Instruction matters!

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Linking

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As teachers teach mathematics, they should remain cognizant of the fact that the concepts and skills they teach will be used later as building blocks to introduce more abstract concepts. Middle-school teachers use concepts, skills and algorithms taught in elementary school, and high-school teachers continue to build on student knowledge gained in middle school. This process is referred to as "linkage" (connections), the introduction of new material through the use of skills and concepts that have previously been taught or outside experiences.

Therefore, as lessons are presented, teachers should link the new material to previously learned concepts or outside experiences. By introducing concepts through the utilization of linkages, teachers enable students to place new ideas into a context of past learning. Students are introduced to new or more abstract concepts *using familiar language*, thereby not being threatened. Teachers, on the other hand, have an opportunity to *review and reinforce* previously learned topics, topics and skills they often identify as deficiencies and reasons why they are not successful teaching their assigned curriculum. Teachers can then *compare and contrast* that information, and students see the idea used in a *different context*. Research suggests all the aforementioned leads to increased student achievement. Simply put, students are then more likely to understand and therefore absorb new material when linkage is being used.

How many times have you thought to yourself, how can I teach _____, my kids don't know _____?

The importance of linking concepts and skills to previously learned material and outside experiences can not be overstated. Many of our best students probably don't know the equation of a circle, the distance formula, Pythagorean Theorem, and trig identity $\cos^2x + \sin^2x = 1$ are all the same formula, just written differently because they are being used in different contexts.

Whether you are linking the areas of a rectangles to multiplication arrays taught in second and third grade, the algorithm for adding/subtracting decimals to the algorithm for adding/subtracting fractions, polynomials to expanded notation, the Order of Operations to solving linear equations, the division algorithm to synthetic substitution, or FOIL to the 3rd grade multiplication algorithm, those linkages allow teachers to review and reinforce previously taught material as well as address student deficiencies.

By not introducing these concepts through linking, teachers lose valuable instructional time by introducing these ideas as brand new and students don't see or understand the beauty behind mathematics.

Instruction matters! What you teach is important, how you teach those concepts and skills will impact student understanding and achievement.

Linking to previously learned material

Many students experience little difficulty with adding/subtracting decimals. Linking that procedure to adding/subtracting fractions could help student understanding resulting in students being able to transfer that knowledge to adding/subtracting fractions. A skill identified by teachers that students experience difficulty.

Algorithm Add/Sub Decimals	Algorithm Add/Sub Fractions
1. Line up decimal points	1. Find common denominator
2. Fill in zeros	2. Make equiv. fractions
3. Add/Sub numbers	3. Add/Sub numerators
4. Bring dec. pt down	4. Bring denominator down
	5. Simplify

Explain to the students that when they lined up the decimal points and filled in the zeros, they were finding a common denominator and making equivalent fractions. That when they added the numbers in the decimals problem that was the same as adding the numerators with fractions. And finally, when they brought the decimal point straight down, they were bringing down the denominator. That linkage would allow teachers the opportunity to review and address difficulties students might be having with fractions.

Linking to outside experiences

If the cost of one cold drink is $0.50, two cold drinks would be $1.00, three would cost $1.50. Each additional cold drink would cost $0.50, the change in price for each additional cold drink would be $0.50, the rate of change would be $0.50, the slope would be $0.50. We do use math in our lives everyday.

Linking to outside experiences makes the math taught in the classroom come alive. Whether you are linking a parabola to flashlights, satellite dishes or amphitheatres, the concept of slope to the pitch of a roof, grade of a hill, or the additional cost of buying multiple quantities of the same item, or the circumference of a circle to pipe fitting or how changing the size of one's tires results in the odometer and speedometer being off in their car.