Long Division – Before Lesson Plan

Subject: Mathematics  Grade level: 5  Time: 1-2 days

Objectives:
1. Students will divide three-digit whole numbers by one-digit divisors using the US standard algorithm for division

Prior Knowledge: Students will have already learned how to estimate quotients and are familiar with the terms “dividend” and “divisor”.

Suggested procedure:
1. Share with students that they will learn how to use the US standard algorithm for solving long division problems.
2. Connect math objective to relevance for students.
   a. Ask: When, in your own life, do you use long division? How might this lesson be important to you?
   b. Provide opportunity for students to share ideas and connections.
3. Provide students with a simple story problem involving long division.
   a. Example: A fifth-grade class collected $108 to share equally among 4 charities. How much will they donate to each charity?
   b. Have students explore how to solve this problem.
   c. Encourage students to share the strategies they used to find the answer to this problem.
4. Model and demonstrate how to use the US standard algorithm for division to solve this problem.
   a. Example: 432 ÷ 6
5. Have students make up their own long division story problem that includes a 3-digit dividend and 1-digit divisor. Then, have students share their story problems and have the class complete the division problems using the US algorithm modeled in class.
6. Provide additional practice problems for students to complete including long division story problems. Students must show their work (each step of the US algorithm) along the way.

Evaluation:
Give students an assessment covering the skill of long division. Provide basic computational problems (i.e. 235 ÷ 9) and long division problems within multi-step story problems involving 3-digit whole numbers and 1-digit divisors.
Long Division – After Lesson Plan

Subject: Mathematics  Grade level: 5  Time: 2-3 days

Objectives:
1. Students will divide three-digit whole numbers by one-digit divisors using the US standard algorithm for division
2. Students will learn other long division algorithms from around the world (focusing primarily on algorithms from students within the classroom if applicable)
3. Students will be able to explain the similarities and differences among the algorithms
4. Students will gain a greater appreciation for the variety of ways math problems can be solved and for the challenges others may face when having to learn a new skill/concept for the first time

Prior Knowledge: Students will have already learned how to estimate quotients and are familiar with the terms “dividend” and “divisor”.

Suggested procedure:

Day 1:
1. Share with students that they will learn how to use the US standard algorithm for solving long division problems in addition to other long division algorithms from around the world.
2. Connect math objectives to relevance for students.
   a. Ask:
      i. When, in your own life, do you use long division?
      ii. How might this lesson be important to you?
      iii. Why do you think different countries have different methods/computational procedures for solving long division problems?
   b. Provide opportunity for students to share ideas and connections.
3. Provide students with a simple story problem involving long division.
   c. Example: A fifth-grade class collected $108 to share equally among 4 charities. How much will they donate to each charity?
   d. Have students explore how to solve this problem.
   e. Encourage students to share the strategies they used to find the answer to this problem.
4. Model and demonstrate how to use the US standard algorithm for division to solve this problem.
   f. Example: 432 ÷ 6
5. Have students make up their own long division story problem that includes a 3-digit dividend and 1-digit divisor. Then, have students share their story problems and have the class complete the division problems using the US algorithm modeled in class.

6. Provide additional practice problems for students to complete including long division story problems. Students must show their work (each step of the US algorithm) along the way.

Days 2-3:

1. If your classroom includes students from other countries that are familiar with other algorithms for long division, have students share how they would solve the math problem from yesterday ($108 \div 4$) using other algorithms from around the world.
   a. If students within your classroom are not familiar with other algorithms for long division, be prepared to share 2-3 algorithms yourselves (may include, but not limited to Russian, Korean, Chinese algorithms) OR prior to this lesson, ask students to go home and explore long division algorithms from their parents’ home country. It may be that their parents know the algorithm and can teach it to their child, or they can go on Internet and explore for themselves.
   b. Encourage students to explain the steps involved in the algorithm

2. Provide students with the opportunity to practice solving long division problems using the algorithms they learned from their peers (or from the teacher). Encourage students to pick at least one new algorithm to practice in class.

3. After learning some other algorithms for division, have students get into groups and come up with a list of the similarities and differences between the algorithms. Have students compare other countries algorithms to the US algorithm and make comparisons between other countries as well.
   a. Have students complete this activity using large sheets of butcher paper that can be hung on the walls of the classroom.

4. Have students, in their groups, complete a “gallery-walk” by having them each visit groups recording sheets for comparing and contrasting the various algorithms.

5. Then, have students come back whole group and share some of the observations they noticed as they observed each other’s work.

Evaluation:
Give students an assessment covering the skill of long division. The assessment will include basic computational problems (i.e. $235 \div 9$) and long division problems within multi-step story problems involving 3-digit whole numbers and 1-digit divisors. Students will be required to demonstrate they are proficient in using the US long division algorithm (as required by Washington state standards), but will also demonstrate their understanding of at least one other
algorithm learned in class. Additionally, students will be asked to explain the similarities and differences between the US standard algorithm for long division and the other algorithm they chose to use on the assessment. Lastly, students will reflect and respond to an open-ended question regarding how learning different long division algorithms helped them as learners.

**Rationale For Changes**

In fifth grade, students are required to know how to perform the US standard algorithm for long division. Students are asked to perform this specific algorithm on the Washington state math assessment (currently the MSP). However, as we know in math, there is always more than one right way to solve a problem. Because every classroom includes students with a variety of learning styles and cultural backgrounds, it is important to allow students the opportunity to explore different strategies, in the hope that each student will find strategies and methods to solve math problems that work for them. Our ultimate goal as educators is to help our students not only be successful in learning the academic content, but help them to become life-long learners. If that is our goal, then we must not limit our students to one single method or process when learning a new skill or concept. In fact, the reason some students have a genuine dislike for math is because they feel it is hard and confusing. This is, in part, due to the fact that we (educators) have become so focused in teaching one “correct” method to solve certain math problems, like the US algorithm for long division, because that is what is required on the state standardized test, or MSP.

In the school in which I work, the make-up of the students in my classroom each year is incredibly diverse. I have students from around the world, including China, Korea, Japan, Philippines, Russia, Poland, England, India, and Mexico. Many of my students are already familiar with other algorithms for long division and, if given the opportunity, would eagerly share these other methods for solving division problems.
In the past, I have tended to hesitate to include other algorithms for learning long division for fear that students, especially those who struggle in math, would only get more confused when introduced to other methods. In the end, I worried that my students would not perform as well on the final topic test and on the MSP in the spring. However, after deep reflection on what I’ve learned from this course, I have come to realize that, in fact, allowing students to explore multiple algorithms from around the world would actually help all of my students strengthen their understanding of division in general, but also strengthen their understanding of the US standard algorithm they are required to know for the MSP. If you can teach a skill to someone else, you will end up having a deeper understanding of it yourself. So, by providing my students with the opportunity to teach their classroom peers other algorithms they are familiar with will help my students to deepen their own understanding of this concept. Furthermore, as students explore and learn about other division algorithms, they may find a different method that makes more sense to them. Then, through the process of analyzing the different algorithms and having a discussion on the similarities and differences among those algorithms may help my students make connections to the algorithm they do understand with the US algorithm they didn’t understand previously. My “Before” lesson plan never really allowed students with the opportunity to explore long division or analyze the process; however, my “After” lesson plan does provide students with this opportunity.

An additional goal/objective I would hope to come out of my “After” lesson plan is one where students are more appreciative of the variety of ways students learn and perhaps help my students to gain a greater appreciation for others who struggle to learn a new skill or concept. In math, I always have a wide range of ability. I have some students who pick up on new math concepts quickly while other students struggle to master their basic facts. The week focused on
Attitude during this course came to mind when revising my lesson plan to be more culturally responsive. During that week, I was reminded of the idea of “white privilege” while reading, “Unpacking the Knapsack”. The article focused on racism and made me think about my students who struggle in math. When I only allow one way for students to solve a math problem, in this case the US standard algorithm for long division, I am preventing certain students from being able to access the material if that method doesn’t make sense to them. This can create a negative view of math by certain students. By providing a variety of ways to learn the math concept through the examination of other division algorithms, I am allowing my students to learn in a way that helps them best. Additionally, by providing my students the opportunity to share other algorithms, my struggling student who may not understand the US algorithm, may understand a different method and can become the “expert” in teaching it to the rest of the class, thus boosting his/her confidence in math. Likewise, my students who tend to do well in math, may for the first time, experience what it is like to not understand something right away as they learn something unfamiliar to them, thus helping them to gain a greater appreciation for the challenges other students face when learning something new or foreign.

Another big idea I took away from this course came from our week on Access. In reviewing important strategies to use with students, I was reminded of making sure what I’m teaching is connected to the interests of the students in my classroom. In math, I always have students who want to share a different way, “their” way, to solve a math problem. By including specific opportunities for students to share other strategies to solve long division math problems, I am able to build off of my students’ interests, curiosities, and eagerness to share a method that connects to them.
The week on Materials was another area that I could connect with when changing my lesson plan to be more culturally responsive. My students’ math textbook, adopted by my school district, focuses on strategies and processes that are specific to the United States and what would be described as a more “traditional” approach to learning math with an emphasis on the memorization of algorithms to solve math problems. In recognizing this fact, I need to be more intentional in addressing this bias. By including the opportunity to learn about other algorithms or strategies for long division, I am better able to address this bias within the textbook.

Yet another important message I took away from this course, which informed the changes I made to my long division lesson plan, was from the week on Communication. Through the readings, online lecture and discussion posts that week I was reminded how important and valuable it is to acknowledge my students’ cultural backgrounds and languages, which may be different from the dominant culture. One big take-away I had came from the readings in learning of the stories of the Navajo, Hualapai, Maori, and Hawaiian cultural groups who set up schools and learning communities that fostered an educational experience that allowed those students to learn in their native language. Those students thrived when provided an alternate way to learn in school. I realized in my original lesson plan that nowhere did it provide students the opportunity to learn long division in an alternative way. Every year, I have students who struggle with long division. By providing students with a variety of methods to explore this math concept, I am opening the opportunity for my students to see math differently, and hopefully, allow all of my students to understand the concept better in the end.

Our most recent focus on Parents and the Community also resonated with me when developing a more culturally responsive lesson plan. I realized that this lesson, when including the opportunity to explore and learn about other long division algorithms or strategies, would
allow my students to include their families in the learning process. In my “After” lesson plan, students would be encouraged to go home and talk to their parents about the methods they were taught in school. This provides a powerful link from home to school and visa versa and can help to foster a classroom community that includes the unique cultures present within my classroom.

Throughout this course, I have been exposed to so much important learning with regards to being culturally responsive within my classroom. I am leaving this course with a greater understanding and appreciation of what it means to be culturally responsive; and through this assignment, I was able to practice the steps involved in reviewing my lessons, making appropriate changes based on the theories/concepts I learned throughout this course.