

Remedial Mathematics Project

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*T*he study of mathematics cultivates clear logical thinking. It is similar to lifting weights to strengthen the muscular body or cutting weeds to create a walking path. Working with math teaches problem solving and develops inner flexibility. The activities of problem solving and thinking flexibly are important tools for our adult world. We may not pull out the quadratic formula at the grocery store, but we do use the neurological pathways and the capacities we have created in working with higher mathematics each time we encounter an everyday problem.

According to one study, fewer than two students in three (63%) entering college are proficient in mathematics. More than one third of these young adults have underdeveloped problem solving skills and deficiencies in flexibility of logical thinking. The number of high school students without proficiency in math is far greater; not all students enter college. Why is the proportion of students who struggle with math so large? Who are these students and what can be done to change this? What impact might this deficiency have on students' futures?

On a typical day at a Waldorf high school you can spot instantly the students who do not like math or who are not high achievers in the subject. They can be seen dragging their feet on their way to class. Mention "word problems" and hear these students groan; refer to fractions and watch them cringe; speak of decimals and see them roll their eyes. These are the students who attend courses commonly referred to as the B-group, remedial class, lower level, slower paced math, offerings for those with learning difficulties, and even, sadly, by fellow students, as "dummy math" or "stupid math." I will call them here the "lower level." The courses these

students attend usually have small class sizes, averaging around 10 students per class, and are taught at a slower pace beginning with Algebra in the 9th grade and ending with Algebra II or Trigonometry in the 11th or 12th grade. As with higher-level classes, these lower-level classes are often taught with the intention of preparing students for college. The students in these modified classes, however, are often drawn to art and humanities or choose careers not requiring a college education. In other words, these are often classes attended by normal, intelligent students who happen to struggle with mathematics.

Teaching these students in a meaningful and productive way is a challenge. Many wonderful and qualified teachers avoid teaching these lower-level classes. Perhaps this is because the same teaching methods and styles that aid learning for higher-level math students generate little understanding or enjoyment among lower-level students. Advanced groups may be filled with math-loving students who enthusiastically take on the next topic as fast as a teacher can dish it out. They are often self-teachers. Lower-level students, however, require a different style and classroom environment. In order to teach math effectively to lower-level students a teacher must acquire a fundamental understanding of who they are and what makes them different from other math students. These students possess, more or less, three distinct qualities: they are feeling-based, they are intuitive, and they are picture-image-learners.

By using the phrase "feeling-based" to describe high school math students, I am describing the center from which their reactive decisions originate. For these students, judgment, which is centered in feeling more

than in thinking or willing, predominates. Other students are influenced by their feeling lives, but these students are inundated by them. Many things—such as sleep, nutrition, exercise, conflict, stress, or menstrual cycle—affect their emotional states. These students appear to lack the ability to put aside their emotions and perceptions in order to focus on thinking. Their openness or receptivity to new material is predicated on how well they feel.

Lower-level math students often understand math by means other than pencil and paper. They typically do poorly on standardized tests. Instead, they may have greater than average verbal and visual abilities and ways of understanding that do not mesh with ordinary textbook modalities. Lower-level math students may not be able to perform rigorous steps to solve an equation, but they may quickly blurt out a correct answer to a math problem. Such students may not know where the answer came from or how they know that it is true.

This group of students may also have a knack for being in tune with their surroundings. They may sense effortlessly the state of their classroom environments, their peers' emotional states, and the moods of their teachers. Their intuitive abilities, coupled with strong personal feeling lives, affect their ability to stay focused and on-task. Their attention may easily be drawn into a conversation half a room away, to a bird flying by the window, or to a friend's emotional state. These students seem to have antennae stretching out from their bodies. They can quickly become overloaded with sense impressions and lose the ability to concentrate.

Finally, these students are picture-image-learners. More often than not they need to associate a mental picture or image with a math problem in order to understand it. Many of the students in lower-level high school math courses performed well in and enjoyed grade school mathematics. These students may have begun to struggle only when

algebra was introduced in seventh grade. For many students, moving into algebra, and thus into the abstract, is a welcome change, one for which they are developmentally ready. Some students, however, cannot easily form abstract concepts. These students require scaffolding to support their visualization of advanced mathematical concepts.

According to Euripides, "Whoso neglects learning loses the past and is dead for the future." If we ignore the importance of an education for all students that is rich in mathematics, we are ignoring the gift of clear thinking and the beauty of math in all that surrounds us. For this reason it is important to understand all our students and to find a method of teaching that connects them with mathematics.

