ENCORE: UTILIZING CRITICAL LITERACY STRATEGIES IN MATHEMATICS INSTRUCTION

September 6, 2016
Great Lakes Equity Center

- One of ten federally funded, regional EACs
- Federally funded - Title IV, 1964 Civil Rights Act
- Provide On-Demand Technical Assistance
- Serve local and state educational agencies
- Desegregation, race, gender, national origin

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Great Lakes Equity Center Mission

- Ensure equity in student access to and participation in high quality, research-based education
- Expand states’ and school systems’ capacities to provide robust, effective opportunities to learn for ALL students
- Reduce disparities among and between groups in educational access, participation, and outcomes
- Serve as a resource for the Office for Civil Rights and Department of Justice
Today’s Agenda

1. WELCOME AND OVERVIEW
2. CONTEXT OF MATH TEACHING & LEARNING
3. WHAT IS CRITICAL MATH LITERACY?
4. APPROACHES TOWARD CRITICAL MATH LITERACY
Today’s Facilitation Team

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Welcome to EquiLearn Webinars

This webinar is interactive - join the discussion live via the chat feature.

To reduce noise distractions, participants’ microphones will be disabled.

A recording of this webinar and materials will be posted to greatlakesequity.org.
Centering Equity In Educator Effectiveness Webinar Series...

- Culturally Responsive and Sustaining Classrooms
  - November 18, 2015

- Utilizing Critical Literacy Strategies in Mathematics Instruction
  - May 18, 2016

- Encore: Utilizing Critical Literacy Strategies in Mathematics Instruction
  - September 6, 2016
Today’s Objectives

Participants in this webinar will…

Identify characteristics of critical mathematic literacy instruction;

Explain at least two major implications of the current Standards movement on mathematics instruction;

Articulate the importance of supporting traditionally under-represented students in developing positive math identities; and

Describe (and enact) at least one instructional approach/strategy that promotes critical literacy skills in mathematics.
Today’s Purpose...

This webinar is not about a "know how" or "ten steps to…", it is more of a "recalibration" to cultivate mindsets or paradigms that support critical consumption of pedagogical practices and theories that perpetuate inequities and erase the development of our own critical literacy. As equity-oriented educators, we must tend to our own critical consciousness through vigilant self-reflection.
Educational Equity

- Representation
- Meaningful Participation
- Access
- Positive Outcomes

(Equity, Fraser, 1998)
Context of Mathematics Teaching and Learning
Use the poll feature below to answer the following questions:

- **KNOW:** What do you already know about Critical Mathematics Literacy?
- **QUESTIONS:** What questions do you have about Critical Mathematics Literacy?
- **LEARN:** What do you want to learn about Critical Mathematics Literacy?
Between 10-25% of US high schools offer only one of the core math and/or science courses (OCR, 2014a)

Only 50% of high schools in the CRDC sample offered Calculus (OCR, 2014a)

“Even less access for Black, [Latina/o], American Indian, and Alaska Native students...” (OCR, 2014a)

Students in districts that serve a greater proportion of non-white students are more likely to be taught by under qualified and inexperienced teachers (OCR, 2014b)
AIAN = American Indian and Alaskan Native; NHPI = Native Hawaiian or Pacific Islander
NOTE: Figure reflects data for 99% of CRDC high schools, including approximately 200,000 American Indian/Alaska Native students, 743,000 Asian students, 75,000 Native Hawaiian/Other Pacific Islander students, 2.5 million black students, 3.3 million Latino students, 340,000 students of two or more races, and 8.5 million white students.
PARTICIPATION AND OUTCOMES

Percent of US Students Enrolled, Taking Algebra I, and Passing Algebra I in Grades 7 and 8 by Race/Ethnicity (OCR, 2014a)

- **AIAN = American Indian and Alaskan Native; NHPI = Native Hawaiian or Pacific Islander**
- **NOTE:** Data reflects only those schools included in both the CRDC collection and the National Center for Education Statistics (NCES) Common Core of Data Public School Universe Survey, approximately 98.5% of CRDC schools. Totals include 6.8 million students enrolled in grades 7 or 8, 1.4 million students enrolled in Algebra I in grades 7 or 8, and 1.1 million students passing Algebra I in grades 7 or 8.

- **District Enrollment**
- **Enrolled in Algebra I**
- **Passing Algebra I**

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What’s going on in schools that surrounds teaching and learning of mathematics?

Standards, and New Standards

New Teachers’ Evaluations

More uniformity across grade levels

• Scope & sequence guides
• Unit pre- & post-tests
• Response to Intervention
Finding Common Ground – What’s the problem with mathematics instruction?

- Often treated as an individual, cognitive activity; fixed body of knowledge
- Presented from a White-dominant perspective (Cobb & Russell, 2015; Gutstein, 2003; Gutierrez, 2012)
- Prevalent math ideologies and narrow notions of mathematical success serve to sort children and contribute to a sense of competence
- Lack of focus on children’s thinking; preoccupation with how we might “confuse” learners
- Many of us struggle to envision a math teaching and learning space that honors children’s experiences, intuition, and cultural ways of knowing – multiple mathematics knowledge bases (Turner et al., 2012)
What is critical math literacy?
Critical Math Literacy

Aiming for a critical literacy in and through math knowledge

Involves the 1) ability to ask basic [mathematical] questions in order to deepen one’s appreciation of particular [social] issues, and 2) the ability to present data to change people’s perceptions of those issues (Frankenstein, pp. 336-337, 1990)
### Dominant Literacies

- Being able to read and do mathematics
- Mathematical skills, competencies, and understandings that allow for the ‘doing’ of advanced mathematics, results in successful testing

### Critical Literacies

- Approaching knowledge critically, seeing social events in the interrelationship of their historical and political contexts, and acting in one’s own interest as a conscious agent in and on the world (Gutstein, 2003)
- Skills, competencies, and understandings that allow for the critique of and successful intervention in issues of social injustice (Terry, p. 78, 2010)
Critical Math Literacy: Key Constructs

Identity
(Aguirre, Martin, & Ingram-Mayfield, 2013)

Participation
(Boaler & Staples, 2008)

Power
(Gutierrez, 2007)

Affinity
(Gee, 2005)

Relevancy
(Gutstein, 2006; Martin, 2010)
Using the chat feature…

- Share ONE word or phrase to describe your math identity
- How was that identity formed?
Approaches Toward Critical Math Literacy
Framework Toward Critical Literacy In Mathematics Instruction

- Selection of texts, activities, and valued outcomes
- Discourse, structure, and connections
- Mathematics History and Contexts

- Mathematics Identity
- Critical Mathematics Practice

- Critical Reflection on Mathematics Instruction
- Educator and student identities, agency etc.
<table>
<thead>
<tr>
<th>Mathematics History and Context</th>
<th>Mathematics Identities</th>
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<tbody>
<tr>
<td>• What do I value as math instruction; why?</td>
<td>• What is my math identity as an educator; is it positive or negative?</td>
</tr>
<tr>
<td>• Why is math important for students to learn; whose interests are being served?</td>
<td>• How do I nurture positive and resist negative math identities for my students?</td>
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<td>• What barriers are in place that limit access to and participation in rigorous math instruction?</td>
<td>• Who do I consider to be “math doers”, who do I not think of as “math doers”; why?</td>
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(Aguirre & del Rosario Zavala, 2013)
### Critical Reflection on Mathematics Instruction

- To what extent does my math instruction include and sustain the perspectives and lived experiences of my students?
- In what ways do I incorporate manipulatives and multiple representations of mathematics concepts in my instruction?
- How do I encourage students to use math as a tool to disrupt issues of power and privilege in their communities?

### Critical Mathematics Practices

- Do I hold high expectations for every student in mathematics instruction?
- How do my lessons enable every student to closely explore and analyze math concepts, procedures, and reasoning strategies?
- How does my mathematics instruction make student thinking visible and deep?

(Aguirre & del Rosario Zavala, 2013)
Critical Math Literacy Vignette

Curry Green

Mr. Thompson

Ms. Davis

(Aguirre, Martin, & Ingram-Mayfield, 2013)
DOT AND RECTANGLE

The dot (Point A) on this graph represents a rectangle whose area is 24 square inches.

Mark two other points on the graph that represent other rectangles with area of 24 square inches.

Explain why you put each dot at a particular point. (Hint: The marks on the lines are not units of 1.)

(Aguirre, Martin, & Ingram-Mayfield, pp. 61, 2013)
## Ms. Davis’ Stations

<table>
<thead>
<tr>
<th>Multiplication Stations</th>
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<tbody>
<tr>
<td><strong>Station 1</strong></td>
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<tr>
<td>Multiplication Arrays</td>
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<tr>
<td>[Students create a set of array cards.]</td>
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<tr>
<td><strong>Station 2</strong></td>
</tr>
<tr>
<td>Why does it look like a square?</td>
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<td>[Students build, record, and cut out models of the following facts on colored paper: 2 x 2, 3 x 3, 4 x 4, 4 x 5, 5 x 5, ... 12 x 12. Then they arrange them in ways that show an increase or decrease in area.]</td>
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<tr>
<td><strong>Station 3</strong></td>
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<tr>
<td>Division: A rectangle, then a little more...</td>
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<td>[Students create a rectangular array for each of the following division problems: 15/4, 64/5, 84/5; 65/7; 44/9. Then they represent each one on graph paper.]</td>
</tr>
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(Aguirre, Martin, & Ingram-Mayfield, pp. 62, 2013)
Station One: Multiplication Arrays

(Aguirre, Martin, & Ingram-Mayfield, pp. 63, 2013)
Closing Thoughts

Knowledge is Power
2016 EQUITY LEADERS INSTITUTE

CENTERING EQUITY IN CURRICULAR AND INSTRUCTIONAL PRACTICES:
USING UNIVERSAL DESIGN FOR LEARNING AND CULTURALLY SUSTAINING PEDAGOGY

September 21 –22, 2016 | IUPUI Campus Center | Indianapolis, IN
THANK YOU FOR YOUR PARTICIPATION!!

PLEASE PROVIDE YOUR FEEDBACK

Post-Session Questionnaire

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