

# **MAKING FRACTIONS FUN AND MEANINGFUL FOR ENGLISH LEARNERS**

**HEEGYONG SONG**

*Warford Elementary School*

**RITA BARGER**

*University of Missouri-Kansas City*

## **ABSTRACT**

*This article describes a virtual, introductory lesson on fractions that highlights eight strategies for making learning meaningful and engaging for English Learners (ELs) using real objects available in the home.*

## **INTRODUCTION**

This article will share strategies and activities that empowered English Learners (ELs) to solve math fraction problems while developing English language skills. ELs often approach mathematics with fear and anxiety - probably because mathematics represents a third language to master. A caring teacher, however, can make a difference in changing those attitudes and relieving the fear and anxiety.

## **STRATEGIES**

The first author of this article teaches elementary ELs in an urban district in the Midwest, and we are going to share activities from her virtual classroom to make the case for our arguments about the teaching of fractions to ELs. The strategies highlighted in this article are:

1. Attending to the affective components of learning by using humor to create an inviting environment and positive emotions toward learning through making content comprehensible for English Learners (ELs) (Echevarria, Vogt, & Short, 2016)
2. Using individual students' funds of knowledge (Moll et.al, 2005) and experiences to empower them to own the knowledge they construct in collaboration with their peers and the teacher (Vygotsky, 1978)
3. Using play-like, hands-on activities that manifest real life and students' lived experiences (Gardner, 1998)
4. Using fully engaging, participatory learning so that nobody is left behind (Freire, 1970)
5. Focusing on learning and meaning making using real objects and materials that are available at home as opposed to prescribed or prepackaged worksheets for learning (Forman & Fyfe, 1998)
6. Including family engagement so that parents and siblings can help students reach their learning targets (Mapp & Kuttner, 2013)
7. Ensuring that all participants experience successes and challenges - celebrating successes and overcoming challenges together (Gay, 2010)
8. Teaching using essential insights from Piaget's method of four primary stages of development, starting with concrete sensory experiences, using words and pictorial representations to represent objects, thinking logically about concrete events, and only then emerging and addressing the abstract use of symbols (Piaget, 1977).

## THE LESSON

As her 3rd grade ELs joined her Zoom room, the teacher said, "Good morning." Showing apples, oranges, and a rectangular piece of cornbread, she said, "We are going to learn fractions today." She encouraged students to smell the objects, and with this introduction, the students seemed to forget about fractions. Instead, they looked at the real objects and enjoyed pretending to smell them. The teacher heard their giggling and laughing when she said to them, "Apples and

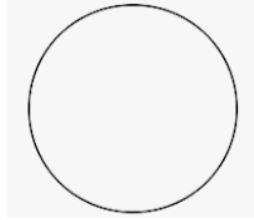
oranges smell good.” She encouraged them to say “yummy-yummy cornbread” and to pretend to smell it. [Strategies 1-5: Affect, Funds of Knowledge, Activities, Participation, Real Objects]

This introduction set the tone for the class. Now children’s emotions were positive, and they were excited to see objects with which they were familiar. They were ready to learn. It’s important to note that the teacher always starts the day checking on her students’ feelings and emotions and saying hi to their parents and/or siblings in the room on Zoom. [Strategies 1-3, 5: Affect, Funds of Knowledge, Activities, Real Objects]

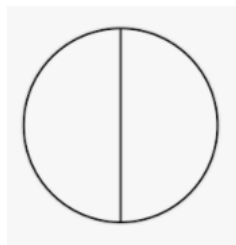
The teacher knows that drawing on learners’ background knowledge and experiences shapes their comprehension (Gay, 2010) and that all learners proceed with the information they already know and build new knowledge and understandings based on it. In doing this, she capitalizes on students’ funds of knowledge (Moll et al., 2005) and their experiences to help maximize their learning. [Strategy 2, 4, 6: Funds of Knowledge, Participation, Family]

The teacher asked her ELs, “What does decomposing fractions mean? What does decompose mean?” Only two 4th and 5th grade ELs were able to answer with an example like  $\frac{2}{3} = \frac{1}{3} + \frac{1}{3}$ . None of her K-3 ELs answered. She told them that “decompose” means break apart like one apple can be cut into pieces. [Strategies 2, 4, 5, 8: Funds of Knowledge, Participation, Family, Piaget]

The teacher asked her ELs what she was holding. The answer was “apple.” She asked, “How many apples am I holding?” Students answered in unison, “One.” The teacher said, “Draw one circle that represents an apple and write down a numeral 1 on top of the circle.” [Strategy 8: Piaget] In doing this she began the lesson with students in the concrete operational cognitive stage (Piaget, 1977).



Then, she cut the apple into halves in real time on Zoom and asked the students how many equal parts they now saw, adding that “equal” means equal amount (equal size and equal shape). They said, “Two.” She said, “Great,” and asked them to draw a line through their circles to make halves.



She had them write on their papers “2 equal parts.” She went on to say that because there were two equal parts, 2 should be the denominator of the fraction. Since students did not all know the meaning of the word “denominator,” she wrote “/2” to demonstrate what she meant by the denominator. She went on to say, “Because half of the apple is one of the two equal parts, ‘1’ is the numerator, thus making the entire fraction  $\frac{1}{2}$ .” She followed the same procedure to help the students understand the meaning of “numerator.” She wrote the fraction, pointed to the numerator, and repeated the word “numerator.” She went on to say, “Since I have two halves,  $\frac{1}{2}$  apple and another  $\frac{1}{2}$  apple, it makes 2 half apples over 2.” Pointing to the ones, she asked the students to add the numerators to obtain  $\frac{2}{2}$ . Showing the combined apple, she asked, “Why do 2 halves - writing  $\frac{2}{2}$  - equal 1?” Students said, “One apple.” She added that when you shade half of the circle and then the other half of the circle, you see the whole circle shaded. You have one

circle. She also said that when you combine a half of the apple and the other half of the apple, you have one whole apple. All 3rd grade ELs nodded their heads. [Strategies 2, 5, 8: Funds of Knowledge, Real Objects, Piaget]

The teacher then demonstrated fractions using an orange. Showing the whole orange first, she asked, “How many oranges do you see?” They said, “One.” When she started peeling the orange with her hands, the students laughed as they watched her struggling to break the whole orange into pieces. She broke some of the sections apart, and her hands were wet and dripping orange juice. She accidentally dropped some pieces when she had the students count how many pieces she had. They counted aloud with her. [Strategies 1-5: Affect, Funds of Knowledge, Activities, Participation, Real Objects]

Because the mom of one of the 3rd graders had to go to work, that student stayed in her mom’s car for 50 minutes during the lesson just so she could participate in the activities with her peers and the teacher. Since her daughter’s classmates were having so much fun with the teacher and the activity, that mom, who speaks only Spanish, asked her daughter to translate what they were doing so she could understand. Her daughter did translate the teacher’s instruction with activities and directions for her mom to understand (Mapp & Kuttner, 2013). [Strategy 6: Family]

The teacher’s orange had 10 pieces. She asked her students how many equal pieces of an orange she had. They answered, “10.” She had them write 10 as a denominator. She showed them that one equal part is out of 10 equal pieces:  $\frac{1}{10}$ . In order to make a whole orange, they should write  $\frac{1}{10}$  10 times, which they did. Then, in order to add the fractions, they kept the same denominator 10 and added 1, the numerator, 10 times until they had  $\frac{10}{10}$ . Then, the

teacher asked them, “10/10 makes what?” while she showed the whole orange combining the 10 equal parts. They said, “One orange.” [Strategies 6 and 8: Family, Piaget]

Next, the teacher showed a rectangularly shaped piece of cornbread to her students. She asked her students, “What shape is it?” Her students said, “Rectangle” and she responded, “Yes, this is a rectangle.” She asked all the students to draw a rectangle on their paper and show her their work. Then, she sliced her cornbread into 4 equal pieces. When she was slicing her cornbread, she said to her students, “This is yummy, yummy cornbread and the smell is wonderful.” She told them that she added some jalapeño pepper to the cornbread to make a special flavor. Everybody pretended to smell it on Zoom. They thought it was funny the way their teacher talked to them and the way she demonstrated the lesson to them. By now she had cornbread all over her table. She demonstrated putting the four pieces together to make the original piece of cornbread. Students laughed because what was happening was real life. The teacher was not pretending; she was actually cutting and putting pieces together. She made mistakes when she broke oranges into pieces and dropped one piece of cornbread while she was showing them how to decompose fractions and make sense of parts to whole and whole to parts. [Strategies 1-4, and 8: Affect, Funds of Knowledge, Activities, Participation, Piaget]

Throughout the lesson, the teacher gave all students positive feedback. Some students divided their apples into 2 halves when she asked them to divide into 3 pieces, so she simply said that they made a mistake, and “that’s okay.” She told them, “You eat the 2 halves of the apple and use another one to divide into 3 pieces.” There was no competition; it was a warm, supportive learning environment with lots of laughing. [Strategies 1, 4, 5, 7: Affect, Participation, Real Objects, Successes and Challenges]

The class had many opportunities for family engagement (Mapp & Kuttner, 2013). Here is one example. [Strategy 6: Family]

While Bill (a pseudonym), a first-grade boy from the Republic of Moldova whose first language and home language were Romanian, was participating in the class, his mother was sleeping. He found an orange to use in the lesson, but had a lot of difficulty peeling the orange. He used an emoji showing a raised hand to stop the lesson so the teacher could listen to him. When she asked what she could do for him, he pointed to his sleeping mom and indicated he could not peel the orange because it was hard. The teacher agreed that it was hard to peel and encouraged him to try again. Eventually his mom awoke and helped him cut the orange into 4 pieces. The teacher focused on that part of the lesson for Bill. She drew a circle on a piece of paper and wrote Bill's name at the top. She drew lines in the circle to show fourths, and asked the class how many pieces Bill had. They all drew similar circles on their papers and wrote  $\frac{1}{4}$  inside each piece. She asked how many equal parts they saw and then had them all write on their papers  $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{4}{4}$ . She asked Bill to put the 4 parts of his orange together and asked the students how many oranges they saw. All recognized that  $\frac{4}{4}$  equals 1 whole orange.

[Strategy 7: Successes and Challenges]

## CONCLUSION

As a result of this lesson, the teacher's ELs wanted to do more math. Writing tools had been sent home by the teacher and school when remote learning started. Those tools included pencils, markers, crayons, paper, and journals. Because these tools were ready to be used, students were able to solve math problems and share their work with their peers and the teacher. Parents and siblings who were available were eager to help the third graders learn math in an

exciting way. We note that learning mathematics as another language through engaging activities is another investment that will benefit all ELs academically, linguistically, and socially. Recognizing and using the cultural and linguistic capital (Bourdieu, 1991) ELs bring to the classroom will empower them to develop mathematics concepts and foster literacy skills in communicating the processes and procedures needed to solve those math problems. In practice, then, the relevance of fractions for the real world coupled with these sensory activities helped all students “connect the dots” to both the mathematical and the linguistic concepts, both the Basic Interpersonal Communication Skills (BICS) and the Cognitive Academic Language Proficiency (CALP) (Cummins, 1980) they are learning.



## THE AUTHORS

*HeeGyoung Song is an ESL Classroom Teacher Grades K-5 at Warford Elementary School in the Hickman Mills C-1 School District in Kansas City, Missouri. As a Korean immigrant, she has extensive experience working with English learners, their families, and their communities. She also teaches advanced teacher education and English Language courses at the University of Missouri-Kansas City. She is highlighted as a January 2021 WIDA-Featured Educator.*

*Rita Barger is an Associate Professor and Interim Co-Chair for Graduate Programs at the University of Missouri-Kansas City. She taught math at the middle and secondary levels for 25 years before moving to her university position. Her research interests include the teaching of mathematics, recreational mathematics, and all aspects of the affective side of teaching mathematics to diverse students. As a Fulbright Scholar, she taught creative problem solving in Edirne, Turkey.*

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