Lesson: Fractions of a Set with Unlike Denominators using "Fractions Mosaics"

Objectives: Students will be able to build and compare fractions of a set; explain why two fractions are equivalent, even though they use different numbers

Standards:
CCLS 3.NF.3 – Explain equivalence of fractions in special cases
CCLS 4.NF.2 – Compare two fractions with different numerators and denominators
Standard for mathematical practice: Construct viable arguments and critique the reasoning of others

Materials: image of mosaic artwork, chart paper with activity directions, colored sticky-notes for modeling, bags of colored square tiles for all groups, backs of pattern blocks for advanced groups, task cards (differentiated for three levels, a, b, and c,) iPads to record solutions, projector and screen for share

Vocabulary: Equivalent fractions, denominator, numerator, least common multiple

Lesson:
Motivation/Introduction:
Show an image of mosaic artwork that uses square tiles. Ask students about places that they have seen tile mosaics and introduce a multicultural connection by discussing mosaics as a frequent medium in art from the Islamic world. Explain that today the students will be extending their understanding of fractions by working in groups to solve challenges that use math tiles to make "math mosaics" that match specific fraction-rules.

Whole class:
Explain that we'll practice a few challenge cards together to begin. Show a challenge card with the task: "Build a design that is one fourth yellow and one half blue." Show students the post-it notes that will serve as mock square-tiles for this modeling. Have students turn and talk to describe a design they could make to illustrate the description on the card. Choose one pair to build their design using post-it notes on the board. Ask them to explain how their design matches the description. Ask if any pairs had a different idea for a design. Call a second pair up to build their design. Ask:
Do these two designs look the same? Why or why not? How can that be since both designs match the same task card?
Did both designs use the same number of tiles? Why or why not?
Repeat for a second task card: "Build a design that is one-third green and one half yellow." Have students share their ideas.

Post the directions for group work. Emphasize the importance of quality math discussions about how students will solve the challenge cards. Let students know that the yellow and orange groups will need bags of square tiles and the green groups will need square tiles and pattern blocks.

Group Work/Engage:
Students work in homogenous teams of three to build mosaic designs that match their differentiated task cards. Students share their designs within their groups and the photograph a representative design for each task card.
Directions for students:

1) Work on one challenge card at a time as a team, going in order from A-H
2) Each team member builds a design to match the description on your card. (Option: You can all work together to build one design.)
3) Once all team members have finished, share and discuss your designs together.
4) Choose one design to share with the class. Take a photo of this design and the task card using an iPad.
5) Be ready to share your designs with the mathematicians on the other teams.

Share/Math Congress:
Students meet to share their designs and discuss how their "mosaics" meet the specifications on their task cards. Encourage students to question each other about their designs. Provide question stems on chart paper to facilitate student-initiated plenary.
Questions for Group Discussion:
How did you get started?
How did you decide what you were going to do to create your design?
Is another design possible? How do you know?
Why do you want this design versus another design?
How can you prove that it matches the task on your card?

Assessment: Formative: As students are building their designs, circulate to check for misunderstandings about fractions, as well as to evaluate the level of math talk (Do the students critique each other's solutions? Do they fully explain their mathematical reasoning with viable arguments?)