



SLIDESHOW

Full Details and Transcript



Fraction Game on Number Lines

Tollgate Elementary School, Colorado
February 2011

Topic DEVELOPING EFFECTIVE FRACTIONS INSTRUCTION FOR K-8

Practice FRACTIONS AS NUMBERS

- Highlights**
- » Mathematics games can help students develop concepts as they communicate their strategies in play.
 - » In the Fraction Tracks game, students practice with equivalent fractions, breaking fractions into unit fractions, and adding and subtracting fractions with denominators less than 10.
 - » While building the Fraction Tracks game board, students practice placing equivalent fractions on parallel number lines.
 - » The rules are shown for several different games, all involving practice with fractions.
 - » Various strategies for winning the game are shown; these parallel students' increasing fluency with fractions and fraction equivalents.
 - » Variations on the game lead students to work with fractions greater than one and also to practice with equivalent decimals and percentages.

About the Site **Tollgate Elementary School Aurora, Colorado**

Demographics

- » 45% Hispanic
- » 31% Black
- » 18% White
- » 5% Asian/Pacific Islander
- » 2% American Indian/Alaska Native
- » 65% Free or Reduced-Price Lunch

Tollgate Elementary School focuses on developing mathematically powerful students using the districtwide curriculum developed by Aurora Public Schools. Features of the program include the following:

- » A district mathematics coach and a school teacher leader who support classroom instruction, including collaborative lesson planning and demonstration lessons;
- » Use of models, manipulatives, and visual representations to support fractions instruction;
- » Ninety-minute blocks of math instruction, which allow for a number talk, whole-group lesson, small-group work, independent work time, and assessment; and
- » Emphasis on mathematical discourse and communication to explain reasoning.

Full Transcript **Fraction Tracks**

Tollgate Elementary School, Aurora, CO



Fifth-grade teacher Cindy Matthews shares some experiences that her students have with Fraction Tracks, a fraction game using number lines.



Slide 1: Mathematical games

Text: Mathematical games can provide context and contribute to the development of mathematics concepts. Games often help students make sense of the mathematics and give them the opportunity to practice skills. Also, mathematical games can foster mathematical communication about concepts as students explain and justify their moves.



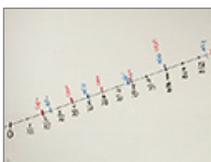
Slide 2: Fraction Tracks game setup

Text: At Tollgate Elementary School, one of the fraction games students learn to play is called Fraction Tracks. The game board has seven parallel number lines (tracks) marked in halves, thirds, fourths, fifths, sixths, eighths, and tenths. A deck of fraction cards is used to make plays in the game.



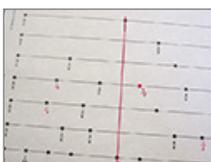
Slide 3: Skills practiced in Fraction Tracks

Text: The Fraction Tracks game can provide opportunities for students to recognize and use equivalent fractions, break fractions into familiar unit fractions such as $\frac{3}{4} = \frac{1}{2} + \frac{1}{4}$, and mentally add and subtract fractions with denominators of 10 or less.



Slide 4: Prior experience for Fraction Tracks

Text: Students have been using number lines for whole numbers, and now they extend this model to numbers between 0 and 1 and to mixed numbers. Before learning to play Fraction Tracks, students constructed number lines and located fractions with different denominators.



Slide 5: Preparation for Fraction Tracks

Text: An exercise for students is to complete labeling the game board for Fraction Tracks. This involves labeling points already located on the lines and locating other points to label with fractions on the lines. Students may use equivalence, for example, $\frac{1}{2} = \frac{2}{4} = \frac{3}{6} =$

$4/8 = 5/10$, and use a vertical straightedge to locate points. In some cases, students might find a point, say, for $3/5$, halfway between two given points.

 **Audio:** When we play Fraction Tracks, the tracks are divided into halves, thirds, all the way up to tenths. The kids are asked to early on make a fraction track that lists equivalencies. One of the lessons early on is that we're building our own board to show that $3/6$ is equal to $1/2$ is equal to $4/8$. So they have built the fractions themselves and put the equivalencies on the chart, so they own the numbers that are on there.



Slide 6: Rules of the game

 **Text:** To start a game, place seven chips on the game board one on each track. This can be done with all chips at 0 or at randomly chosen points for fractions less than $3/4$. Students take turns taking a fraction card and moving chips along the tracks. A play may move on more than one track, but the total must equal the fraction on the card. If this cannot be done, the player must pass. Chips are shared by players, so wherever they are at the end of one player's turn will be the starting point for the next player.



Slide 7: Object of the game

 **Text:** The object of the game is to capture chips by landing exactly on 1 on a track. A player may not move beyond 1 or “wrap around” to restart a chip on the same track during a turn. When a chip lands on 1, the player captures that chip. A new chip is placed on the same track at 0 just before the next player's turn.



Slide 8: One-track plays

 **Text:** The rules of the game suggest the possibility of making a move on several tracks, but novice players often move only on the track indicated by the denominator of the fraction on the card they select. For example, if the card selected is $5/10$, the student might

feel obligated to move $5/10$ on the tenths line. As students gain experience or realize that the obvious move is not available, they recognize and use equivalent fractions; a $5/10$ move can be made moving $1/2$ on the halves line or $3/6$ on the sixths line or $4/8$ on the eighths line.

 **Audio:** A low-level fraction track lesson allows them just to move across the board in a straight fashion. If they have $5/10$, they would move $5/10$ on the tenths track. As they become more sophisticated in their strategies and their understandings of equivalency, they start to understand that $5/10$ can mean many things to them. And that's what we're after. We're after them to think strategically about $5/10$ could be $2/5$ and $1/10$ left over. It can be many, many things.



Slide 9: Combination plays

 **Text:** As students gain fluency with fractions, especially with comparing fractions and with addition of fractions, their moves make use of several tracks. This fluency leads to more strategic play of the game. For example, if the card is $3/5$, some different possible combination moves are

- » $2/5$ and $2/10$
- » $1/5$ and $4/10$
- » $1/2$ and $1/10$
- » $3/6$ and $1/10$
- » $1/3$, $1/6$, and $1/10$

 **Audio:** As their fluency increases on their equivalency, we encourage them to move on separate tracks when they can be efficient with their moving.



Slide 10: Game strategy

 **Text:** In this game, chips are at different places on the tracks. The card we draw is $4/5$. What plays can we make, and can we capture chips?

- » Move $\frac{8}{10}$ on tenths line; do not capture a chip.
- » Move $\frac{1}{5}$ on fifths line and $\frac{6}{10}$ on tenths line; capture one chip.
- » Move $\frac{1}{2}$ on halves line and $\frac{3}{10}$ on tenths line; do not capture a chip.
- » Move $\frac{3}{6}$ on sixths line and $\frac{3}{10}$ on tenths line; capture one chip.
- » Move $\frac{1}{4}$ on fourths line, $\frac{2}{8}$ on eighths line, $\frac{1}{5}$ on fifths line, and $\frac{1}{10}$ on tenths line; capture two chips.

Other moves are possible.



Slide 11: Playing to 2

 **Text:** Another version of the game extends the game board to 2. In this case the fraction cards would include fractions greater than 1, and chips are captured by landing exactly on 2. Otherwise the rules are the same. As students become successful with the Playing to 1 version of the game, they are ready to advance to the Playing to 2 version.

 **Audio:** Also on Fraction Tracks, for a while we moved just to 1. The fraction track is built from 1 and then it goes to the whole number 2. As the kids become more fluent with their fractions, they're more comfortable moving from 1 all the way up to 2.



Slide 12: Strategies when Playing to 2

 **Text:** With the Playing to 2 version of the game, there are new strategies and more opportunities to extend thinking about fraction concepts. For example, students learn that with a fraction between 1 and 2, the player can move 1 on any track and the remaining part of the fraction on another track.

 **Audio:** In Fraction Tracks today, some of the kids decided to enlarge their board from one whole to two wholes. Well, that brings along some new challenges. And as that came, some new strategies came along with them. That when they would pull a card that said

13/12 they could automatically jump 1 on any track and do 1/12 more. Well, that was like a gift. They thought that was fabulous that they could do that. And so as they enlarged their board, their strategies became more sophisticated.



Slide 13: Extension to percentages/decimals

 **Text:** Another extension to the game is to add common percentages (10%, 50%, 75%, 90%) and/or decimals (0.25, 0.5, 0.8) to the fraction card deck. This adds translating among fractions, percentages, and decimals to the play of the game.

 **Audio:** The game really gears up when it gets into fractions, percents, and decimals. Long ago we used to teach fractions separately, percents separately, and decimals separately. And now they are taught pretty much as one. Decimals will follow up fractions and percents in just a few weeks. I believe it helps the kids be completely fluent between one situation and another.