EDC 456 Math Methods Lauren D’Ambra

Dr. Seitsinger April 21, 2011

**Lesson Title**: “Eggsactly Equivalent” (from Illuminations - http://illuminations.nctm.org/LessonDetail.aspx?ID=L338)

**Grade**: 5th//Measurement/Equivalent Fractions

**Overview**: Students use 12 eggs to identify equivalent fractions. Construction paper cutouts are used as a physical model to represent various fractions of the set of eggs, for example, 1/12, 1/6, and 1/3. Students investigate relationships among fractions that are equivalent.

**Alignment with State Standards**:

*M(N&O)–5–1* **Demonstrates conceptual understanding of rational numbers with respect to:**

**…positive fractional numbers** (proper, mixed number, and improper) (halves, fourths, eighths, thirds, sixths, twelfths, fifths, or powers of ten (10, 100, 1000))…as a part to whole relationship in area, set, or linear models **using models, explanations, or other representations**. (State)

*M(N&O)–5–2* **Demonstrates understanding of the relative magnitude of numbers** by ordering, comparing, or identifying equivalent positive fractional numbers…within number formats (fractions to fractions)… (State)

*M(CCR)–5–2* **Students will create and use representations to communicate mathematical ideas and to solve problems** and be able to:

* Use physical models and diagrams to represent important mathematical ideas (e.g., multiplication).
* Use appropriate representations to solve problems or to portray, clarify, or extend a mathematical idea.
* Recognize equivalent representations of concepts and procedures and translate among them as appropriate (for example, understand how the addition of whole numbers, fractions, and decimals are related).

**PSSM Content and Process Standards:**

***Number and Operations***

* Understand numbers, ways of representing numbers, relationships among numbers, and number systems
  + Develop understanding of fractions as parts of unit wholes, as parts of a collection…and as divisions of whole numbers;
  + Use models…and equivalent forms to judge the size of fractions;
  + Recognize equivalent representations for the same number and generate them by decomposing and composing numbers;
  + Recognize and generate equivalent forms of commonly used fractions

***Algebra***

* Analyze change in various contexts
  + Investigate how a change in one variable relates to a change in a second variable

**Mathematics Goals**: Learning Expectations (Objectives)

Students will:

* demonstrate understanding that a fraction can be represented as part of a set, given a set of identical items (eggs)
* identify fractions when the whole (set) and part of the set is given
* **identify equivalent fractions**
* **identify relationships inherent in equivalent fractions (e.g., 1/2 can be multiplied by 2/2 to get the equivalent fraction 2/4, or 2/4 can be divided by 2/2 to get the equivalent fraction 1/2.)**

**Students’ Needs**:

Students will have spent 1 – 2 months developing a conceptual understanding of positive proper and improper fractional numbers, as a part to whole relationship in area, set or linear models using manipulatives, explanations, and possibly other explanations. The students will have also been introduced to the concept of equivalent fractions in these forms (using pattern blocks, for example).

**Materials**:

An egg carton designed to hold 12 plastic eggs for each pair of students (about 10 cartons and 120 eggs)  
Construction paper cut to fit various fractions of an egg carton (1/12, 1/6, 1/4, 1/3, etc.)   
Eggsactly Eggs Overhead

**Environment:**

***Lesson Plan***

**Before**:

Use the Eggsactly Eggs overhead to review fractions as part of a set of 12.

For example, ask students how to show 1/2 of a dozen eggs. Accept equivalent fractions [6/12, 3/6, etc.] and all the arrangements of six eggs in a carton that holds a dozen eggs (evidence of RIPTS 5.4 – engage students in generating knowledge…and exploring methods of inquiry and standards of evidence).

Give students paper cutouts that cover various parts of the egg carton, e.g., 1/12, 1/6, 1/4, and 1/3 (see the illustration below). Students need enough cutouts of each fraction to represent the whole. For example, students will need two 1/2s, six 1/6s, four 1/4s, and so forth.

Have students investigate each cutout and identify the fraction that is represented by each. Guide students to label each cutout with the appropriate reduced fraction. For example:



Prompt students to begin looking for fractions that cover the same area, i.e., equivalent fractions (evidence of RIPTS 5.1 – design lessons that extend beyond factual recall and challenge students to develop higher cognitive skills). For example, ask students how many 1/12 pieces are needed to cover 1/6 [2]. Have students record 1/6 = 2/12 on notebook paper. Ask students how many 1/6 pieces are needed to cover 1/3 [2]. Have students record 1/3 = 2/6 on notebook paper.

**During**:

Students will work in pairs to continue identifying as many equivalent fractions as possible, using the provided egg cartons and paper cutouts to model their fractions (evidence of RIPTS 5.5 – use tasks that engage students in exploration, discovery, and hands-on activities and RIPTS 2.2 – design instruction that addresses the core skills, concepts, and ideas of the disciplines/content areas to help all students meet Rhode Island’s learning standards). Students will individually record all equivalent fractions on notebook paper (evidence of RIPTS 6.5 – create learning groups in which all students learn to work collaboratively and independently),

While they’re working in pairs, I’ll be walking around the room to help facilitate the process or provide guidance if I see any pairs of students having difficulty (RIPTS 8.5 – seek knowledge of and demonstrate sensitivity to the particular communication needs of all students); I will also ask open-ended questions about some of the equivalent fractions that they’ve identified and ask them to explain their thinking (evidence of RIPTS 5.2 pose questions that encourage students to view, analyze, and interpret ideas from multiple perspectives).

When finished, groups will take turns reporting the equivalent fractions to the whole class (evidence of RIPTS 6.4 – help students establish a classroom environment characterized by mutual respect and intellectual risk-taking and RIPTS 8.4 – emphasize oral and written communication through the instructional use of discussion, listening and responding to the ideas of others and group interaction).

**After**:

If any groups did not find the equivalent fraction being shared, they will add the new set to their list. I will ensure that all of the following are identified, and I will record the representations on a large piece paper up on the whiteboard:

|  |
| --- |
| 1/6 = 2/12 1/4 = 3/12 1/3 = 2/6 1/3 = 4/12 1/2 = 2/4 1/2 = 3/6 1/2 = 6/12 |

Next, I’ll have students explore relationships between the equivalent fractions. For example, students might notice that dividing the numerator and denominator by the same number results in an equivalent fraction. Along the same lines, multiplying the numerator and denominator by the same number also results in an equivalent fraction (evidence of RIPTS 8.2 – use a variety of modes of communication (e.g., verbal, visual, kinesthetic) to promote student learning).

*Related Questions for student discussion* -

What do you notice about the relationship between 1/2 of a dozen and 6/12 of a dozen?

[Students should be able to tell from their recordings that 1/2 and 6/12 are equivalent fractions.]

What do you notice about the relationship between 1/3 of a dozen and 4/12 of a dozen?

[Students should be able to tell from their recordings that 1/3 and 4/12 are equivalent fractions.]

What do you notice about the relationship between 1/4 of a dozen and 3/12 of a dozen?

[Students should be able to tell from their recordings that 1/4 and 3/12 are equivalent fractions.]

What do you notice about the relationship between 1/6 of a dozen and 2/12 of a dozen?

[Students should be able to tell from their recordings that 1/6 and 2/12 are equivalent fractions.]

What other equivalent fractions did you identify using 12 eggs?

[Student responses may vary.]

What relationships do you see in the equivalent fractions identified in this lesson? Do you notice any patterns when you multiply a fraction's numerator and denominator by the same number?

[An equivalent fraction results.]

As stated in the lesson plan, one common misconception at this stage is that some students assume that multiplying a fraction by 2, for example, will generate an equivalent fraction, which is not the case. Multiplying a fraction by 2/2, for example, will generate an equivalent fraction, because 2/2 is the same as one whole. I will make a point to note any students who confuse these concepts so that these misconceptions can be addressed (evidence of RIPTS 2.4 – engage students in a variety of explanations and multiple representations of concepts…that help all students develop conceptual understanding).

**Connection to mathematical history:**

**Assessment**:

After the lesson, I will be able to use the student-completed eggsactly worksheets and their responses during the class discussion (evidence of RIPTS 9.3 – systematically collect, synthesize, and interpret assessment results from multiple assessments to monitor, improve and report individual and group achievement RIPTS 8.4) to determine whether individual students:

* Have demonstrated an understanding that a fraction can be represented as part of a set
* Can identify fractions when the whole (set) and part of the set are given
* Can identify fraction relationships associated with the set including equivalent fractions (e.g. 1/2 of the set of 12 eggs is the same as 6/12 of the set)

(Evidence of RIPTS 9.1 – select and/or design individual and group classroom assessments based on the strengths, limitations, and data provided by the assessments).

**Accommodations**:

If a pair of students appears to be struggling, I’ll suggest that those students investigate how their fractions would change if the egg carton holds 6 eggs; by the same token, if a pair of students finishes identifying their fractions early, I’ll help to enhance their understanding by suggesting they look at how fractions would chance if the egg carton holds 18 eggs or 24 eggs (evidence of RIPTS 4.1 – design instruction that accommodates individual differences (e.g., stage of development, learning style, learning disability, cultural background) in approaches to learning). Students will model and record all equivalent fractions. Multiple 6-egg cartons will be made available for students to use as a stand-alone model or as additions to the standard 12-egg carton.

**Reflection on First Mathematics Lesson**

**Classroom Environment**

*Strengths*

I used cooperative learning groups (for this activity, I chose pairs), as I fully understand the benefits of students being able to share and elaborate upon each other’s knowledge-based and ideas in problem solving. I also believe that group work should always include an individual accountability component, and as such I had each student complete his or her own listing of equivalent fractions that they discovered while working with their partner in completing the activity.

*Target Areas*

Most of the students in this classroom are already in arranged in groups of desks; a few desks are paired, and there also two individual desks. The setup is already fairly heterogeneous (in terms of mixed gender), so decided to pair them with the student sitting directly beside or across from the other. That being said, I think it’s important to often choose learning groups by pairing students with varying abilities and temperaments. I imagine this will come more naturally once I’m in the classroom full-time and become better acquainted with each student’s personality and learning style and develop my own strategy for students seating.

That being said, I understand that ideal groups of students will not always be made and that student conflict will not always be avoidable. After the introduction of the lesson and soon after I had paired up the students, two male students in my class began to express their disdain in working with the other. One student, who is relatively new to the class, argued that the other wasn’t sharing the materials and was being mean; the other student, a very bright and gifted student who has a history of establishing friendships with his peers, claimed that he worked better along and that “you just can’t get along with some people”. I explained that they needed to work in pairs and that they would need to try and get along, that part of the lesson was learning to work cooperatively with other students. While there was some struggle throughout the lesson, eventually the pair was able to work together in a reasonable manner and to complete the assignment.

I think it’s important for these situations to be viewed as learning opportunities for both the teacher and the students. As a teacher, I felt some loss of control when the students began to argue, and was torn between helping this pair of students to solve their dilemma but also to give the other students in the classroom the type of assessment and attention that they deserved as well. As a new teacher, I realize it will be important for me to better understand and utilize effective strategies in the classroom for managing such emotional and social conflicts, so that it does not distract from students’ opportunities to learn.

**Planning**

*Strengths*

As a new teacher, I’ve started to gather a running list of quality and valid lesson-planning resources, many of which are available via the Internet, to include the lesson I sourced from the Illuminations website. While there is any number of wonderful lessons that already exist for probably almost any mathematical topic under the sun, I understand the importance of working through any borrowed lessons and making that lesson one’s own, based on the developmental and cultural needs of students, as well as proprietary teaching beliefs and strategies.

After reviewing this particular lesson plan, I came up with an additional extension activity and conceptual questions for students, and also expanded upon accommodations for those students who might need more or less of a challenge. While we ran out of time and I wasn’t able to offer the extension activity, it’s certainly one that I would look to provide to students as a follow-up lesson. I provided different colored plastic eggs for each of the cartons, and the extension activity would involve students shifting from looking at the fractions as a region of the whole carton to looking at fractions as a set. I would then ask students to find the fractions for each different color of egg in their carton as it relates to the total number of eggs, and then to explore any equivalent relationships or patterns between those fractions.

Preparation of materials and how those will be provided to the students is also an imperative part of planning. Whenever possible, it’s clearly best to have all concrete materials prepared, organized and ready to be distributed in order to maximize students’ learning time. For this lesson, I had all eggs arranged in the cartons and the (unlabeled) fraction paper cutouts ready to be passed out to students at the beginning of the lesson.

*Target Areas*

Based on my initial experience in teaching this lesson I’ve realized that being realistic about encountering unexpected interruptions and/or being prepared and open to addressing any student questions and misconceptions can actually help build a teacher’s skills as being a strong facilitator rather than just directly and rigidly teaching the material to students. As was the case in teaching my lesson, underestimating the time it may take to explore students’ knowledge base and encountering other interruptions (the student dispute) slowed the pace of the lesson down and excluded certain activities from being addressed that day. I think it’s important to develop a flexible attitude and to find ways to either re-prioritize learning activities and lessons for the following day or to integrate subject matter, so that the most integral concepts are still covered and understood by students.

**Content Knowledge**

*Strengths*

I understand that as an educators, it’s imperative to have a thorough understanding of the content to be taught; I soon realized that I would need to begin to take the time to re-educate myself on any elusive or shakily-held concepts; man of my recollections of math in school are mostly linked to rote memorization and very segmented content areas. Before teaching my lesson, I wanted to be sure that I had a solid knowledge base on fractions. In addition to reading through our text book’s chapter on fractions, I also checked out Marilyn Burns’ book on fractions for grades 5 – 6 in order to further familiarize myself with proven and effective ways to teach fractions and the concept of equivalency. While reading through the texts, I took notes on useful strategies and questions to ask for helping students to make conceptual connections; I also made notes on common misconceptions. I brought these notes in which me in order to help support my lesson.

*Target Areas*

While standing up in front of the classroom during the introduction of the lesson, I still feel I could have clarified concepts further and asked more open-ended questions. While some of this may come with more time and experience in the classroom, I’ve realized that as an educator it’s important to never assume that one has ‘mastered’ mathematical material – there is always more to learn and additional perspectives to explore, whether through additional research on how children best learn mathematical concepts and strategies; by looking into various mathematical histories, as well as how different cultures might view or utilize various theories or concepts; by exploring children’s literature, games, or various exercises; etc. As a proactive and engaged teacher, I will make efforts to attend professional workshops when possible and perform my own individual research and practicing of exercises in order to continually build my content knowledge and challenge my cognitive faculties.

**Instruction**

*Strengths*

At the beginning of the lesson, I was sure to state the topic that we would be exploring (equivalent fractions) and the students’ goal for that day (to find as many equivalent fractions as they could), using the materials provided. During the introduction portion of the lesson, I had students identify and share the task of labeling their own fractional cutouts, while we as a class identified the various fractional representations of each cutout, to ensure that the students understood which each cutout represented in relation to the whole. The whole was the first amount that I asked them to consider and to agree on as a class (which we agreed was one dozen, or 12 eggs) before illustrating the various fractions.

During the activity, I walked around the class to ensure that all students were on task and were utilizing the materials (not just computing in their heads equivalent fractions for the different cutouts, as one student admitted to doing because “he knew how to do everything in his head already”). I explained to the student that I wanted him to use the cutouts and egg carton, because there is more to math than memorizing numbers and algorithms, and that it’s important to visualize and recognize how those fractions are represented in the various objects that surround him on a daily basis.

By the time the students had time to full work through the activity, I had less than 10 minutes to gather the students’ attention and to help them conclude and make sense of the lesson. I used a large piece of chart paper at the front of the class and had one individual from each pair of students come up and record one equivalent fraction (that was not completely identical to any that had been written previously). I was sure to allow students, as occurred at one point, to record equivalent fractions written in reverse (for example 1/3 = 2/6 and 2/6 = 1/3) to better allow them to view the mirrored relationship of fractional equivalents. I made sure to ask the students if they could identify any patterns amongst the equivalent fractions; eventually, one student did answer that if you multiplied the numerator and denominator by the same number, you would receive an equivalent fraction.

*Target Areas*

I decided to open the lesson by using the “Eggsactly Equivalent’ overhead and posting questions that helped to provide insight into the students’ basic conceptual understanding of fractions. Most of the students were able to identify the whole, and some of the students seemed more comfortable with identifying the various parts of the fraction that I illustrated on the transparency than others. I’m not sure that all of the students had a firm understanding of identifying fractions by looking at an illustrated grouping in the carton.

If time had allowed, I would have spent more time with the students exploring and asking them different questions to more deeply probe their conceptual understanding of identifying area fractions. For example, the 1/3 cutout (in purple) is in the shape of an L; however, if I were to do the lesson a second time, I would circle three of the eggs horizontally and ask the student what fraction was illustrated, have them compare that fraction and illustration to the provided 1/3 paper cutout, and have a discussion on why they thought the two illustrations represented the same fractional amount of the whole.

**Use of Technology**

*Strengths*

I used the website Illuminations.nctm.org to source the idea for the math lesson. During the lesson, I used the overhead projector to illustrate fractional concepts so that all students could clearly see my thought process and so that I could more easily make changes or show different representations on the transparency as needed.

*Target Areas*

While there is limited technology (in terms of computers) in this particular classroom, one of my goals during my time at URI is to learn how to use the Smart Board. If possible, I’d like to take advantage of using this technology during my student teaching, as it has great potential in being able to customize and create math applications, games, etc. In an increasingly wireless and plugged-in world, where many elementary children have been completely immersed in such technology all of their lives, I think it can (if used appropriately) be an effective tool in garnering their attention, and is also useful in terms of conveniently manipulating and illustration various concepts more quickly and in different ways.

**Assessment**

*Strengths*

After students had recorded their equivalent fractions on notebook paper and immediately before having students come up to the front of the classroom to record their equivalent fractions, I asked students to check off those fractions that they had come up with in pairs that were identified on the board, and then to add any equivalent fractions to their list (ideally in a different color pen or writing utensil) that they had not come up with in their pairs. I asked the students to follow these directions so that when they turned in their paper, I would have a clearer summative assessment showing the various equivalent fractions that each student had identified and/or how well they followed my verbal directions.

*Target Areas*

While I feel that I have a fairly good grasp on developing summative assessments to illustrate final student work products, I think it’s important for me to develop and to be consistent about performing and documenting formal, ongoing assessments while activities are in progress. I think one basic but invaluable idea is to simply keep a clipboard with names of the students on paper (or individual sticky notes) as I walk around to each student and group, and to make any important notes about student progress or apparent obstacles, and to later compare and contrast these observations to students’ final work products. It also provides a way of keeping track and adding notes to individual portfolios for tracking overall progress and long-term goals. Related to the summative assessment described above, if I were to do the lesson a second time I would also develop a more formal rubric to accompany the summative assessment.

*Student Work Samples*

The three samples of student work included illustrate (3) Exceeds Proficiency; (2) Proficient; and (1) Approaching Proficiency. The student who is labeled as (3) actively used the physical model provided to represent the mathematical idea of finding equivalent fractions; the student used appropriate representations to portray those equivalent fractions in written form, and he clarified and expanded upon his own thinking by organizing and grouping equal equivalent fractions in line form; and the student fully understand and recognized (as was made obvious during the closing group discussion) the inherent pattern in producing equivalent fractions, that being the concept of multiplying the numerator and denominator by the same number (2/2, for example) to formulate a new equivalent fraction. The student who is labeled as (2) actively used the physical model provided to represent the mathematical idea of finding equivalent fractions; the student used appropriate representations to portray those equivalent fractions in written form; and the student understood the concept of multiplying the numerator and denominator by the same number to formulate a new equivalent fraction. The student who is labeled as (1) used the physical model provided, but only with some additional prompting by me; used appropriate representations to portray those fractions in equivalent forms, although at times it appeared as if the student relied too much on his partner’s written answers; and appeared to recognize the concept of multiplying the numerator and denominator by the same number to formulate a new equivalent fraction.

**Diversity**

*Strengths*

To accommodate any students who clearly needed to solidify their concept of equivalent fractions by using a smaller whole, I also brought in multiple 6-egg carts; these smaller cartons could also be added on to the 12-egg cartons (to make an 18-egg carton) for students who finished early and needed an extension activity.

In addition to being a concrete way of allowing all students to better visualize the concept of identifying fractions and equivalent fractions in such everyday objects as egg cartons, I also hoped that this activity would be an engaging and hands-on activity. Based on my past experience teaching an inquiry-based science lesson, and on the research that I’ve read, such activities are likely to alleviate many behavioral issues with those students who might have more difficulty focusing on direct instruction (the IEP’s that are in place for this particular group of students address the learning exceptionalities of ADD and ADHD).

*Target Areas*

Similar to content knowledge, I think educating one’s self on various learning disabilities, as well as on the various perspectives and learning traditions of different cultures and socioeconomic backgrounds, is an essential component of being an educator. Each group of students that a teacher encounters will bring various developmental and cultural needs, and in addition to getting to know each individual on a more personal level, understanding how to most effectively temper teaching strategies and to choose appropriate lesson plans based on these broader contexts is invaluable in facilitating all students’ learning abilities and opportunities.