Equity-Focused Teaching in K-12 CS: Strategies for Teachers, Teacher Educators, and District

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Session Agenda

- Define equity and equity-focused CS teaching and learning
- Integrating CS with an equity lens
- Family and community engagement
- Practical examples
- Resources

We advocate for the use of equity-focused teaching and learning as an essential practice within computer science classrooms.

(Madkins, Howard, & Freed, 2020, p. 1)

Defining Equity in CS Classrooms

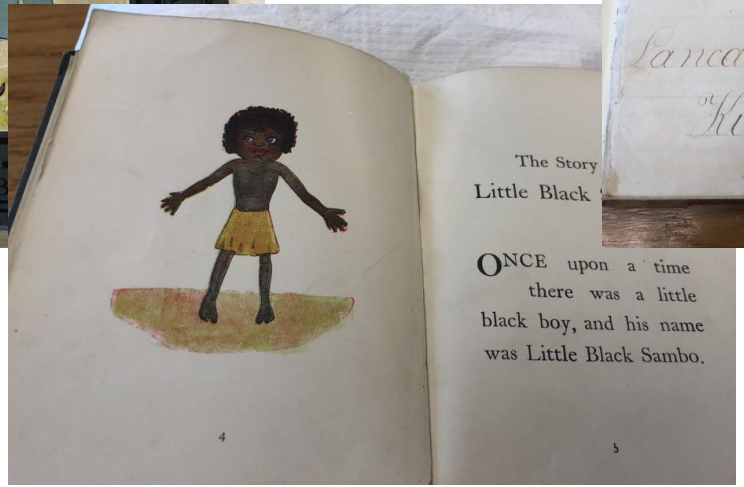
- **What does *equity* mean to you?**
  - **In the chat:**
    - Type your role, location, and definition of equity.
    - Hit enter when I say, “Go!”

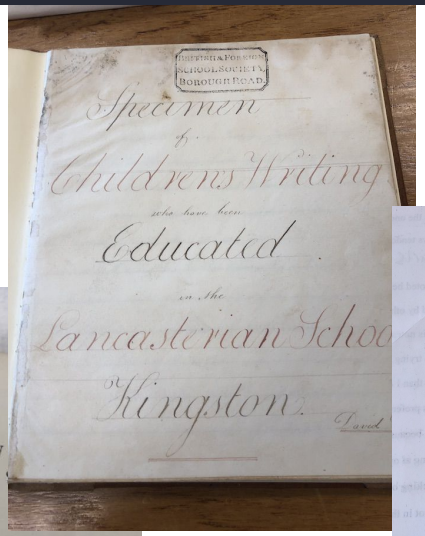
What do we mean by *equity-focused*?

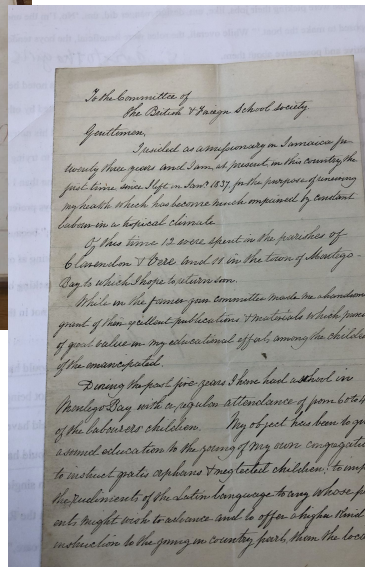
Justice-oriented approach...

- Empowers students to use CS knowledge for transformation
- Moves beyond access and achievement frames
- Asset- or strengths-based approach centering students and families

Identifying and Rejecting Deficit Thinking







How do we effectively do this work together?

Considerations for Equity-Focused CS Teaching

- Your beliefs (and your students' beliefs) and how they impact CS classrooms
- Tiered activities and pair programming
- Self-expressions vs. CS preparation
- Equity-focused lens

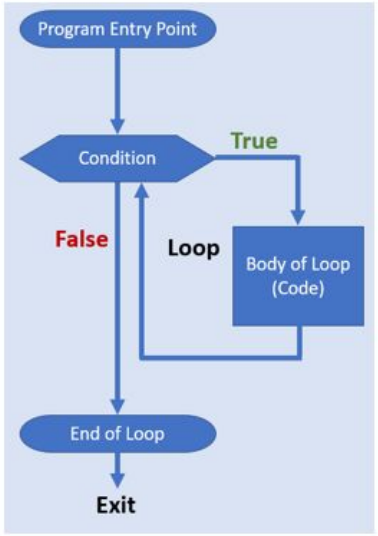
Integrating CS with an equity lens

- Provide a Basic Understanding of Computer Science Language for ALL
  - Flow
  - Data Type
  - Syntax
- Teach Tools & Allow Creativity to Flourish
  - Allow Exploration in the Platforms
  - Interest Drives Engagement
- Identify Your Purpose
  - Self-Expression vs. Computer Science Preparation
  - Autonomy and Capacity vs. Arbitrary Standards Compliance
  - High Expectations

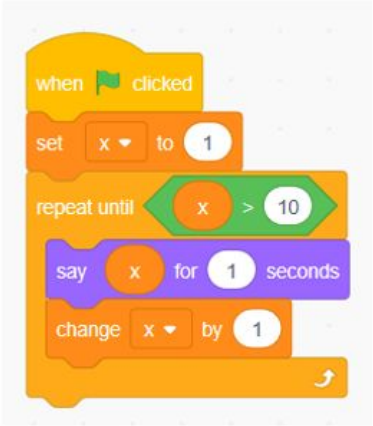
What does this mean?

- Progress is mutually beneficial
- Enrollment in CS, when available, may have the largest influence on students' selection of STEM fields
- Greater attention should still be given to the preparation of our youth
  - Broadening participation
  - Engaging Equity Pedagogies in Computer Science Learning Environments: https://inspire.redlands.edu/jcsi/vol3/iss2/1/

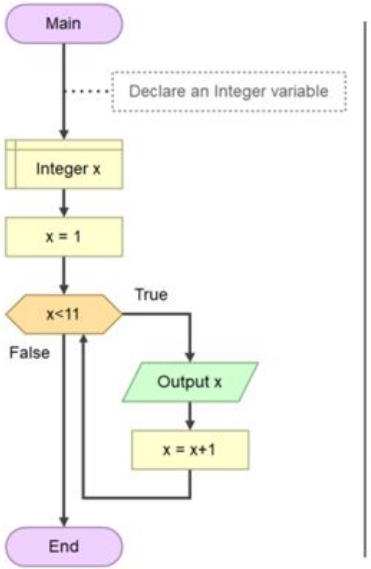
Different Paths to CS Literacy



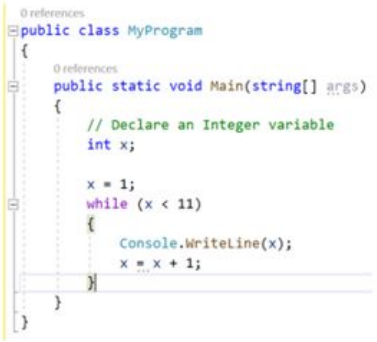
Flowchart



Scratch



Flowgorithm



```
0 references
public class MyProgram
{
    0 references
    public static void Main(string[] args)
    {
        // Declare an Integer variable
        int x;

        x = 1;
        while (x < 11)
        {
            Console.WriteLine(x);
            x = x + 1;
        }
    }
}
```

Visual Studio

Parents without backgrounds and insights into the changing landscape of technology struggle to negotiate what roles they can play, such as how to work together in computing activities or how to find learning opportunities for their children.

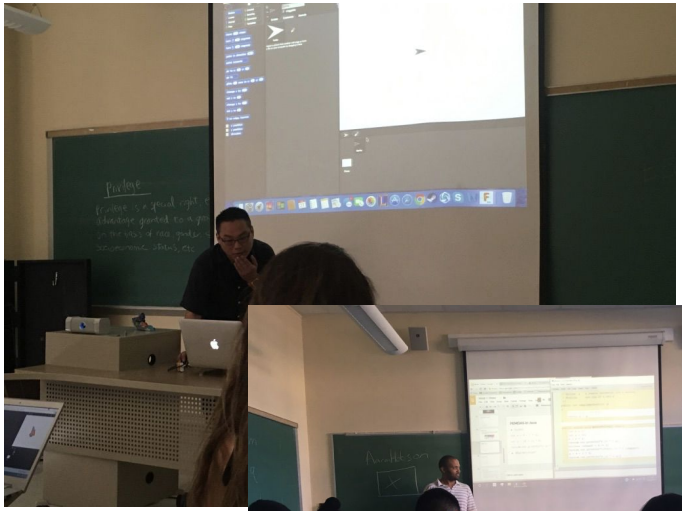
(DiSalvo, Ried, & Roshan, 2014; Roque, 2013)

Practical examples

- Family and community engagement
- Building community
- Innovative professional learning opportunities
- Preservice teacher education

Family and Community Engagement

Building Classroom Community



- **We should be...**
  - Self-Aware
  - Relational
  - Mindful
  - Intentional

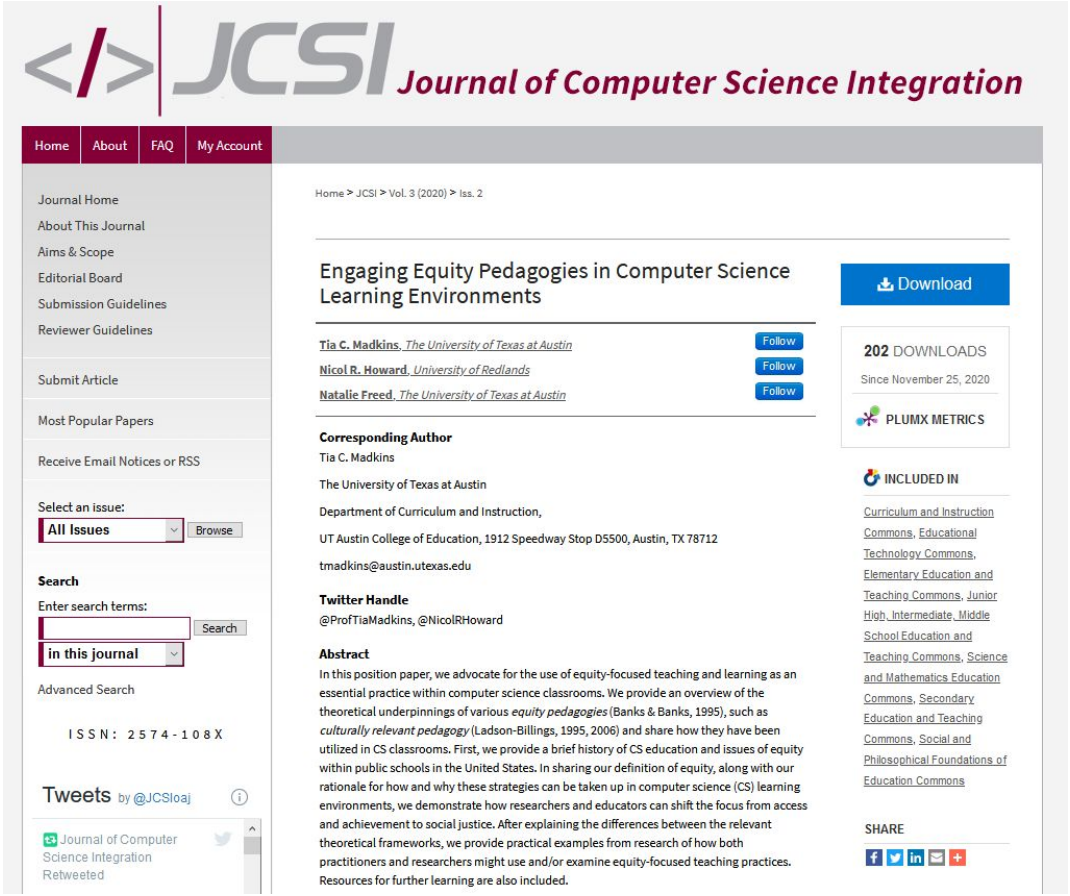
Building Classroom Community

- Connect with students' cultural practices and lived experiences
- Empower students to become change agents
- Foster and maintain relationships with students, families, and communities

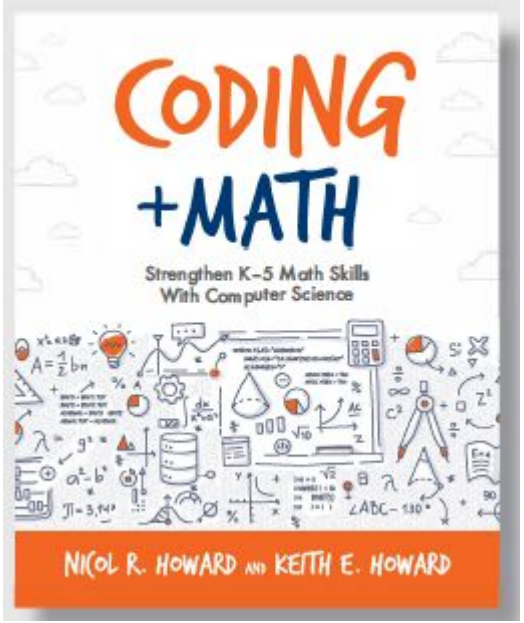
Innovative Professional Learning Opportunities

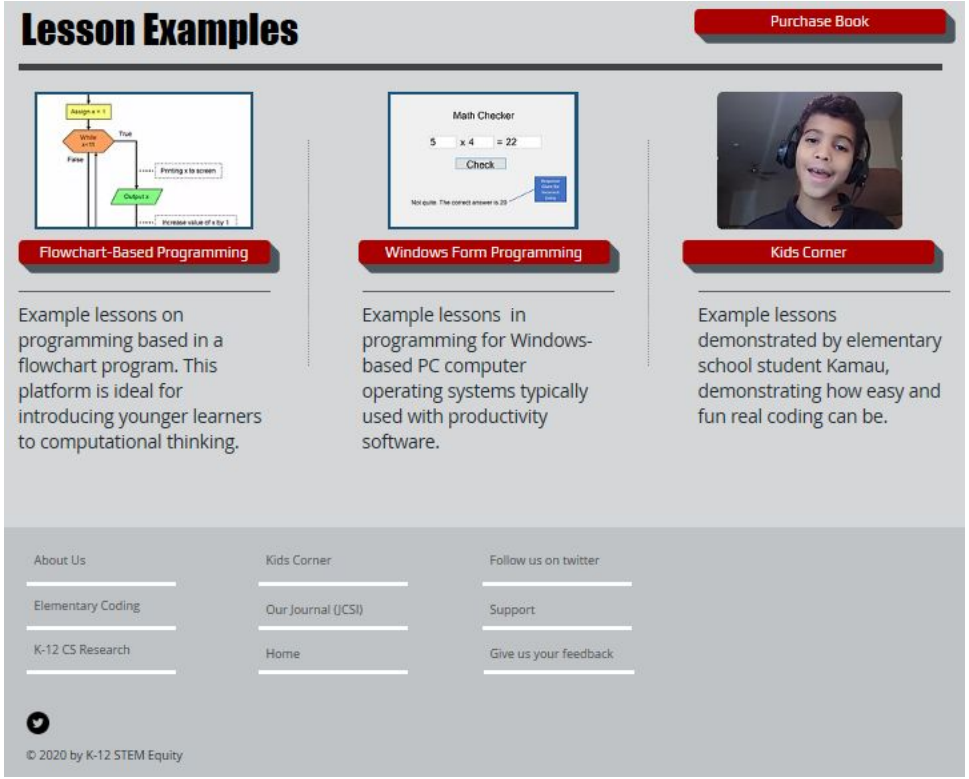
- Professional learning communities
- Reach across stages/grade levels
- Lesson study

Preservice Teacher Education



https://inspire.redlands.edu/jcsi/vol3/iss2/1/





https://www.k12stemequity.com/

SpringerLink

Original research | Published: 16 July 2018

EdTech Leaders' Beliefs: How are K-5 Teachers Supported with the Integration of Computer Science in K-5 Classrooms?

Nicol R. Howard

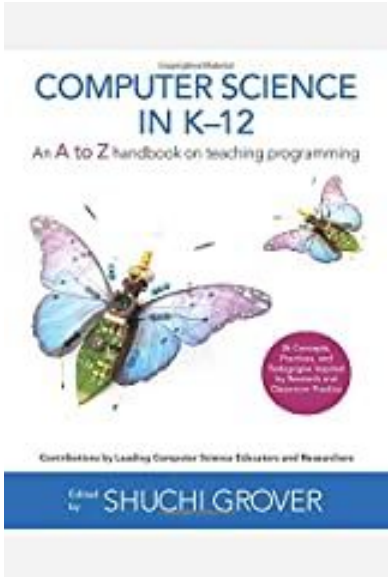
Technology, Knowledge and Learning **24**, 203–217(2019) | Cite this article

572 Accesses | **1** Citations | **8** Altmetric | Metrics

Abstract

Educational Technology Leaders' support of computer science teachers in K-5 classrooms are influenced by their beliefs about school-based program implementation criteria, available district-level support, and state mandates on the integration of computer science. The researcher in this study examines the beliefs about Computer Science teacher support, and training in five different Educational Tech Leaders' districts, to determine sustainable implementation practices for K-5 schools. In order to effectively integrate computer science in K-5 instruction, administrators and program decision-makers must be aware of the beliefs Educational Technology Leaders hold related to the implementation process of programs, specifically related to the training of K-5 teachers who facilitate the computer science curricula in classrooms. Information reported in this study may inform school-level, district-level, and state-level decisions related to sustainable computer science program implementations.

https://link.springer.com/article/10.1007/s10758-018-9371-2



er science teacher, found that using these culturally relevant educational tools to teach web-based software allowed high school students to apply lessons on algorithms, computing, and how to better use search engines to "create simulations of cultural arts, such as Native American beadwork, as [they] moved from concepts to making, students were excited to finally start 'programming' their rugs, baskets, and beadwork [. . .] with little direction from [the instructor] they deep dived into the website, problem-solved, made mistakes, and iterated."

In their work in an introductory computer science course with middle school students, Yolanda Rankin and Jakita Owensby Thomas found in their research that integrating a module that leveraged food, recipes, and cooking to expose students to algorithmic thinking as a starting, or anchoring, experience led to 100% retention of black women undergraduate students for that course.

> Such programs suggest engaging underrepresented students of color in educational experiences that strengthen their cultural, linguistic, gender, and racial identities can provide more equitable learning outcomes in computing.

CULTURALLY RELEVANT PEDAGOGY

▶ How We Selected These Practice

Next, we provide practical examples of how teachers sustaining practices in programming classrooms in sc student outcomes. We selected these examples becau sustaining teaching practices we believe are empower ming. Importantly, these examples come from our ob contexts that each aim to support students of color in tween programming and their lives. We desired to pr can use as a guide to support their professional learni positively influence student learning goals and outco gramming. These examples are sample methods educ scriptive approaches simply to be replicated. We encc es to determine what will work well for their unique that engaging in this work can at times be challengin these practices into their pedagogical approach with

We organize our ideas and guidelines for CRP in prog

A. Connect with students' cultures/life experiences
B. Empower students to become change agents
C. Relationships with students, families, and comm

▶ Connecting With Students' Cultur

Rooting computing curriculum and pedagogy in the allows them to engage and learn about programming assets, life experiences, and community knowledge a have found the following teaching strategies to be eff

- Engage students with programming activities th (e.g., creating the best transportation route for a learning minimal spanning trees)

- Make programming accessible by connecting learning to students' personal interests, social identities, perspectives, and everyday lives (e.g., inviting a student who skateboards to help introduce a culturally situated design tool about the culture and mathematics of skateboarding)
- Draw from students' cultural assets and knowledge to use as building blocks for examining programming topics (e.g., using popular music to discuss programming paradigms such as loops and linked lists, or using family recipes to discuss how the same algorithm can be represented in different ways)
- Develop project-based assignments for students to both identify an issue of concern to their lives, family, or community and to design a technology-based solution (e.g., mapping food deserts in urban neighborhoods)
- Storytelling from one's own programming education experiences where appropriate to dispel common alternative conceptions of programming concepts and model resilience and effective problem-solving practices in programming education (e.g., storytelling to illustrate the sequence of steps taken to discover that instance variables have a default value in Java)

o Become Change Agents

npacts and ethics of programming is necessary ddress community problems and inequities that m. Examples of how this can be done include
n programming that have led to bias and e.g., face-recognition misgendering rates for

echnology firms on diverse and historically fter and other tech companies on e San Francisco?)
y, surveillance, and other issues with . police searches of social media accounts)
with programming activities to help students g., presenting a data science project about an s or designing and gathering feedback about a

system to identify potential points of licymakers, venture capitalists, corporate the programming opportunity landscape for map of institutions, companies, and of color in tech)

udents, Families, and

r families is an important aspect of culturally ital role in supporting and sustaining derrepresented students of color.

iences involve curriculum that facilitates ncluding tribal and community agencies,

CHAPTER 12

Learner-Centered and Culturally Relevant Pedagogy

Tia C. Madkins, Jakita O. Thomas, Jessica Solyom, Joanna Goode, and Frieda McAlear

INTRODUCTION: CULTURALLY RELEVANT PEDAGOGY

What we have learned about [swimming and] computer science is that all of the seemingly cultural preferences and interests are profoundly impacted by historical legacies, structural inequities, denied learning opportunities, and belief systems that justify these inequities
– Jane Margolis, *Stuck in the Shallow End*

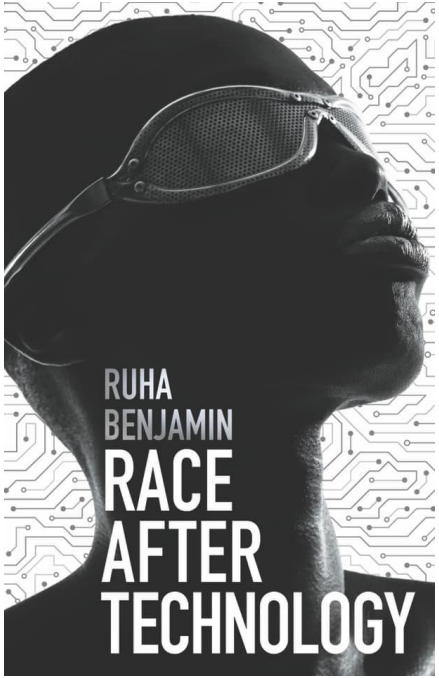
Underrepresented minority students (for example, black, Latinx, Native American/Alaskan, Hawaiian / Pacific Islander in the United States) have historically experienced racial bias and structural inequities both inside and outside of school settings. Educational inequities appear at all levels, from low funding for schools with high proportions of underrepresented students of color to diminished teacher and counselor expectations, tracking students into remedial and special needs programs, and over-referring students to school disciplinary officials. For underrepresented students of color, these practices are an extension of colonial and assimilative educational practices, have led to the development of school-perpetuated (historical) trauma, and contribute to experiencing an education environment that feels irrelevant, hostile, and unwelcoming.

Culturally relevant pedagogy (CRP) was first proposed by Ladson-Billings as well as Allen and Boykin in the 1990s. CRP is founded on the idea that learning grounded in a familiar cultural context can potentially increase equitable outcomes. This framework outlines three tenets for academic success: (1) implementing academic rigor, (2) honoring students' cultural and linguistic backgrounds, and (3) helping students to understand, recognize, and critique social inequities. This mode of teaching also emphasizes an authentically caring rapport between teacher and student and connecting curriculum to students' home cultures and everyday lived experiences.

WHY CULTURALLY RELEVANT PEDAGOGICAL PRACTICES MATTERS IN COMPUTING

One emerging area of scholarship combines the well-established research and practice of culturally relevant pedagogy with programming education to develop engaging and rigorous programming instruction for underrepresented students of color. This line of research provides a conceptual foundation for integrating culturally relevant pedagogical frameworks into programming instruction across learning contexts. In programming, principles of culturally relevant pedagogy and related approaches include: *(1) **supporting student identity development**, (2) **encouraging a critique of inequities in computing**,* and *(3) **addressing sociopolitical issues**.*

L(Madkins et al., 2019, 2020)



Design to Disrupt: Making Space for Every Student in CS

CSforALL Follow
Feb 24, 2020 · 5 min read ★

As #BlackHistoryMonth draws to a close and #WomenHistoryMonth begins, *Dr. Nicki Washington illustrates Computer Science with the* ***whom*** *it should represent, along with the* ***why*** *these identities matter.*

Photo Credit: Code.org

Drs. Ruha Benjamin, Nicki Washington, and John Cheney-Lippold

Breakout Room Prompts

In small groups, discuss the following:

1. **Think about an upcoming lesson (or set of concepts, topics, etc.) you will teach in the coming weeks.**
   a. What are some ways you can revise that lesson to be more equity-focused? How do you think your students will respond?
   b. How can researchers approach designing a study related to equity-focused teaching and learning?
2. **What are some realistic ways schools/districts/researchers can better engage with families and communities?**
   a. What kinds of responses do you anticipate from families and communities as you (further) engage equity-focused teaching and research?
3. **Think of an existing professional development model that has worked well for you and your colleagues.**
   a. How can you use this model to build capacity to (further) engage equity-focused teaching?
   b. What kinds of supports will you need from administrators or your district?

Questions?

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