

Creating a Mathematics Classroom Cultural Toolkit

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What is culture?

A group's collective ways of thinking, believing and knowing, which includes their shared experiences, consciousness, skills, values, forms of expression, social institutions and behaviors.

Hillard (2001)

Individuals acquire culture through contacts and associations with others who share their culture such as nuclear family members, relatives, and friends.

Marshall (2002)



What is culture?

Elements of culture include: food, language, music, and beliefs about good and evil... Culture is a feature of all human groups and is shaped by historical, social, political, economic, and even geographical factors.

Additionally, culture is often reinforced (positively) through our contacts with societal institutions. Whether we experience such reinforcement, however, largely depends on the status position of the cultural group to which we belong.

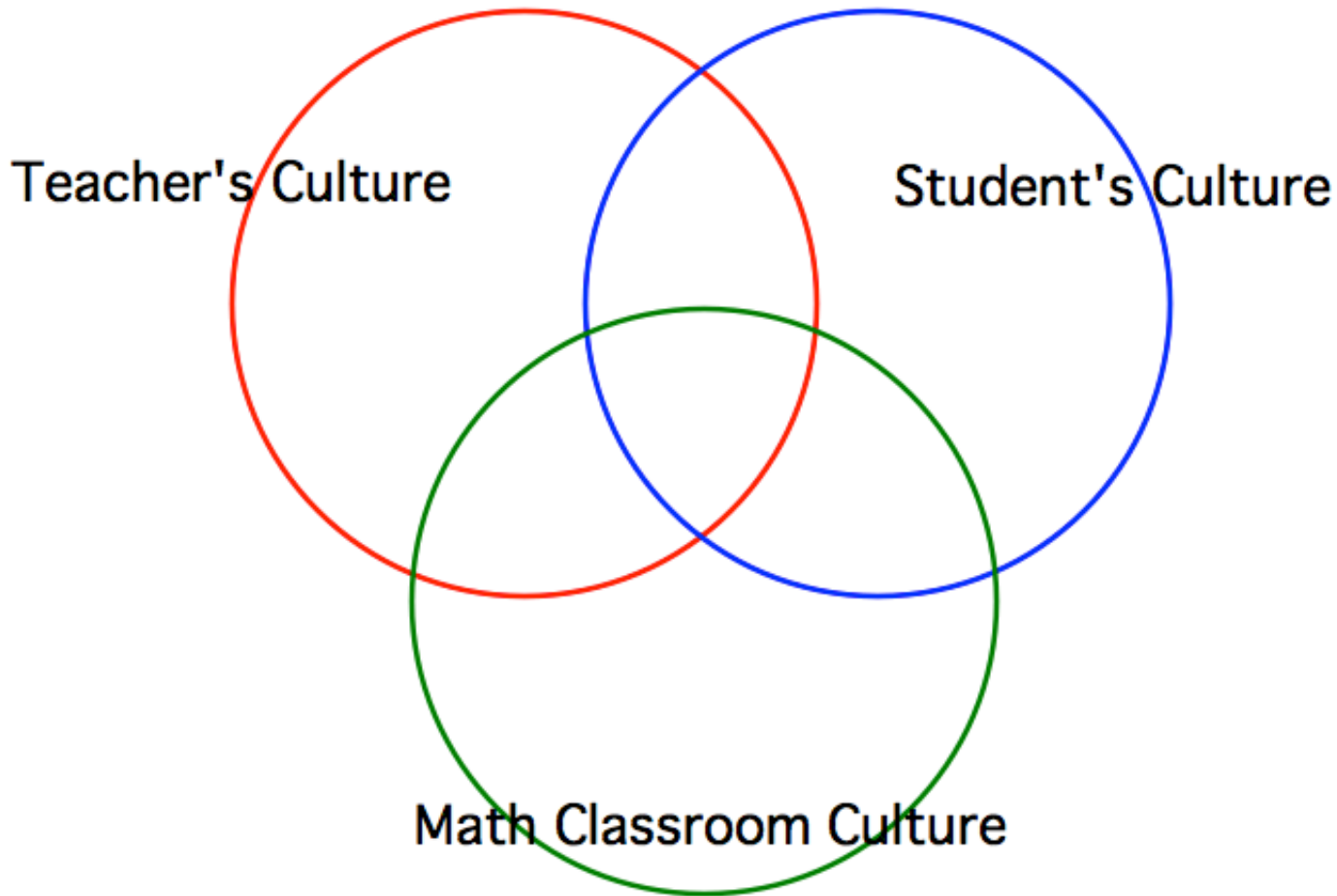
Marshall (2002)

A few common features of culture...

- ▶ Culture is learned, therefore it is adaptable and vulnerable to changes.
- ▶ Substantive cultural changes rarely occur quickly or easily.
- ▶ Through conscious (and sub-conscious) resistance, people tend to defend and protect their culture.
- ▶ Our own cultural ways of being tend to strike us as ordinary, usual, and normal. Consequently, we are often oblivious to the peculiarities of our own culture.
- ▶ It is not uncommon for other people's cultural ways of being to strike us as quaint, strange, or even pathological.

Marshall (2002)

Every Classroom has a culture

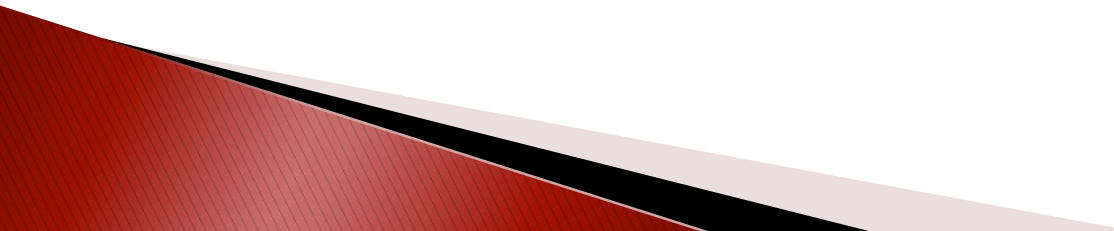


What is a Mathematics Classroom Cultural Toolkit?

- ▶ The toolkit is a binder or set of folders that includes information about:
 - Mathematics Goals
 - Teacher's Culture
 - Student's Culture
 - Classroom Culture



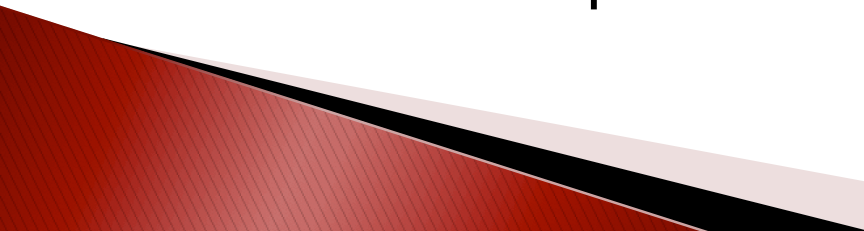
Before the lesson...

- ▶ Select a topic you want/will teach.
 - ▶ What are the Mathematics Goals?
 - ▶ What are the Related Standards?
- 

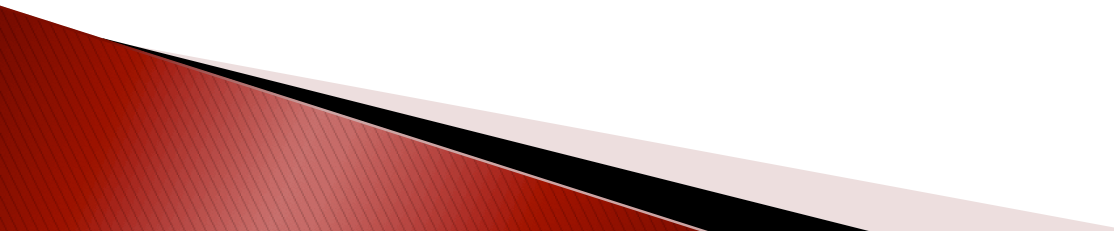
CCSSM – The Number System (6.NS)

- ▶ Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
 1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for $(2/3) \div (3/4)$ and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that $(2/3) \div (3/4) = 8/9$ because $3/4$ of $8/9$ is $2/3$. (In general, $(a/b) \div (c/d) = ad/bc$.) How much chocolate will each person get if 3 people share $1/2$ lb of chocolate equally? How many $3/4$ -cup servings are in $2/3$ of a cup of yogurt? How wide is a rectangular strip of land with length $3/4$ mi and area $1/2$ square mi?

Our Example – Fraction Operations

- ▶ Topic: Division of fractions
 - ▶ Mathematical Goals:
 - Understand the relationship between multiplication and division of fractions
 - Model division of fractions
 - Compute division of fractions (procedural) and understand why the procedure works
 - Solve word problems involving division of fractions
- 

Before the lesson...

- ▶ Select a topic you want/will teach.
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- 

CCSSM

6th Grade: Understanding ratio concepts & use ratio reasoning to solve problems

1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
2. Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.
3. Use ratio and rate reasoning to solve real-world and mathematical problems.

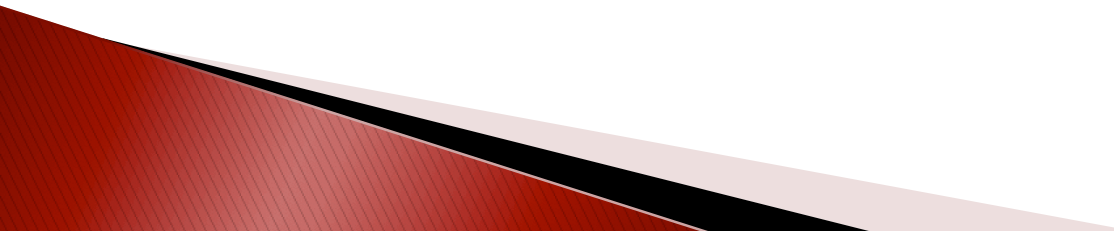
7th Grade: Analyze proportional relationships and use them to solve real-world and mathematical problems

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
2. Recognize and represent proportional relationships between quantities.
3. Use proportional relationships to solve multistep ratio and percent problems.

8th Grade: Understand the connections between proportional relationships, lines, and linear equations.

5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
6. Use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .

Teacher's Culture

- ▶ *I am*
 - ▶ *I was raised to believe...*
 - ▶ *I value*
 - ▶ *My experiences with other cultures include...*
- 

Teacher's Culture (DW)

- ▶ *I am African American, woman, mom, smart, funny, committed to education, cute, and mentor.*
- ▶ *I was raised to believe that I can do anything I set my mind to, I should speak my mind.*
- ▶ *I value mathematics education, fairness, and a love of learning.*
- ▶ *My experiences with other cultures include meeting southerners, working with other ethnic groups, being the minority.*

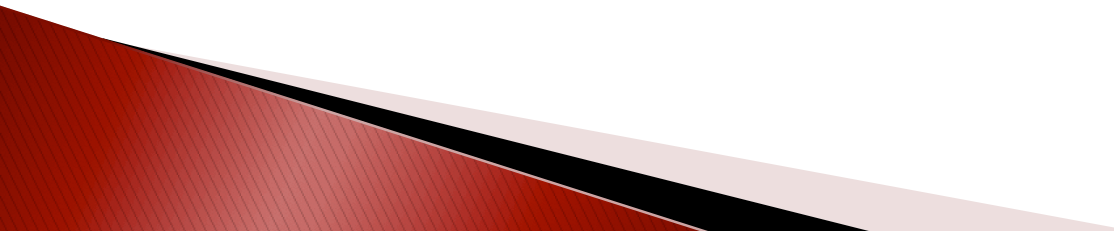
Teacher's Culture (TD)

- ▶ *I am Asian American, woman, wife, daughter, friend, funny, and loyal.*
- ▶ *I was raised to believe to work hard and to dream big.*
- ▶ *I value mathematics education, respect, relationships.*
- ▶ *My experiences with other cultures include understanding my Korean family, the South, and working with students and faculty of different ethnic groups.*

Teacher's Culture (EM)

- ▶ *I am 40 year old, white woman, educator, mathematician, mother, sister, daughter, New Yorker, athlete.*
- ▶ *I was raised to believe that I should always put family first, work hard and be successful.*
- ▶ *I value effort, kindness, honesty, and loyalty.*
- ▶ *My experiences with other cultures include working with colleagues and students from different cultures, meeting people from around the world.*

Teacher's Culture

- ▶ *I am*
 - ▶ *I was raised to believe...*
 - ▶ *I value*
 - ▶ *My experiences with other cultures include...*
- 

Teacher's Culture

Beliefs about mathematics learning & teaching

- ▶ *I learn by...*
- ▶ *I was taught by...*
- ▶ *I want my students to learn by...*
- ▶ *As I teach, I will ask these types of questions...*

Teacher's Culture (DW)

Beliefs about mathematics learning & teaching

- ▶ *I learn fraction division by drawing pictures.*
- ▶ *I was taught fraction division by KCF.*
- ▶ *I want my students to learn fraction division by working with models and talking in groups.*
- ▶ *As I teach fraction division, I will ask these types of questions...*
 - *How many $\frac{1}{8}$ can we make from $\frac{1}{4}$?*
 - *How did you get your answer?*

Teacher's Culture (TD)

Beliefs about mathematics learning & teaching

- ▶ *I learn fraction division by drawing pictures & talking to my peers (thinking out loud).*
- ▶ *I was taught fraction division by KCF.*
- ▶ *I want my students to learn fraction division by using models and communicating their thoughts to one another.*
- ▶ *As I teach fraction division, I will ask these types of questions...*
 - *How did you get your answer?*
 - *How can we make sense of the invert and multiply method?*

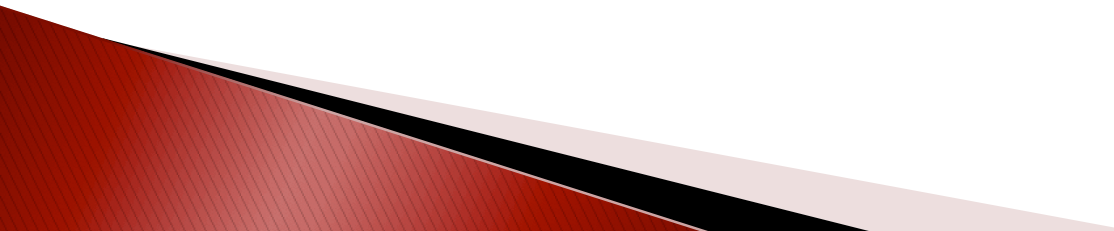
Teacher's Culture (EM)

Beliefs about mathematics learning & teaching

- ▶ *I learn fraction division by thinking about real life scenarios and drawing pictures.*
- ▶ *I was taught fraction division by rules and procedures.*
- ▶ *I want my students to learn fraction division by using multiple representations.*
- ▶ *As I teach fraction division, I will ask these types of questions...*
 - *Can you show this using a picture?*
 - *Can you explain how you got that?*

Teacher's Culture

Beliefs about mathematics learning & teaching

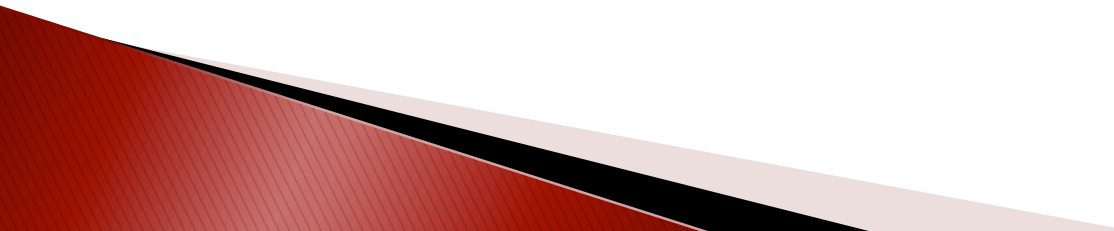
- ▶ *I learn by...*
 - ▶ *I was taught by...*
 - ▶ *I want my students to learn by...*
 - ▶ *As I teach, I will ask these types of questions...*
- 

Student's Culture

▶ Complete the following table:

Name	Math Strengths	Out-of-School Culture	Learning Style	Group Habits
Dorothy	Knows basic facts	Solves jigsaw puzzles, Walks with friends	Needs to understand what she's doing	Works well in groups and listens to others
Tonya	Can follow procedures and explain them to others	Kickboxing, walking my dog, reading	Needs to see things visually and use color to understand concepts	Works well with others
Eileen	Mimics procedures well	Ultimate frisbee, movies	Needs to understand why things work	Bossy, focused and takes good notes

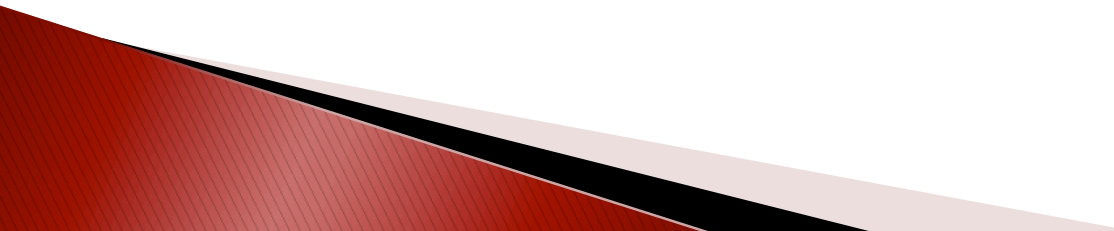
Math Classroom Culture

- ▶ My classroom is arranged by:
 - Physical environment
 - Student arrangements
 - ▶ My student expectations include:
 - Communication and interaction
 - Behavior
 - Mathematical authority
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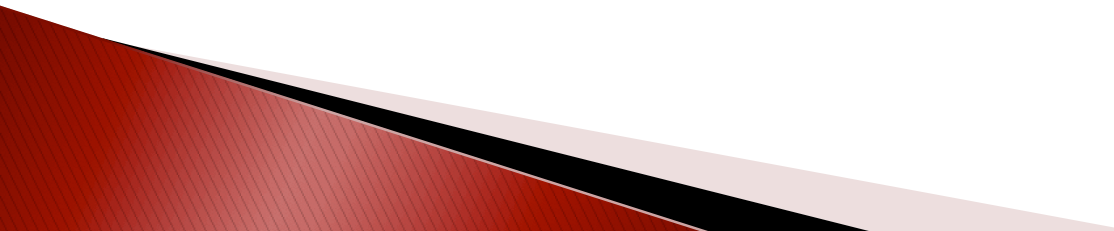
Math Classroom Culture

- ▶ My classroom is arranged by...
 - Physical environment **natural and/or bright lights, manipulatives, lots of board space**
 - Student arrangements **desks in groups**
- ▶ My student expectation include:
 - Communication and interaction **share their thinking and answers, listen and critique peers**
 - Behavior **share the materials and be respectful**
 - Mathematical authority **all learners, including teachers**

Math Classroom Culture

- ▶ My classroom is arranged by:
 - Physical environment
 - Student arrangements
 - ▶ My student expectations include:
 - Communication and interaction
 - Behavior
 - Mathematical authority
- 

After the lesson...

- ▶ How did the lesson support all student learning? How do you know?
 - ▶ How did the toolkit support the lesson?
 - ▶ What other aspects do I need to consider when I teach this lesson again?
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Conclusions

- ▶ What did you find helpful?
- ▶ How can we improve the toolkit?

Thank you for your time!!

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