



Lesson Study: Collaboration among Middle School Mathematics Teachers of Latino Students

Cynthia O. Anhalt, Laura Farias, Salvador Farias,
Josie Olivas, & Melanie Ulliman

Abstract

This lesson study experience occurred within a partnership between mathematics educators and four middle school mathematics teachers of ELLs. The lesson focus was addition of fractions of unlike denominators. The students were given opportunities to think individually and then work with a partner using fraction bars to explain and justify their solutions.

Discussion And Reflection Enhancement (DARE) Pre-Reading questions:

1. Reflect and brainstorm effective teaching practices that you are familiar with for teaching mathematics. Share with the group and find commonalities and differences in the approaches shared.
2. Share specific strategies and practices that you are familiar with for effectively teaching Latino students in your school.
3. Share what you know about Lesson Study. What are its components? Discuss the potential professional growth in participating in a lesson study cycle.

“DARE” Post-Reading questions appear at the end of the article. This article (without DARE questions) originally appeared in Spring 2007 *Noticias de TODOS*.

Cynthia O. Anhalt (canhalt@math.arizona.edu) is Instructional Faculty at the University of Arizona, in the Department of Mathematics, and the Director of the Secondary Mathematics Education Program. Lesson study was a research project with the Center for the Mathematics Education of Latinos/as (CEMELA, NSF Award No. ESI-042983) and with Chaparral Middle School mathematics teachers **Laura Farias, Salvador Farias, Josie Olivas, and Melanie Ulliman**.

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Lesson study is a collegial form of professional development, based on the Japanese model of “*kenkyuu jugyou*” -- or research lessons. In the US, lesson study focuses primarily on mathematics, while in Japan it is also used for other subject areas. Lesson study allows teachers to examine each other’s approach to teaching subject matter, in order to collaborate and improve the overall teaching experience in the school. Common characteristics include:

- shared goal for improvement
- focus on learning of a specific aspect of academic content
- oriented toward gathering evidence on students’ learning, engagement, and treatment of one another as a result of the teacher’s lesson, in order to examine student thinking, or “the eyes to see children (*kodomo wo miru me*).”
- based on shared observation of actual lessons in progress. Videotape, written cases, lesson plans, photographs, and student work are used to aid teachers in analysis and improvement of instruction.

In the fall of 2006 in Arizona, middle school mathematics teachers of predominantly Latino students teamed up with a researcher at the Center for the Mathematics Education of Latinos/as [CEMELA] to examine effective strategies in teaching mathematics. The project centered around a lesson study cycle.

We followed the traditional lesson study structure that allowed all of us to design a lesson. Then, each of the participating teachers taught the lesson while the rest of us on the team observed during the teaching. Each rendition of the lesson contained modifications based on the team’s feedback and debriefings. Our discussions and negotiations that took place on what constitutes effective teaching were based on and influenced by our individual teaching experiences, as well as on the book *The Teaching Gap* (Stigler & Hiebert, 1999). Our overall goal for the evolving lesson was for students to initially think independently and then to collaborate with a partner to arrive at a solution.

Adding Fractions

The lesson involved addition of fractions with unlike denominators, which the middle school students had not worked on yet this year. First, students were given the following word problem:

Cecilia uses $\frac{2}{6}$ pound of cheddar cheese and $\frac{1}{4}$ pound of mozzarella cheese to make nachos. How much cheese does she use in all?

Students were initially given time to think independently. Most of them readily added the fractions by adding the numerators and by adding the denominators, and wrote down a solution of $\frac{3}{10}$. After discussions took place among partners, only a few pairs of the students changed their solutions to

7/12, recognizing that it was necessary to find a common denominator. Not until additional hands-on tools were provided to students, namely fraction bars, did they begin to think critically about their approach, since they had to “justify” their solutions using the fraction bars. It was at this point that most of the students were able to make connections between the fractions, the fraction bars, and why they needed to find a common denominator to solve the problem.

Making Sense of Mathematics

Our reflections on this lesson involve issues surrounding teaching mathematics to Latino English Learning students. By allowing students to make mistakes initially (adding the numerators and the denominators) we were able to accomplish a salient goal of observing how students would later correct their own thinking after identifying their own errors. The impact of students realizing their own mistakes and understanding why a common denominator is necessary for adding fractions will have a lasting effect on their continued learning of fractions. We realize that all students need to make these connections; however this approach proved to be especially crucial for English Language Learners (ELLs), as they may not al-

ways “fully” understand everything the teacher is saying during English instruction.

Teaching-by-telling often has a negative impact, because some students whose academic English may not be developed appropriately for grade level expectations will never have an opportunity to learn particular concepts. In our research lesson, we deliberately planned for students to fully engage during a problem-solving and concrete experience, with the concept of the need for a common denominator, and did not focus on telling them initially how to add fractions with unlike denominators by a procedure.

While it was difficult to observe exactly when they were making a mistake in the process of adding fractions, it was powerful to observe the “discovery” students later made on their own. Teachers did intervene, but only to ask questions and to continue engaging students in the discourse of the mathematics that was involved in the lesson. We found that, by designing the lesson as we did, the ELLs were able to actively engage in academic discourse regarding fractions in a meaningful way.

Collaboration is Key

During the teaching and critiquing of the lesson, lesson study allowed us to work collaboratively in planning, teaching, and observing each other. Ultimately, when we modified the lesson to improve it, lesson study was a way for us to systematically examine our practice, while at the same time focusing on the mathematics in the lesson. Collaboration was a key factor, because we found that our combined strengths for designing effective instruction for our students are greater than our individual efforts. Engaging in the collaborative lesson study process allowed us to improve the lesson with students’ best interests in mind.



Students justifying their solution with fraction bars

Each time we observed the evolving lesson, our attention was directed to the students' learning, interaction, and engagement in class. Our experiences in doing lesson study allowed reflection time in the midst of debriefing and gave us an opportunity to grow in our individual teaching practices, with a focus on our ELL student population.

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REFERENCES

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Discussion And Reflection Enhancement (DARE) Post-Reading Questions

1. Consider the initial problem that was posed to the students about the amount of cheese needed to make nachos. Would you consider this problem reasonable for 6th grade students to know how to solve? Why or why not?
2. What do you think of these teachers' approach to pose the problem and not show the students a procedure for adding fractions with unlike denominators? What are the benefits and the drawbacks of posing a problem for students to figure out how to solve the problem and then to justify their solution?
3. What do you suppose happens in a lesson when students realize that adding the numerators and denominators does not produce a reasonable solution when they are asked to justify and prove their solutions using an alternate representation of the solution?
4. What was the teacher's role during the students' work of adding fractions with unlike denominators?
5. What were the benefits for this group of teachers in using a lesson study format for discussing what occurred during the lesson?
6. What are the benefits of including ELLs in the academic discourse of mathematics? What has been your experience in having your students participate in math class discussions?

"DARE to Reach ALL Students!"

