Knowing and Valuing Every Learner: Culturally Responsive Mathematics Teaching
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This work is supported by grants from the National Science Foundation, awards #1660809 and #1321339. To learn more, see http://atmala.weebly.com and http://tacib.weebly.com
Characteristics of Student A’s Math Class

• Focus on making sense of math concepts and relationships
• Share and refine mathematical thinking through peer-to-peer collaboration, communication, and justification
• Take ownership of mathematical ideas
• Engage in contextual problems designed to connect key mathematical concepts, relationships, and skills with local cultural practices and ways of thinking
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Student A developed confidence in sharing mathematical reasoning during peer discussions. Her teacher described her as a genius due to her novel and mathematically rich ways of representing concepts and relationships.
A Tale of Two Classrooms—Student B

Characteristics of Student B’s Math Class

- Follow teacher-given procedures
- Generate correct answers to decontextualized math problems
- Reward for catching peers with wrong answers
- Computer games as incentive to complete work
- No explicit focus on or concern with understanding math
A Tale of Two Classrooms—Student B

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• Computer games as incentive to complete work
• No explicit focus on or concern with understanding math

_Student B did her best to follow the tricks to get answers in math. Her teacher described Student B as a hard worker but struggling with a D+ grade._
The Tale of Two Noras (Hogan, 2008)

Student A was Nora in Grade 6

Student B was Nora in Grade 7

https://www.researchgate.net/publication/233453582_The_Tale_of_Two_Noras_How_a_Yupik_Middle_Schooler_was_Differently_Constructed_as_a_Math_Learner
When asked toward the end of her seventh grade year about her experiences with seventh grade mathematics, Nora explained, ‘...the teacher only lets you learn some stuff.’”

(Hogan, 2008, p. 107)

https://www.researchgate.net/publication/233453582_The_Tale_of_Two_Noras_How_a_Yupik_Middle_Schooler_was_Differently_Constructed_as_a_Math_Learner
“Understanding how a child achieves as a learner [of mathematics] is less about her intrinsic abilities and more about how she is constructed as a learner by her teacher. That construction also affects how power and ownership of knowledge are negotiated in the classroom and whose knowledge is valued.”

(Hogan, 2008, p. 95)

https://www.researchgate.net/publication/233453582_The_Tale_of_Two_Noras_How_a_Yup'ik_Middle_Schooler_was_Differently_Constructed_as_a_Math_Learner
Which Students Are Marginalized and Dehumanized by Traditional Practices of Mathematics Teaching?

**Marginalize**

mar • gin • al • ize | \ˈmärj-,nə-līz,

When you push people to the edge of society by not allowing them a place within it, you marginalize them.

Since the late 1920s *marginalize* has referred not to a literal edge, but to a powerless position...

**Dehumanize**

de • hu • man • ize | /dē′(h)yō̅omə, nīz/

Deprive of human qualities

Make mechanical or routine

(definition from vocabulary.com)
Historical Practices of US School Mathematics

- Repetition and Practice of Received Knowledge
  - Content Knowledge
  - Teacher Practice (Transfer of Knowledge)

Personal Understanding of Mathematics

(Ellis, 2003)
(Re)Humanizing Mathematics

- Mathematics is a human invention and is part of every culture and community.
- Each and every student should feel connected to mathematics and valued for their ways of thinking.
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- Each and every student should feel connected to mathematics and valued for their ways of thinking.
### (Re)Humanizing Mathematics

<table>
<thead>
<tr>
<th>What we need to do:</th>
<th>How to do it:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support each and every student in recognizing, extending, and refining their use, understanding, and appreciation of mathematics.</td>
<td>Through personal and collaborative processes of reasoning, sense making, and communication.</td>
</tr>
<tr>
<td>Create opportunities for every student to see themselves in mathematics and to see mathematics in themselves.</td>
<td>Position mathematics teaching and learning around eliciting, valuing, and connecting students’ mathematical thinking with students’ identities.</td>
</tr>
</tbody>
</table>

To learn more about (re)humanizing mathematics:
Habits in Mathematics Classrooms Today: Standards for Mathematical Practice

Mathematically proficient students...

1. Make sense of problems and **persevere** in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to **precision**.
7. Look for and make use of **structure**.
8. Look for and **express** regularity in repeated reasoning.
Elements of CRMT

- **Supporting deep learning:** How to ensure student success with coherent and connected mathematical understandings
- **Engaging and valuing identities:** How to honor students’ experiences, communication practices, and communities
- **Sharing authority:** How to build inclusive, collaborative norms and routines
- **Applying mathematics:** How to use mathematics to understand and investigate meaningful situations
## Culturally Responsive Mathematics Teaching: What It Is NOT

<table>
<thead>
<tr>
<th>Incorrect Practice</th>
<th>Correct Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowering expectations</td>
<td>Increasing supports</td>
</tr>
<tr>
<td>Removing challenges</td>
<td>Scaffolding access to rigorous mathematics</td>
</tr>
<tr>
<td>Changing the names and images to represent diversity</td>
<td>Ensuring the mathematics is relevant &amp; meaningful</td>
</tr>
<tr>
<td>Assuming all students learn with the same approaches</td>
<td>Getting to know your students and communities</td>
</tr>
</tbody>
</table>
Learning with and from Real Teachers and Real Classrooms

**Advancing Teachers of Mathematics to Advance Learning for All (ATMALA)**

- 20 teachers of mathematics, Grades 6–12
- Diverse southern California “high-need” school districts
- Pursuing National Board certification (or already Board certified)
- Learning about and putting into practice Culturally Responsive Mathematics Teaching (CRMT)
- Developing micro-credential modules around specific CRMT skills for other teachers to learn about this
- 3 CSU Fullerton faculty and 1 school district math specialist

**Reimagining the Mathematics Classroom**

- 23 teachers of mathematics, K–6
- 1 ½ years of classroom visits
- Framed around the question, “What are the components of a powerful mathematics learning environment that supports all students?”
- Cathery Yeh, Mark Ellis, and Carolee Hurtado

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Supporting deep learning: How to ensure student success with coherent and connected mathematical understandings

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Voices from the Classroom:
Annie Chen, Norwalk-La Mirada Unified School District
Angela Reed, Anaheim Union High School District

- Examining our own identities
- Learning about students and their families
Parents Sharing Mathematics: The Quinceañera Problem

Martín is helping plan his sister’s quinceañera. The space where it will be held measures 30 feet by 50 feet.

• Based on the number of guests attending, how many of each size table should Martín recommend?
• Show how the tables will be arranged and how you calculated the total number of chairs.

From Yeh, Ellis, & Hurtado (2017), *Reimagining the Mathematics Classroom*
Engaging and Valuing Identities: How to Honor Students’ Experiences, Communication Practices, and Communities

• What have I learned about my students’ prior knowledge and skills—including the languages they speak and ways they communicate—and in what ways do I encourage them to use these in their learning of mathematics?

• How do I learn about the experiences and interests of my students? And how do I communicate that these experiences and interests are valued in relation to their learning of mathematics?

• How do I invite authentic, meaningful parent/community engagement in my students’ learning of mathematics?
Culturally Responsive Mathematics Teaching

Supporting deep learning: How to ensure student success with coherent and connected mathematical understandings

Engaging and valuing identities: How to honor students' experiences, communication practices, and communities

Sharing authority: How to build inclusive, collaborative norms and routines

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Voices from the Classroom:
Annie Chen, Norwalk-La Mirada Unified School District
Angela Reed, Anaheim Union High School District

• Nurturing an inclusive math talk learning community
• Having students take up mathematical authority
• What norms have I established to ensure equitable participation and the reduction of unequal status among students?
• What routines do I use to scaffold students’ engagement in productive mathematical discourse and collaboration?
• Who is given mathematical authority in my classroom? And who is not?
Supporting deep learning: How to ensure student success with coherent and connected mathematical understandings

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Applying mathematics: How to use mathematics to understand and investigate meaningful situations
Voices from the Classroom: Tor Ormseth, El Rancho Unified School District (Pico Rivera, CA)

- Learning about communities and growing with students
- Creating projects that bring important mathematics together with issues that matter to students

**Figure 1. Gender Shares of Total and STEM Employment, 2009**

- Men: 52% for All jobs, 76% for STEM jobs
- Women: 48% for All jobs, 24% for STEM jobs

**How much carbohydrate and protein does my plant have compared to other plants?**

- Sweet Potato: Carbohydrate 25%, Protein 0%
- Potato: Carbohydrate 20%, Protein 5%
- Chinese Yam: Carbohydrate 15%, Protein 10%
Connecting to the Community: Student Photo Project

• A photo can serve as a powerful tool to investigate the mathematics in students’ daily lives.

• *What’s the mathematics in this picture?*

Yeh, Ellis, & Hurtado (2017), *Reimagining the Mathematics Classroom*
Mrs. Rodriquez bought a large cup of mangos and a small cup of watermelon.

The small cup costs $1.75 and the large cup costs twice as much as the small cup.

If Mrs. Rodriquez paid $10.00, how much money should she get back?

Yeh, Ellis, & Hurtado (2017), *Reimagining the Mathematics Classroom*
Students had opportunities to...

- See themselves in mathematics and mathematics as part of themselves
- Use their knowledge of mathematics to analyze a real issue
- Connect mathematics to other disciplines
- Demonstrate their learning in culturally meaningful ways
Applying Mathematics: How to Use Mathematics to Understand and Investigate Meaningful Situations

• How am I modifying standard curriculum materials so they are more relevant to my students?

• How am I helping my students to see ways to use mathematics to analyze and address issues within their communities?
Challenges and Payoffs of This Work

- Old habits are (initially) hard to break
- Must step out of our comfort zone... or modify what we’re comfortable with
- Planning takes time
- Learning takes time
- But seeing students more engaged and more successful is worth the effort!
- And re-humanizing mathematics *learning* also re-humanizes mathematics *teaching*!
The best teachers focus on how to look rather than what to see. (Lotto, 2017)
The best teachers focus on **how to look** rather than what to see. *(Lotto, 2017)*

- **Look for** and value students’ interests and assets rather than seeing deficits
- **Look for** what works rather than repeatedly seeing what does not
- **Look for** growth rather than seeing gaps
- **Look for** ways to invite students into mathematics rather than seeing them pushed away from it
- **Look for** students’ brilliance rather than seeing the results of our failure to activate this!
Thank you!

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Ready Classroom Mathematics
#CRMT
References


