An Example of a Teacher Work Sample:

A Unit on Perimeter and Area for 6th Grade Advanced Math

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Contextual Factors

This unit was developed for a sixth grade Advanced Math class on block scheduling at a large, diverse middle school in central Florida. The curriculum for the Advanced Math course is designed for students that perform at or above grade level in math. This school also offers sixth grade Honors Pre-Algebra I, the first half of a two-year program designed to prepare students to take Algebra I in the eighth grade. Most students that are high-achieving in math (i.e., that score a 5 or a high 4) are placed in this other course. Thus, the Advanced Math courses contain students who scored at achievement levels 3 and 4 on the fifth grade math FCAT. My supervising teacher teaches three Advanced Math sections, one section of Honors Pre-Algebra I, and two remedial math classes for students who have not passed the FCAT. This TWS will include the students for the three Advanced Math classes, since these classes will all receive the same pre and post assessment.

The school serves about 1400 students from a diverse metropolitan area. The school serves a semi-urban area where many residents work in the tourist industry, or in a variety of related businesses providing goods and services. In the school, 51.7% of the students identify themselves as Hispanic; 27.4% as White, Non-Hispanic; 12.1% as Black, Non-Hispanic; 2.8% as Asian or Pacific Islander; 0.4% as Native American, and 5.6% as multiracial. At this school, 20.8% of the students are identified as ELLs, 13.6% of the students receive ESE services for a disability, and 67.9% of the students qualify for free or reduced price lunch.

My classes are very similar to the demographics of the school. Based on the data available to the teacher through the grade book system, of the 65 students in these three classes, 32 are identified as Hispanic, 19 as White or Caucasian, 10 as Black or African-American, and 4
as Asian. Nine of these students are identified as ELLs currently receiving ESOL services, while 4 students receive ESE services, and one is in tier three of the Response to Intervention (RtI) process. The ELLs in these classes all function at intermediate or advanced levels of English language proficiency. Spanish is the first language for 6 of these ELLs, while two students were raised speaking Haitian Creole, and one student originally spoke Vietnamese.

The IEPs of the four students receiving ESE services indicate the nature of their disabilities. Three students have language-related specific learning disabilities that hinder their reading comprehension and writing abilities. One has a mild Autism Spectrum Disorder (ASD) that affects his interaction with others and may cause him to feel overwhelmed and overstimulated in noisy or chaotic situations. The student in RtI is under evaluation for a suspected emotional behavioral disorder.

My supervising teacher’s classroom is a portable classroom. The desks are arranged in groups of four or five, with a projector and space for the teacher’s laptop computer in the center of the groups. Because this class is held in a portable, there is no wireless network to provide internet access to the computer that is connected to the projector. The room also has no computers for student use, but there are two separate work stations with two desks each and one desk by itself, where students can work in pairs or individually. There are also a variety of mathematics manipulatives in the room, and more available from the math department workroom.

The arrangement of the desks and the available manipulatives will allow me to use some hands-on learning activities. With the projector and laptop always in the room, and with my supervising teacher’s wireless presentation remote, it should also be relatively easy for me to use presentations to give instructions, show visualizations of concepts. I will not be able to use any
interactive online resources, though. The contextual factors of the class also suggest that I should offer images, visualizations, and non-linguistic representations of concepts whenever possible because of the language-related disabilities and ELLs in the classroom.
Learning Goals

The goals for this unit are based on the Next Generation Sunshine State Standards for sixth grade that relate to perimeter and area. All of the students in these classes performed at or above grade level on last year’s FCAT, so these standards should be appropriate for this group of students. Since the FCAT typically uses word problems, I will also use word problems in my classroom activities and assessments. In order to support the ELLs in the class, I will include clearly labeled visual aids or diagrams for each word problem. I may also have to support the students with language impairments and teach them specific strategies to deal with the word problems.

The specific learning goals for this unit are as follows:

1. The student will understand and be able to explain the concept of $\pi$, list common estimates of $\pi$ (3.14 and 22/7), and use these values to estimate and calculate the circumference and the area of circles (Next Generation Sunshine State Standards: MA.6.G.4.1).

2. The student will analyze composite, complex, irregular two-dimensional figures, including non-rectangular (such as triangular and/or semicircular) parts to develop methods to calculate the perimeter and area of those figures and evaluate the methods developed by others (Next Generation Sunshine State Standards: MA.6.G.4.2).

3. The student will develop methods to find a missing dimension of a plane figure given its area and some of the dimensions, and assess the accuracy of their methods and the methods of others (Next Generation Sunshine State Standards: MA.6.G.4.3).
For all of these goals, I will consider that a student has mastered the goal when she or he consistently demonstrates 80% accuracy on exercises, skills, and calculations related to that goal. Although each goal has several sub-skills that may be assessed separately, my pre and post-assessments and any other assessment that is supposed to determine mastery will assess all parts of the goal as much as possible. These goals will also be assessed by applying the knowledge and skills taught as realistically as possible.
Assessment Plan

My supervising teacher uses mini quizzes, with three or four questions, about once per week to assess the students on material they have studied recently and as part of their final grade. I will continue to use this system, since these students are accustomed to it, but I will also use informal questioning and some of the unit’s learning activities to help me assess the students’ understanding of the material.

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In order to properly accommodate for ELLs in this classroom I will be teaching specific academic vocabulary using simple definitions paired with non-linguistic representations of the terms. These instructional techniques will not assist these students on the pre-assessment, however. I will make sure to provide a copy of my Pre/Post assessment to the ESOL Compliance Specialist for help in translating key portions of the instructions and of items into the native languages of my ELLs. I plan to have these translated portions available to assist these students, if needed. I will also allow all students to ask me to read parts of the assessment for them. This will allow me to simply read the assessment as written for any student that does not require accommodation, and to paraphrase or explain further for those students that are having trouble with the language. I also plan to allow my ELL students and my students with language related
disabilities to explain their answers orally, as needed. The student with ASD and the student in RtI also get extended time and/or an alternate assessment location on request.
Perimeter & Area Unit Assessment

Answer the questions below. Use the blank space or the back of this sheet to write out any work that you do. Be sure to put your final answer in the blank provided.

The Radigans are putting tile in their family room, pictured to the right. They want to have enough tile to cover the floor, and also put a tile border all the way around the room on the walls.

1) How many square feet of tile will the Radigans need to cover the family room floor? \( \text{LG2 192 ft}^2 \)

2) What length of tile border will the Radigans need to go on the walls around the entire room? \( \text{LG2 60 ft} \)

3) What is the area of the figure to the left? \( \text{LG2 42.85 cm}^2 \)

4) Rebecca wants to put up a fence around an area in her yard for Buffy, her dog. She wants Buffy's play area to be just as long as the side of her house, which is 18 ft long. If Rebecca only has 50 feet of fence, how wide can she make Buffy's play area? \( \text{LG3 7 ft} \)

5) Luis has some cylindrical pots to put his plants in that are 12 inches in diameter. He thinks they are too plain the way they are. He decides to decorate them by putting ribbon around them, but he can only order ribbon by a number of whole feet in length. How long must he order each piece of ribbon to go all the way around one pot? \( \text{LG1 4 ft} \)

6) What decimal value can you use for \( \pi \)? \( \text{LG1 3.14} \)

7) What fraction can you use for \( \pi \)? \( \text{LG1 } \frac{22}{7} \)

8) In the space below, describe what \( \pi \) is and what it is used for. \( \text{LG1} \)

Ratio of circumference to diameter (distance across a circle to distance around a circle) used to calculate the circumference and area of circles

NOTE: This example of a TWS only shows one page worth of assessment items. This unit assessment would actually have 30 total questions, with ten for each learning goal.
Design for Instruction

The students in my classes scored an average 31.2% on the pre-assessment and no student demonstrated mastery of any of the learning goals. This tells me that my students have some familiarity with the concepts that I plan to teach them, but that my learning goals are not too easy for them. Clearly, my students should not show mastery of learning goals that haven’t been taught to them, but the fact they were able to show some correct understanding of the content means that I haven’t made my unit too difficult either. I want to avoid causing frustration for my students since, especially with math, such frustration might cause them to shut down and become demotivated.

The pre-assessment also showed me that many of these students know how to find the perimeter and area of simple shapes when the information that they need is given to them in a simple diagram. The kinds of questions that were most frequently answered correctly required one-step calculations that used clearly labeled diagrams of simple geometric shapes that asked for either the perimeter or area. Students had a much tougher time applying these skills in more complex problems. If the question used a complex shape, if they needed to use multiple steps and formulas, or if the information they needed was in a word problem, students were much more likely to get it wrong.

These results told me that I didn’t need to spend too much time teaching them what perimeter and area are, but that I really needed to teach them how to use that knowledge in more complex ways. I also need to teach these students how to approach word problems better. I always planned to use the first day to introduce vocabulary, formulas, and practice some simple problems. After seeing my pre-assessment results, though, I think will spend more time on all the different ways that perimeter and area can be described in word problems. I’ll also spend some
time teaching students specific strategies for chopping up composite shapes into more manageable pieces.

The unit will follow the general timeline below. For more detail, I have attached my lesson plans (NOTE: This example of a TWS does not have detailed lesson plans attached).

- **Day 1:** Unit Introduction (all LGs) – vocabulary, formulas, & word problem strategies
- **Day 2:** Finding and Applying Pi (LG1) – an activity calculating pi in small groups by wrapping string around cylindrical objects to measure their circumference, and another activity cutting up construction paper circles and arranging the pieces in a parallelogram to find its area
- **Day 3:** Mini Quiz 1 (LG1 & LG2), Composite Shapes (LG2), & Missing Measures (LG3) – strategies and practice breaking complex, composite shapes into smaller ones to find perimeter and area, and using formulas in reverse to find missing measurements
- **Day 4:** Campus Geometry (LG1 & LG2) – activity with a partner using meter sticks to measure designated parts of the campus or the school building
- **Day 5:** Mini Quiz 2 (LG2 & LG3) and Unit Review and Practice (all LGs) – review and individual practice on all learning goals and concepts
- **Day 6:** Unit Post-assessment (all LGs)
**Instructional Decision Making**

**Example One:** The first example of a time that I had to adjust my instructional plan came when I had the students do the Applying Pi activity. When I did this exercises with my first block class, the students seemed to have a really hard time with the instructions. When I asked them to cut up the construction paper circles and arrange them with the points of each wedge in alternating directions to make something that looks sort of like a parallelogram, they were clearly confused. The written directions had a few drawings that I thought were pretty clear, but they were not as clear as I had hoped. During first block, several groups of students seemed confused and started to get frustrated. The ELLs in this class especially seemed to have difficulty with the written directions, even though the EELs were in groups with native English speakers as well. It seemed that the students’ confusion and frustration started to get them agitated. I feared that the noise level and chaos may start to over stimulate and overwhelm the student with ASD.

I stopped the class as soon as I realized the confusion so that I could demonstrate the activity and clarify the directions. As I showed them what they needed to do step by step, I began to hear students saying things like, “Ooohh,” and “I get it.” During the planning period that comes right after this class, I added some additional slides to my instructions that I use at the beginning of class, and pre-cut a series of construction paper circles to illustrate each step. This made the instructions much more clear for my third and fourth block classes, and helped the students get more out of the activity. Because the instructions were better, the students needed less time to complete the activities. This left more time for us to compare everyone’s results and process through the activity to help build their understanding of using π to find a circle’s perimeter and area.
Example Two: The second time that I needed to adjust my plan came when I taught the students how to find the missing dimensions of a shape given its perimeter or area, and some of the other dimensions. My supervising teacher told me to think of each block as two class periods that happen back to back. I followed this advice, and planned to use day 3 to teach two lessons; one on finding the perimeter and area of composite shapes, and the other on finding the missing dimensions of a shape when given some of its dimensions and the area or perimeter. Each lesson was supposed to have a short assignment that the students would begin to work on in class and finish for homework. I used the time while students worked on the practice exercises in class to circulate around the room and check their understanding of each concept.

The students seemed to understand the lesson on composite shapes well, and their performance on the practice exercises confirmed that. Unfortunately, the students performed poorly on the Missing Measures practice exercises. The problem seemed to come from the algebraic thinking required for students to use the formula for the perimeter and area to find one of the other values. It wasn’t natural for them to “use the formula backwards” like I suggested. They also seemed to have a hard time using division to reverse multiplication, and using subtraction to reverse addition. The practice exercises confirmed that they were having a hard time with it.

As I discussed the lesson with my supervising teacher later that day, I suggested that I should delay the unit review and post-assessment, and include another lesson that focuses on the algebraic thinking required to solve these kinds of problems. She agreed. I planned a lesson for the first part of the block that taught students how to reverse mathematical operations, and a lesson for the second part of the block that applied those skills more naturally to the kinds of problems that go with Learning Goal 3. This was the reinforcement that many of these students
needed, and the students did much better with the Missing Measures exercises after that. I gave
the students the opportunity to redo and resubmit the Missing Measures assignment with no
penalty to their grade. Several of the students took the opportunity, and all of the ones that turned
in the assignment again completed it at or above the mastery level of 80%.
Analysis of Student Learning

The pre and post assessment results definitely show that my students increased their understanding of perimeter and area. The class scored an average 79.9% on the post-assessment, which was an increase of 48.7 points from the average pre-assessment score of 31.2%. Individual students increased their scores by anywhere from 23 points to 70 points. The graphs on the next pages show the individual student scores on the pre/post assessment for each student in the three classes in which I taught this unit.
Before instruction, none of my students demonstrated mastery of any of my learning goals. At the conclusion of my unit, 63% of my students had demonstrated mastery of Learning Goal 1, 76% had mastered Learning Goal 2, and 45% of my students had mastered Learning Goal 3. Also, 25% of my students demonstrated mastery of all three learning goals, and only 8% had not shown mastery of any of them. Since so few students have shown mastery of all three goals, I plan to incorporate some review exercises in our assignments for the remainder of my time with them. This will give me an opportunity to continue to review these concepts with the class as a whole, and will give the students some much needed practice.

My cooperating teacher sometimes does what he calls, “Extension Days” after a unit of instruction. These days feature fun, challenging, group enrichment activities that provide advanced practice and application of the content of the unit. He told me that he had a few activities on file that might work with my unit and suggested that I include an Extension Day in next week’s plan. This would allow me to reinforce my students’ learning and pay close attention for gaps in understanding that need filling. For the 5 students that had mastered none of the goals, I will watch for opportunities to directly support them and provide remediation. If they do not engage in the activity or appear to get frustrated, I can also pull them aside for some direct one-on-one instruction.

Two students in my classes failed the post-assessment. One of these 2 students (S60) was an ELL that was very resistant to instruction throughout the class and did not complete most of her assignments. I attempted several times to determine what the problem might be and offer my support. I even called her in from her elective classes to try and complete her work. She did not respond to my efforts. As we discussed the post-assessment results together, my cooperating teacher told me that an ELL receiving ESOL services cannot receive a D or an F as a final grade.
in a course unless a) it can be verified that the poor performance is not the result of a language problem, and b) a conference was held with the parents and the ESOL compliance specialist during the first semester. In hindsight, I should have made contact with her parents and worked with them as soon as I noticed the problem.

The other student that failed (S14) was the student in RtI for a suspected Emotional Behavioral Disability. This student seemed to do well throughout the entire unit. He seemed to understand the instruction and did well on his assignments. Unfortunately, on the day of the post-assessment, he was upset because of an incident in a previous class and was not interested in doing careful work. He may have shown more improvement if he was allowed to take the assessment at a later date.
Evaluation and Reflection

Overall, I think the unit was a success. I think it was important that I decided to use word problems like the FCAT uses that require multiple steps to find the answer. It required more work for me, but I think it made a difference in student learning. I think one of the reasons the pre-assessment scores were so low is because my students haven’t been asked many complex, multi-step problems in their math classes before. I did use a few practice exercises from the book as we learned individual skills in each lesson. By keeping my focus on the ultimate goal of complex, multi-step word problems, though, I didn’t decide that the students had “gotten it” until I had them show me that kind of mastery. I did have to break down these kinds of problems into smaller steps and teach my students how to analyze them, but I think the kind of assessments that I used and the results that my students got on them shows that it worked. I think that my ability to keep instruction and learning activities focused on the application and real-world use of the skills I’m teaching is one of my strengths as a teacher.

As I reflect on my experience with the TWS, I also notice some areas where I can grow as a teacher. When I look at post-assessment data for ELLs, I notice a weakness of mine. On the post-assessment, the ELLs in my classes scored an average of 67.9%, which is 14.5 points lower than students who are not receiving ESOL services. Also, none of my ELLs showed mastery of all three learning goals. I need to pay attention to this difficulty. I plan to read about effective ESOL accommodations and attend some workshops to help me grow in these skills and become a much more effective teacher.

One of the main things that I learned from this unit is that if we want our students to use higher-order reasoning to solve complex, multi-step, real-world problems, then we have to teach them those skills. Just because a student understands all of the separate skills that a complex
problem requires doesn’t mean that they will naturally be able to string those skills together on their own. Students must be taught how to analyze complex problems, how to break those problems down into more manageable steps, and how to figure out which skills to apply to each step. Drill and practice pages don’t accomplish this level of understanding.

I think this lesson is reflected in my most effective and my least effective learning goal. Learning Goal 2 was my most effective learning goal, with my students scoring an average of 83.8% on these items and 76.9% of my students demonstrating mastery. Both values were the highest of any of my learning goals. I think that Learning Goal 2 was so effective because I planned from the beginning to teach my students how to work through complex, composite figures. Since I specifically taught them the problem solving techniques that they would need for these kinds of exercises, my students were much more proficient at using them.

Learning Goal 3 was my least effective learning goal, with my students scoring an average of 74.3% on its items and only 44.3% of them demonstrating mastery. As I discussed in my second example of instructional decision making, I did not start by explicitly teaching my students how to use algebraic reasoning to approach these kinds of problems. By the time I went back and tried to fix my error, though, I think some of the damage had already been done. All of the students that chose to resubmit the Missing Measures assignment demonstrated mastery of that Learning Goal, but far too few students took the opportunity for the additional practice. If I teach a similar unit again, I will definitely start with algebraic thinking, and then apply it to geometry. I think that will have much better results.