Developing Instructional Units: Applying What Students Learn

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The new Workforce Innovation and Opportunity Act (WIOA) requires adult educators to help adult learners prepare for the world of work, not just to pass a high-stakes assessment. The Common Core State Standards (of which the College and Career Readiness Standards are a subset) are designed to teach rigor: equal emphasis on procedural fluency, conceptual understanding, and application. And, research shows that learning in context is better than learning decontextualized material.

According to contextual learning theory, learning occurs only when students process new knowledge in such a way that it makes sense to them in their own frames of reference. This approach to learning and teaching assumes that the mind naturally seeks meaning in context and that it does so by searching for relationships that make sense and appear useful (CORD, p. 1).

So, the way to teach math to our adult learners is through experiences that are contextualized. Oh, but we already give them word problems every once in a while. Surely that will suffice for contextualizing the math, right?

Let's compare the following three examples so you can decide for yourself:

$16{,}000 \div 60 = ?$

Tamika plans to buy a car that costs $16,000. If she pays for the car over a 5-year period, how much will her monthly payments be?

Tamika is interested in buying a car. She learns that she can have a 4-year or a 5-year payment plan. She also finds out that putting money down up front will help with the monthly payments. What might be some possible scenarios for her? Which would be the best scenario for you if you were in a similar situation? Why?

One way to contextualize the math that you are teaching is to develop instructional units with the end goal being the application of learning. Wiggins and McTighe suggest a process that begins with the end in mind; they call this process Understanding by Design, or UbD. It is also called backward design. There are three steps to the process:

1. **Identifying the desired results**. What do we want students to be able to do with what they have learned? During this process, you should think about how students will use what they have learned in situations other than on 'the test' since,

ultimately, we all want our students to be able to apply what they have learned in our classrooms in their lives, on the job, and at home.

2. **Determining assessment evidence**. If we want to know whether our students know *when* to use multiplication vs. addition or subtraction and *how* to choose the most efficient strategy for the situation, then we need to provide assessment opportunities where students will have to make those decisions. You can create an assessment task that is directly aligned to the goal you developed in step 1. You can also include 'test-like' questions as part of your assessment plan so students gain comfort in using math in both real-life and test situations.

3. **Planning learning experiences and instruction**. Here is where you think about all the things you will need to teach in order for students to reach the goal you (and your students) have set. This is where some of those traditional lessons show up.

While the Understanding by Design process begins with a broad goal statement focused on application of learning, you might try narrowing the focus a bit until you get used to teaching and assessing in a more contextualized way. For example, according to Wiggins and McTighe, a goal statement could be something broad such as, "apply mathematical knowledge, skill, and reasoning to solve real-world problems" (pg. 3). However, it might be beneficial to think about a more concrete statement that specifies the target knowledge/skill, the math domain, and the task that requires the student to apply the knowledge/skill in order to demonstrate understanding. Here is an example of a unit goal statement using the car-buying scenario we saw earlier:

By the end of this unit, students will be able to apply their understanding of percentages and operations with decimals in order to describe several car-buying options.

By writing goal statements this way, you already have a clear idea about what the assessment should look like. The goal and the assessment are then nicely aligned. Now your challenge is to figure out all the lessons and learning experiences that you want to engage your students in to ensure that they gain a good grasp of the material. By the way, contextual learning does NOT mean that every single lesson has to be contextualized. By having a contextualized goal statement, students know how they are going to be applying their new knowledge and skills. But, you may have lessons and learning experiences that focus on conceptual understanding without any contextualization at all.

There are several ways that you can begin to develop instructional units. Let's look at two ways: starting with a skill and starting with a real-life concern for students.

Beginning with a skill.

Almost every adult education instructor teaches fractions, so let's begin there. Let's say you know you need to teach fraction operations to your students. You want them to be able to know when to multiply (or use another operation) and you also want them to understand that fractions are used in real-life. You probably already have many lessons that you use to teach operations with fractions. But, how do you assess their ability to use the appropriate operation in any given situation? A page of decontextualized fraction problems won't tell you whether students actually know the difference between multiplying and dividing fractions, but real-life situations will.

So, what might be some scenarios in which fraction operations might be used? Before reading on, you might want to jot down your own sample unit goal statements.

Multiplication? Division? Subtraction?

At the end of the dinner, there was half a pie left in the refrigerator. Sam decided to cut himself a 1/3 of what was left later that night. How much of the original pie was left by morning?
vs.

At the end of the dinner, there was half a pie left in the refrigerator. Sam decided to share the rest of the pie with his two friends. How big of a slice did Sam and his two friends each get?

Here are a few examples of goal statements illustrating real-life application of fractions:

By the end of this unit, students will be able to apply their understanding of fraction operations in order to make several batches of dog biscuits for the local animal shelter.

By the end of this unit, students will be able to apply their understanding of fraction operations and skill in using tape measures in order to calculate various attributes of building components.

By the end of this unit, students will be able to apply their understanding of fraction operations, area, and perimeter in order to design a patio using various sizes of bricks.

By the end of this unit, students will be able to apply their understanding of benchmark fraction operations in dispensing liquid medications.

By the end of this unit, students will be able to add, subtract, multiply, and divide fractions and write and interpret numerical expressions in order to create a business plan for a small pizza restaurant.

By the end of this unit, students will be able to use fractions on a ruler and convert centimeters to inches in order to create a dream home or home improvement plan in the most cost-effective way as empowered consumers. They will share their plans with the class by presenting posters, photographs, or other representations of their project unique to their household.

Beginning with students' concerns
Another way to build instructional units is to first think about real-life concerns of students, then back into the math that needs to be taught. Do a quick brainstorm yourself, jotting down all the things that are important to your students.

I recently asked a group of teachers to do likewise, and here are some of their ideas:

Childcare issues
Need a better job
Making ends meet until the end of the month
Health care
Car issues
Caring for family

Look at your list and the one above. Are there any topics that could have a math focus? Are there any that do NOT have a math focus?

Once you have decided on a topic of interest to your students, you need to think about some scenarios. Let's use the childcare example to brainstorm some potential situations that students might want to address:

Cost per child?
Does age of child matter?
Does it make a difference if I pay weekly vs. monthly vs. yearly?
What about issues related to my ever-changing schedule? Does this impact cost?
How far from work (or home) is the childcare facility?
Are there tax credits that support childcare costs? How do these credits work?

For any of the questions above, the numbers and amount of data given to students (hopefully they would collect their own information from their local community) could be adjusted so that students at various levels could all engage in the topic. Let's look at three different instructional unit goal statements to show how a similar issue related to childcare costs could play out, depending on the students' math level. (I'm including in parentheses some examples of CCR Standards that might be taught in the unit and then applied to each of the final tasks.)

ABE level: *By the end of this unit, students will be able to apply their understanding of whole number operations and simple bar graphs in order to determine which of two childcare options is less costly*. (Possible CCR Standards applied: Represent and solve problems involving multiplication and division.: 3.OA.1, 3.OA.2, 3.OA.3, 3.OA.4; Understand properties of multiplication and the relationship between multiplication and division.: 3.OA.5, 3.OA.6; Represent and interpret data.: 1.MD.4.)

Pre-ASE level: *By the end of this unit, students will be able to apply their understanding of fractions, percentages, and circle graphs in order to create two different budgets based on different childcare options*. (Possible CCR Standards applied: Perform operations with multi-digit whole numbers and with decimals to hundredths.: 5.NBT.6, 5.NBT.7; Extend understanding of fraction equivalence and ordering.: 4.NF.1, 4NF.2; Build fractions from unit fractions by applying and extending previous understanding of operations on whole numbers: 4.NF.3; Understand ratio concepts and use ratio reasoning to solve problems.: 6.RP.1, 6.RP.2.)

ASE level: *By the end of this unit, students will be able to apply their understanding of algebraic reasoning and functions in order to show with graphs and equations which childcare option is the best deal (based on cost only).* (Possible CCR Standards applied: Generate and analyze patterns.: 4.OA.5; Reason about and solve one-variable equations and inequalities.: 6.EE.6, 6.EE.7; Represent and analyze quantitative relationships between dependent and independent variables.: 6.EE.9; Understand ratio concepts and use ratio reasoning to solve problems.: 6.RP.3; Analyze proportional relationships and use them to solve real-world and mathematical problems.: 7.RP.1, 7.RP.2; Understand the connections between proportional relationships, lines, and linear equations.: 8.EE.5.)

Developing instructional units, starting with real-life student concerns or specific math content, can help you as an instructor become more mindful of situating the math that you teach in activities that require students to apply what they have learned.

References:

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