learning differences, avoidance reduces the amount of time on task and they frequently do not get enough repetition to develop mastery. If a student can do many simple problems and operations, they will get more time on task before they become frustrated and avoid, and the increased repetition leads to mastery. Reviewing by doing one problem from each assignment (as described above) before beginning a new assignment provides the student with a systematic way to achieve spaced repetition.

Calculators should be seen as number power tools. Students who do not know their basic number facts should learn them. (Some severe

learning disabilities will limit students' ability to learn the number facts. These students should be accommodated with a calculator.) Many students can learn the number facts but were never taught alternative techniques to do so. These students frequently count or calculate basic number facts, and never learn them. One way to assist them in learning the number facts is through increased quantitative observations. Another way is to teach the students the patterns in math. For example, knowing the following patterns helps many to remember addition and subtraction facts.

E	O	E	O
+E	+O	+O	+E
E	E	O	O

As students learn the basic number facts the speed and accuracy of computations increase and with it their self-confidence.