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Backbone of Lesson Planning – EnCad

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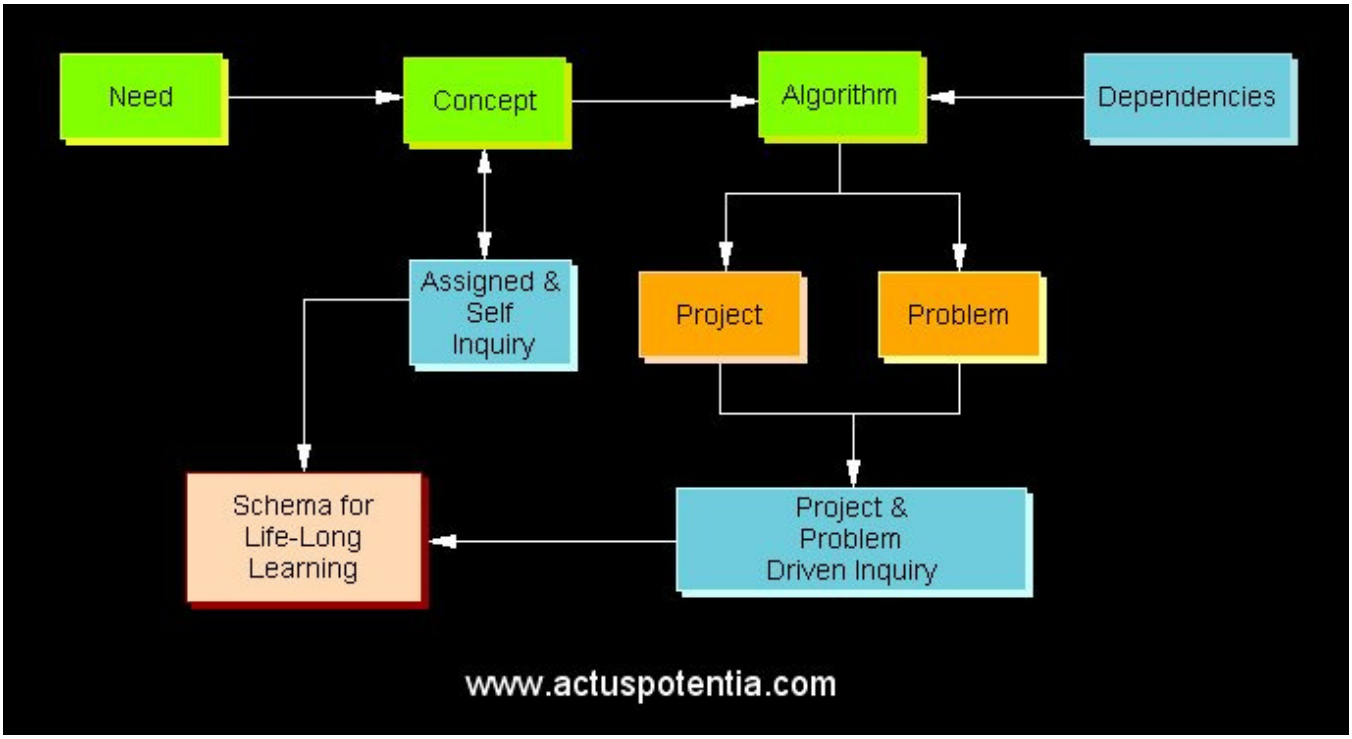
Build your lesson plan with EnCad (NCAD) as the backbone. NCAD stands for Need-Concept-Algorithm-Dependencies. The structure of EnCad will keep your students walking with you and not get lost in the wilderness after seven minutes of lecturing. EnCad is shown in the diagram below. For now, ignore the color coding and focus on only the four blocks, NCAD. I will explain NCAD in the context of teaching division of fractions, but it applies everywhere.



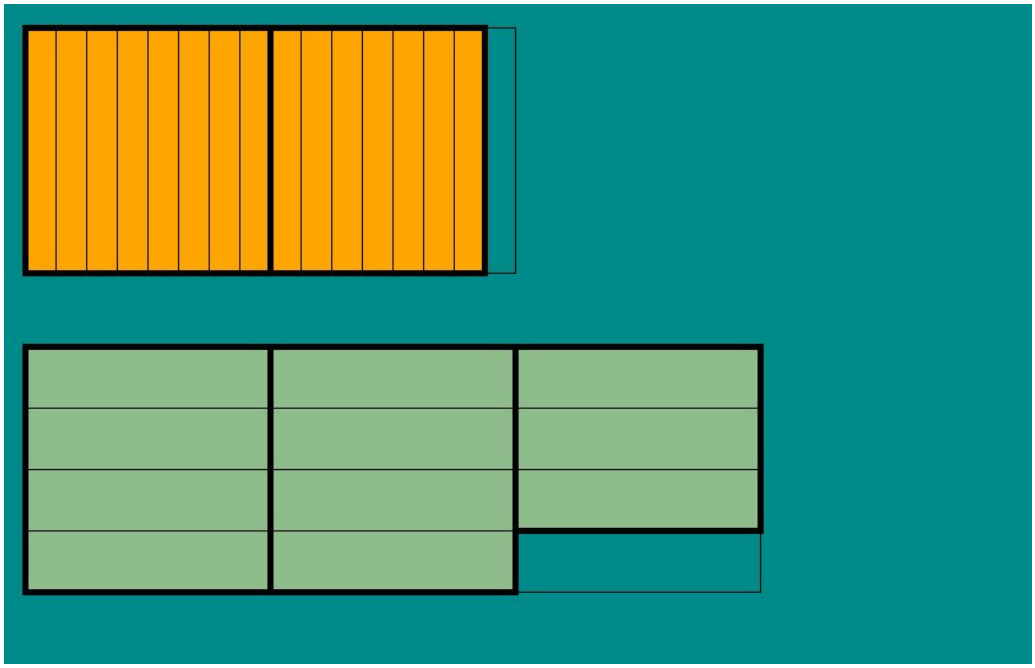
Need – Concept – Algorithm - Dependencies

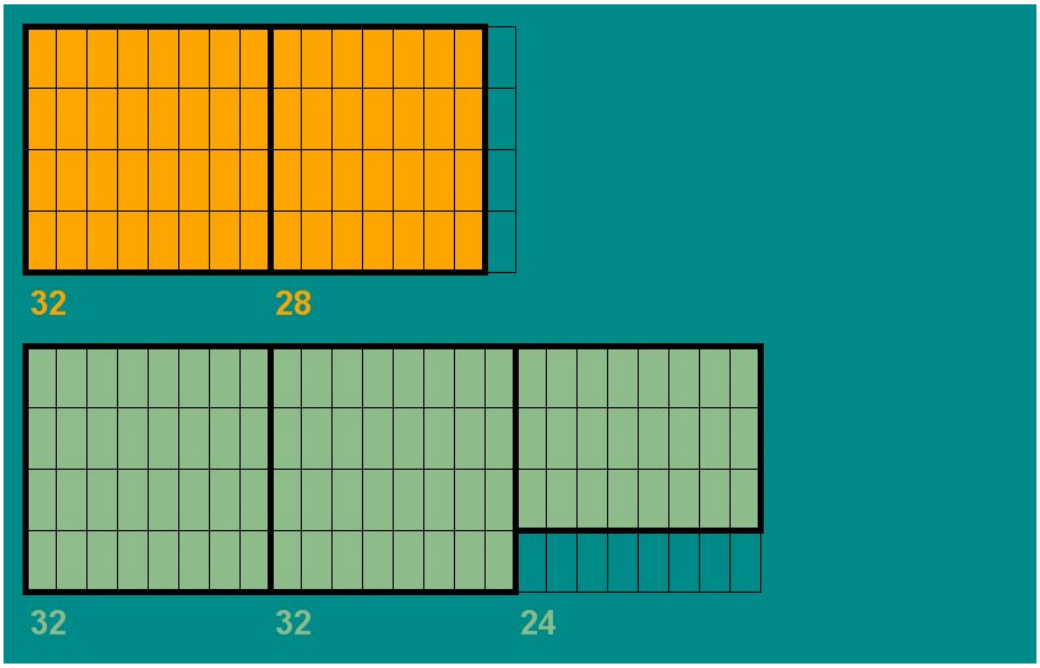
A friend of mine, who has pursued and succeeded in science, once said, “I almost gave up math when I reached fraction division in elementary school.” Her introduction to fraction division went somewhat like this – “Fraction division is the inverse of fraction multiplication. To divide 5/8 by 2/3 is to find that number which being multiplied by 2/3 gives 5/8 as the product. But the compound fraction 3/2 of 2/3 is 1. Hence we have the rule – find the product of the dividend and the inverse of the divisor.” The content within the quotes is copied from an unnamed, arithmetic text. You do not want to read this to your class. Instead, you can do NCAD and achieve enhanced performance and improved abilities from your students.

First, why do we "Need" to divide one fraction by another? Show a few examples of this need to your class. Ask all students to bring fraction division problems they need to solve and promise that all students will engage in solving their own problems.

Each batch of cupcakes requires 3/4 cups of cocoa. If you had 3 1/4 cups of cocoa, how many full batches of cupcakes can you bake and how much cocoa will you have left over?

Next, consider the "Concept" in Jane's problem where she wants to change the color of her fence from green to yellow. She used one and 7/8 quarts of yellow paint to cover two and 3/4 segments of her fence. How many quarts of paint cover one segment of the fence? Give your students yellow and green construction paper to do this exercise.





Screenshots from Actus Potentia's Arithmetic Software.
www.actuspotentia.com/Arithmetic.shtml

Jane used 60 pieces of yellow paint to cover 88 pieces of green fence. Therefore, one quart of yellow paint covers 88/60 (or one and 7/15) sections of green fence.

After the students get comfortable with this idea, move on to the "Algorithm" which is good for number crunching to arrive at the same conclusion as the construction paper exercise.

- Convert both the dividend and the divisor from mixed numbers into improper fractions.
- Invert the divisor
- Multiply the two numbers in the numerator and the two numbers in the denominator.
- Convert the resulting, improper fraction into a mixed number and bring to lowest terms

When students have any difficulty in the algorithmic steps, tell them the "Dependencies."

- Converting mixed numbers into improper fractions.
- Long multiplication
- Converting improper fractions to mixed numbers
- Writing fractions in lowest terms.

Students with insufficient abilities in the dependencies are then required to complete remedial work and practice on their own.

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