

With intentionality: Preparing pre-service and in-service teachers to teach STEM for social justice

January 18, 2025



Paper Set

Paper 1: Learning to Teach STEM for Social Justice using Justice-Centered STEM Pedagogy
Vanessa Dodo Seriki & Samala Lewis

Paper 2: STEM Problem Solving through Social Justice Lessons for Pre-Service and In-Service Teachers

Mary K. Stapleton & Andrew "AJ" Kutz

Paper 3: Integrating Social Justice into STEM Education: Leveraging Design Thinking with Preservice Teachers
Sarah Mamaril

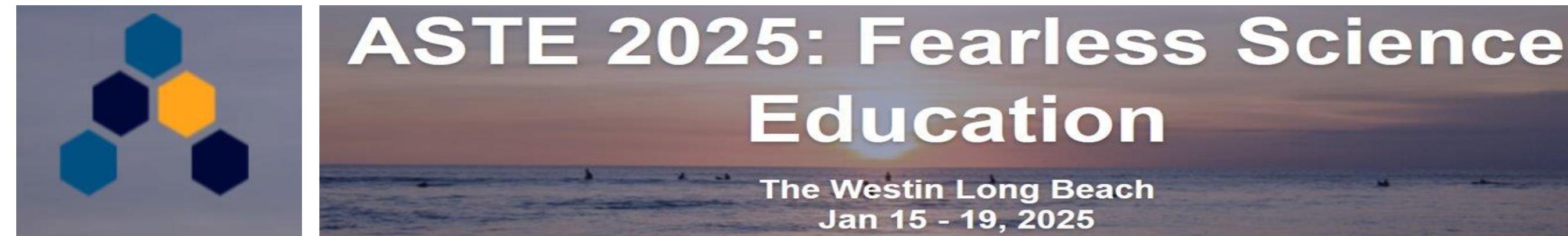
Learning to Teach STEM for Social Justice using Justice-Centered STEM Pedagogy

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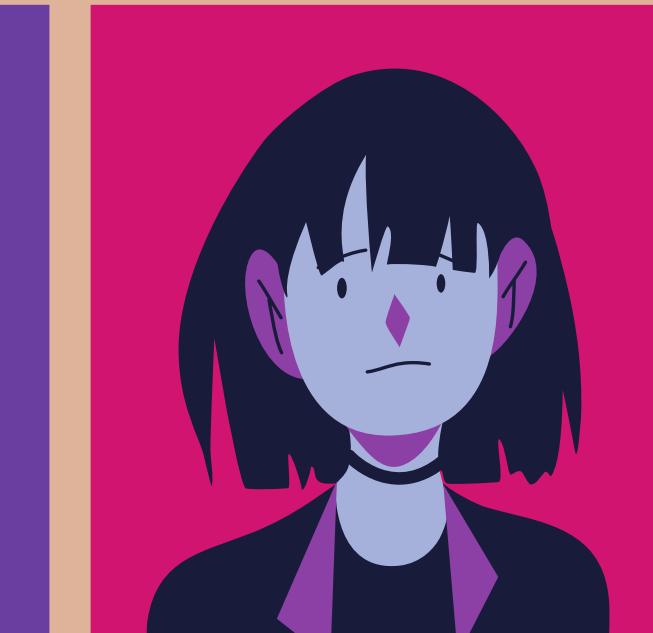
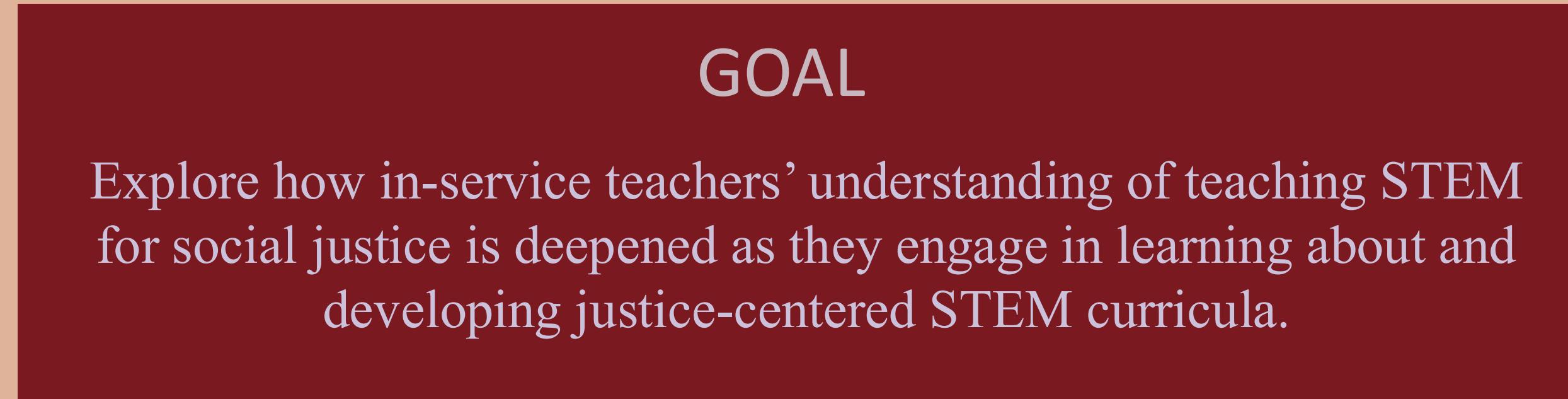
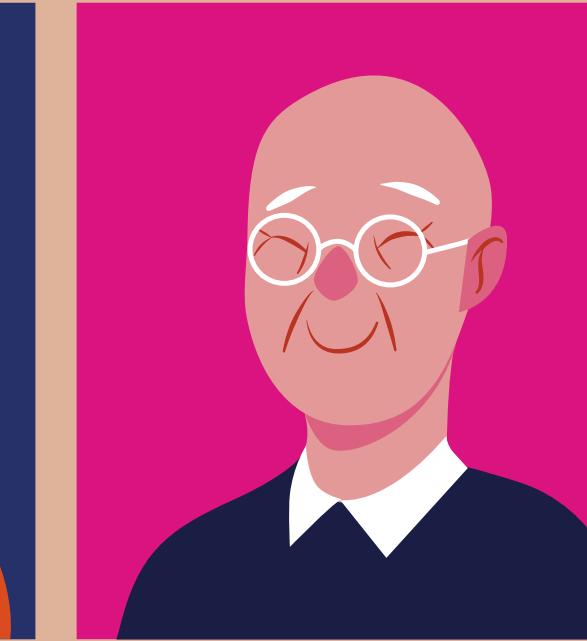
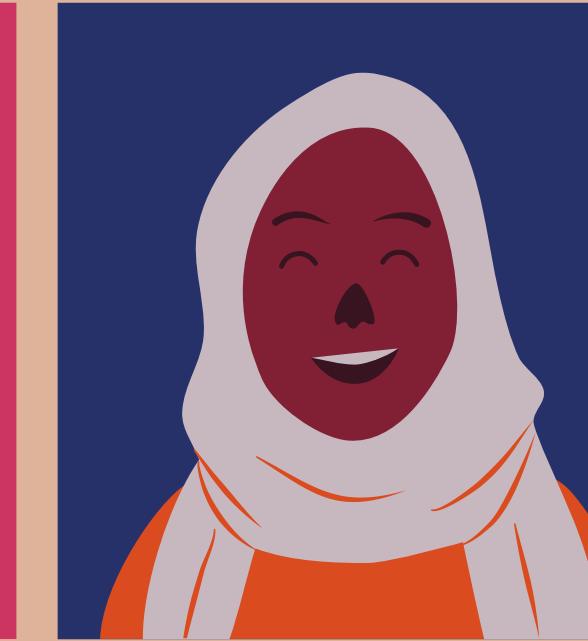
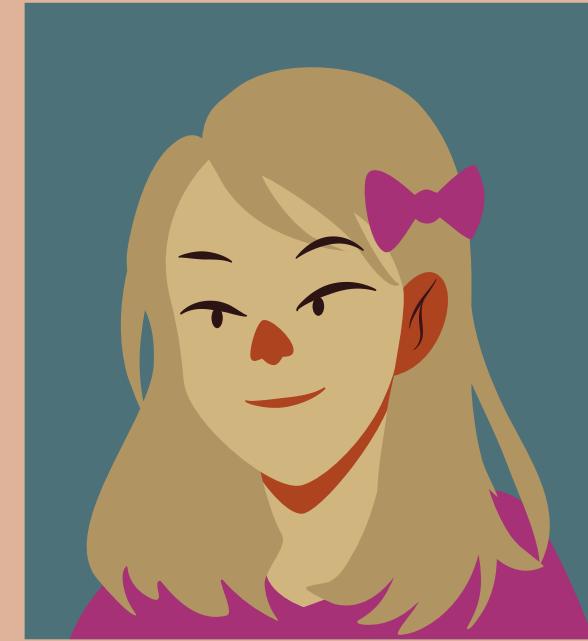


Saturday, January 18th, 2025



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Relevance

Provides an **example** of how **in-service STEM teachers** can be engaged with STEM content, pedagogical knowledge, and socio-scientific issues that **deepens understanding of teaching STEM for social justice**.



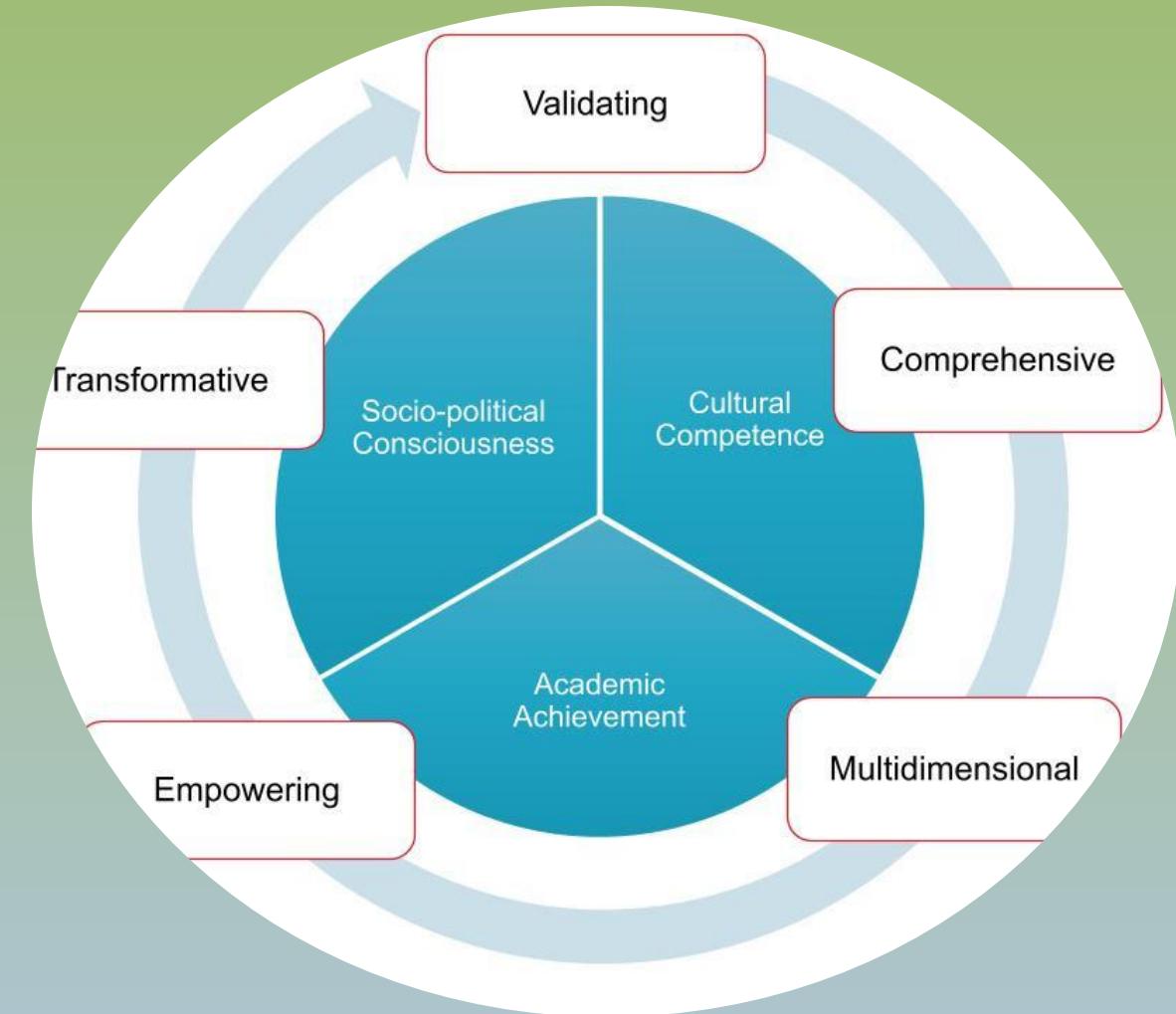
Use or development of **justice-centered STEM curricula**.



Significance

Shows that engagement in **explicit social justice learning tasks** allows STEM teachers opportunities to critically reflect on their beliefs, attitudes and practices; opportunities to grow cultural, community, and social justice knowledge that can **elicit a growth mindset**; and **foster a commitment to teaching for social justice**.

Conceptual Framework

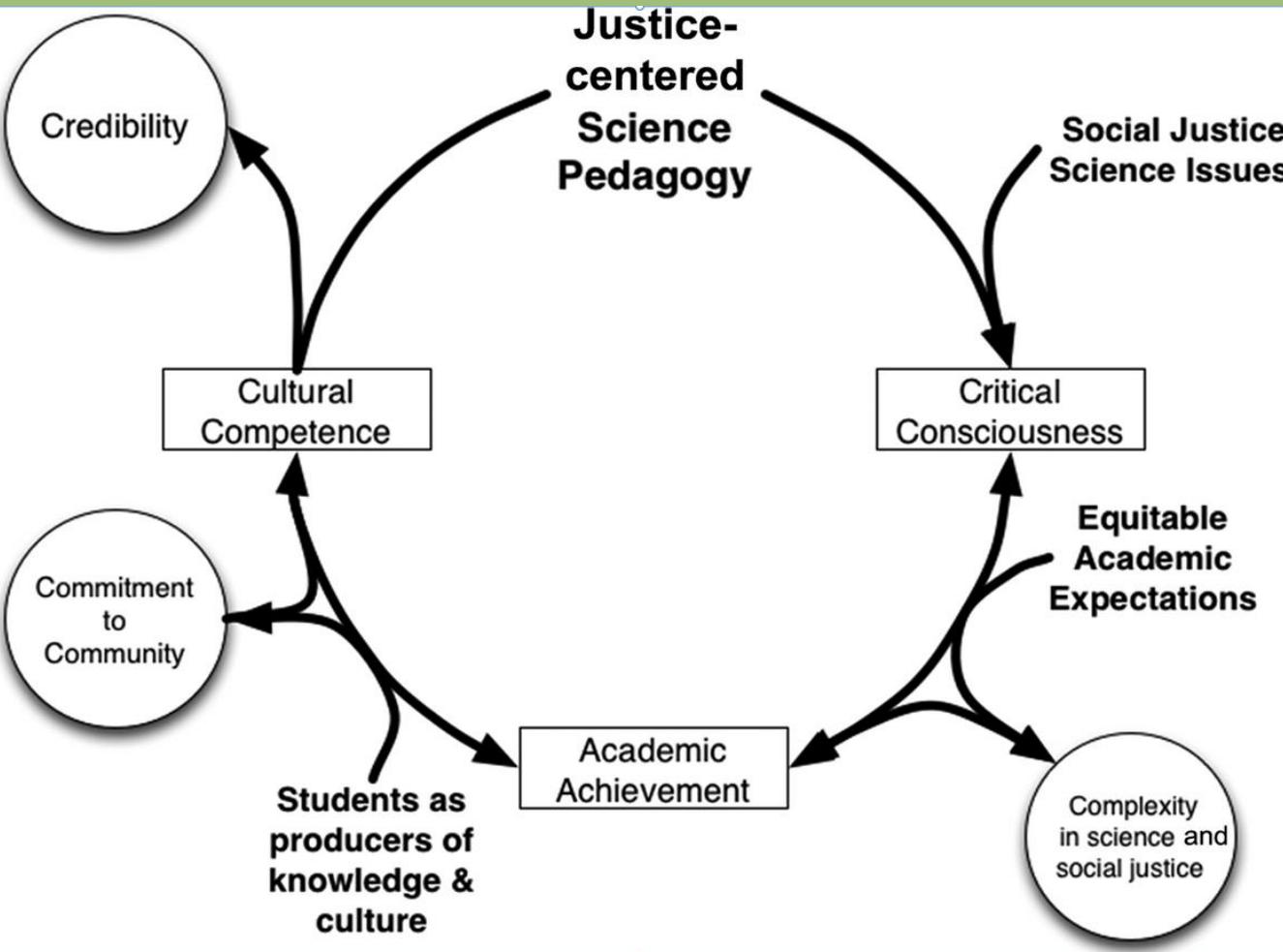


Culturally Relevant Pedagogy (CRP)

Gloria Ladson-Billings (2009)

Culturally Responsive Teaching (CRT)

Geneva Gay (2018)



Justice Centered STEM Pedagogy (JCSP)

Daniel Morales-Doyle (2017)



Teaching for Social Justice (TSJ)

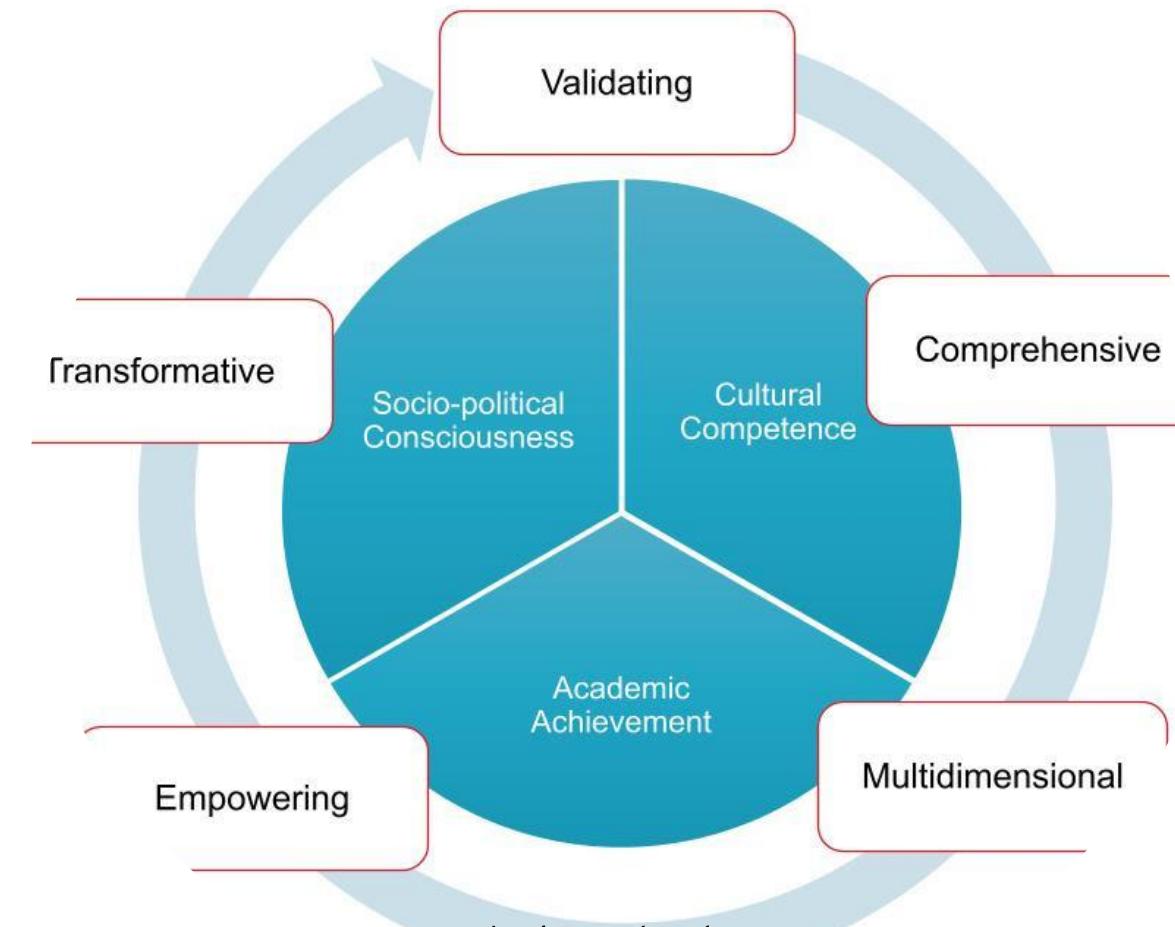
Larry Ludlow & Sarah Enterline
(2008)

MATH 680: Special Topics in Mathematics

Equity and Justice-Centered Pedagogy in the STEM Classroom



Module 1:
Identity across race, class, and gender: How do you see yourself and others?



Module 2:
Culturally Relevant Pedagogy & Culturally Responsive Teaching: What's the difference and how do I do it?
What does Social Justice have to do with it?



Module 3:
Develop Justice-Centered STEM Curricula

Research Question

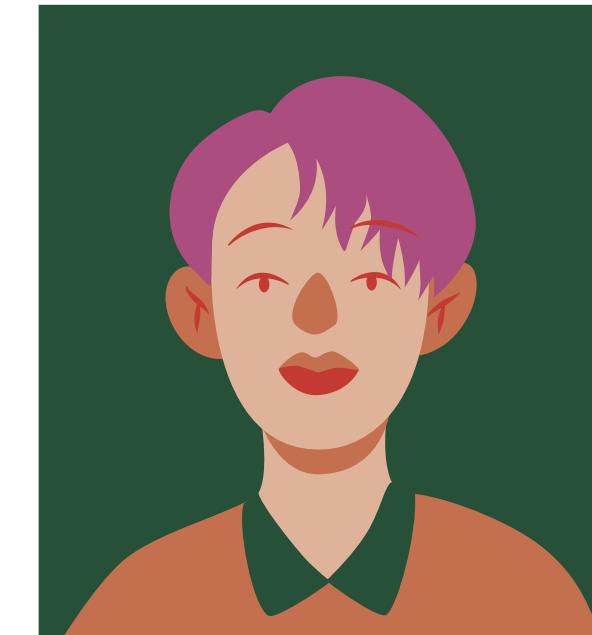
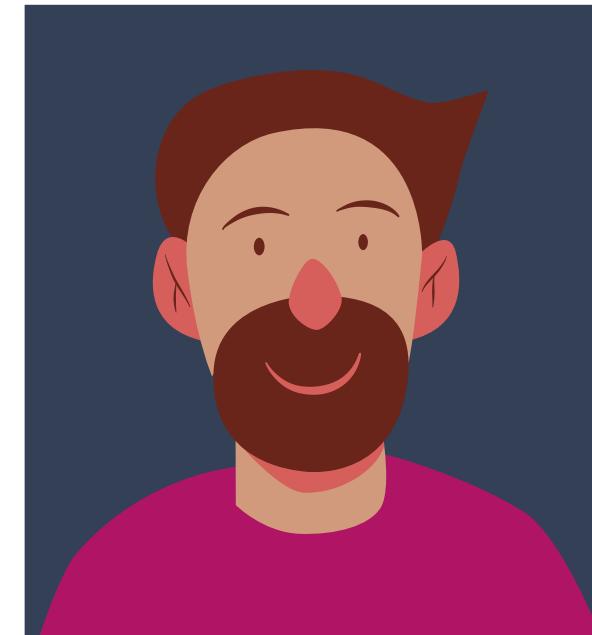
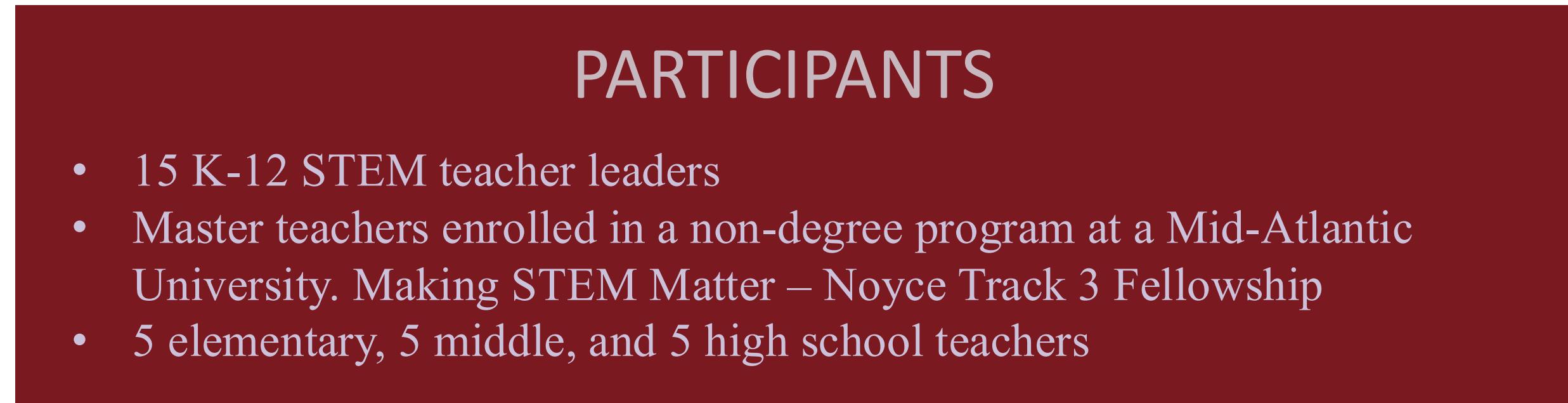
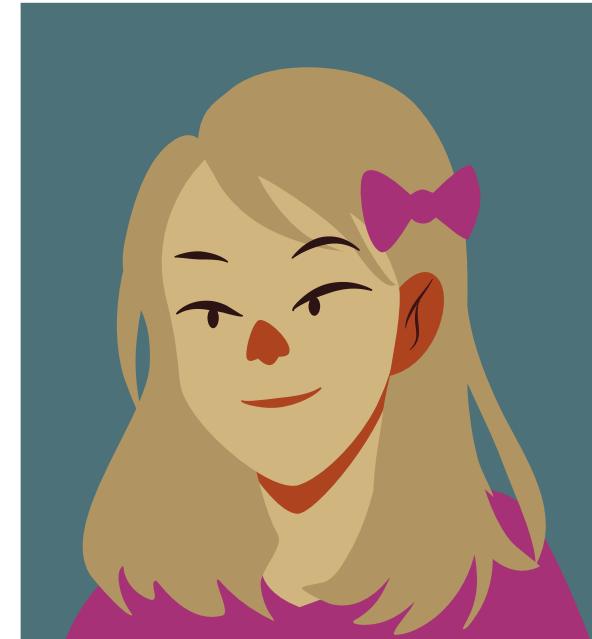
How does an intentionally designed justice-centered STEM pedagogy course aid STEM teacher leaders in deepening their understanding and enactment of teaching STEM for social justice?



What we needed to know

Baseline understanding of STL

1. ...culturally relevant dispositions
2. ...familiarity with teaching STEM for social justice
3. ...areas of growth after JCSTEMP
4. ...challenges with teaching STEM for social justice



Research Design & Methods

Design: Descriptive case study

Methods: Surveys and **questionnaires**, **digital journal prompts**, in-class discourse, and student-developed artifacts such as infographics, and justice-centered STEM curricula.

- *Initial Conceptions of teaching STEM for Social Justice*
- *Culturally Relevant Inventory (3 scales)*
- *Reflective journal prompt*

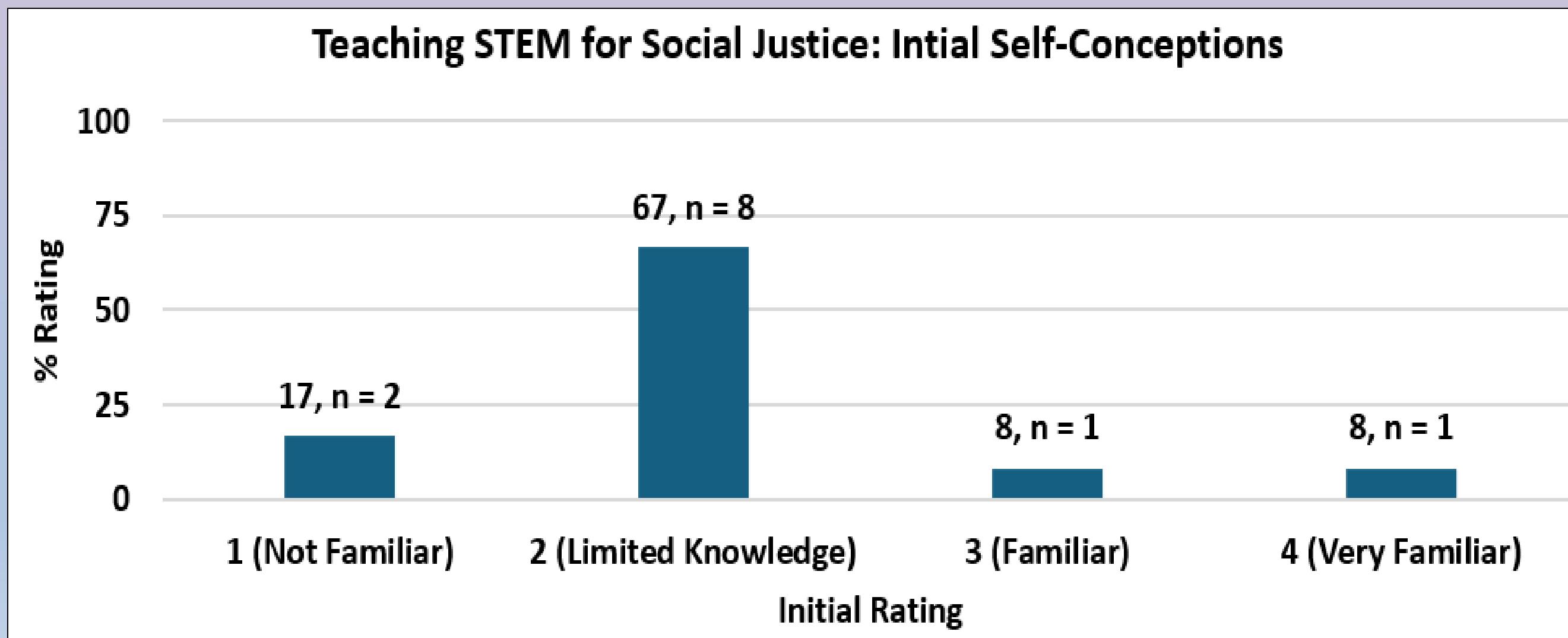
Data Analysis

- *Xcel*
- *Frequency, Percent, Average Ratings*
- *Inductive and Deductive Coding*



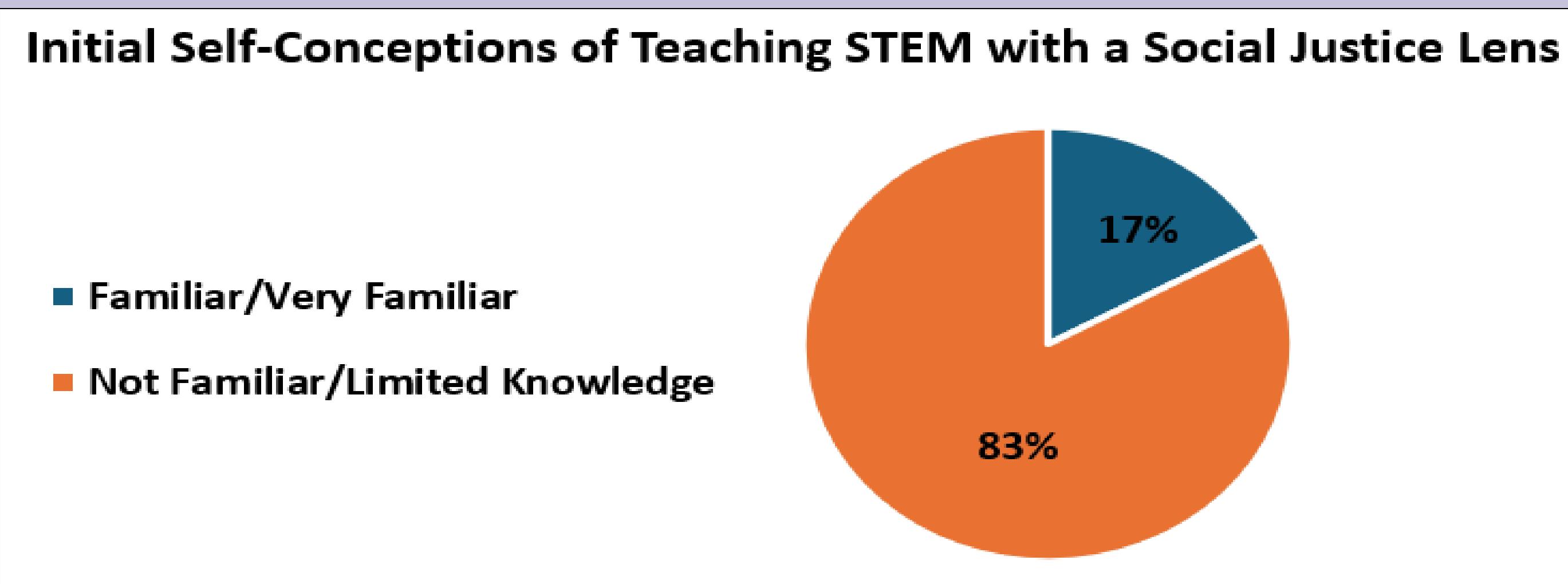
INITIAL CONCEPTIONS OF TEACHING STEM FOR SJ

| Rating | Frequency | Percent |
|-----------------------|-----------|---------|
| 1 (Not Familiar) | 2 | 17 |
| 2 (Limited Knowledge) | 8 | 67 |
| 3 (Familiar) | 1 | 8 |
| 4 (Very Familiar) | 1 | 8 |



INITIAL CONCEPTIONS OF TEACHING STEM FOR SJ

| Total Rating | Frequency | Percent |
|------------------------|-----------|---------|
| Familiar/Very Familiar | 2 | 17 |
| Not Familiar/Limited | 10 | 83 |

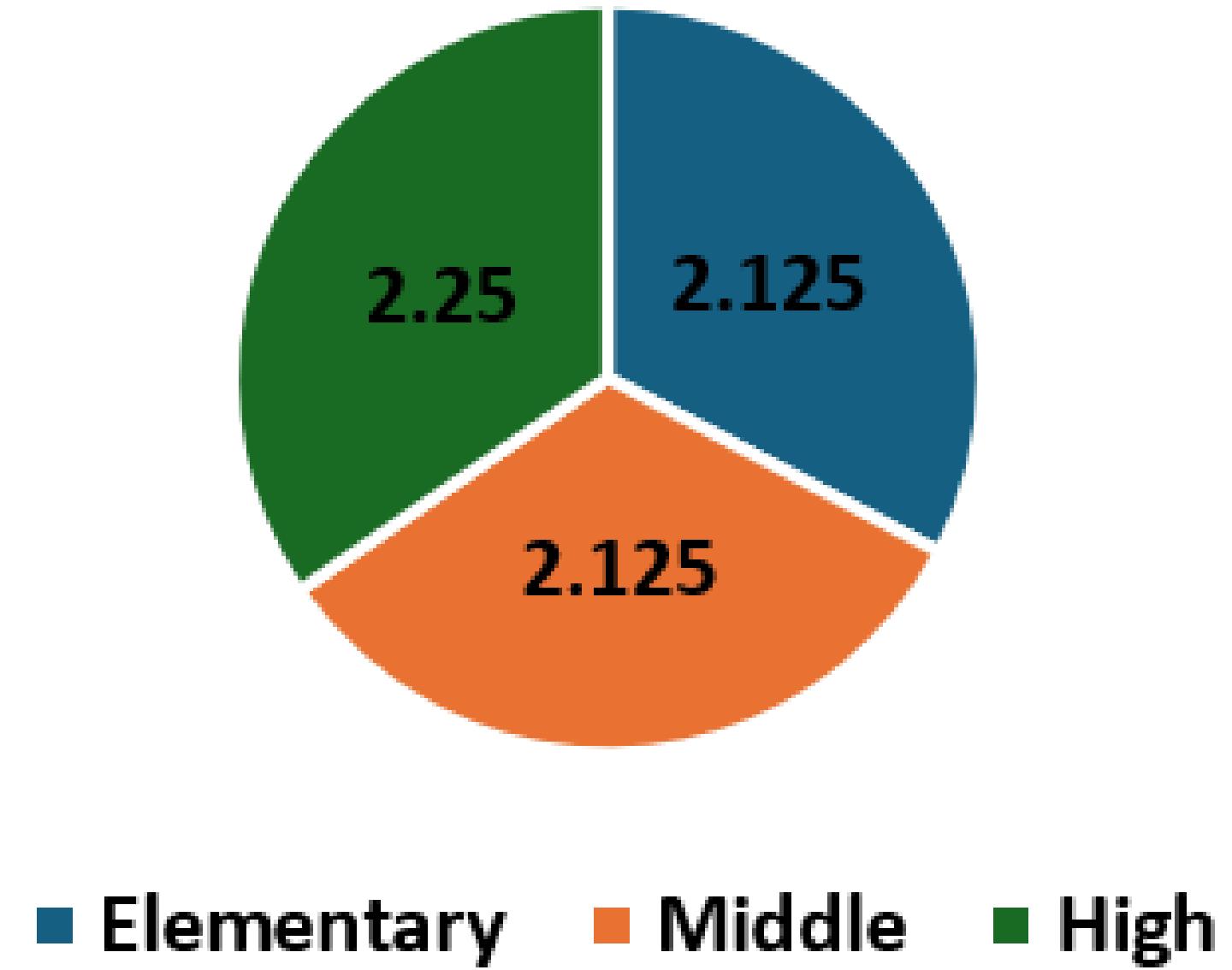


INITIAL CONCEPTIONS OF TEACHING STEM FOR SJ

| Rating |
|-----------------------|
| 1 (Not Familiar) |
| 2 (Limited Knowledge) |
| 3 (Familiar) |
| 4 (Very Familiar) |

| Level | Average | n |
|------------|---------|----|
| Elementary | 2.13 | 4 |
| Middle | 2.13 | 4 |
| High | 2.25 | 4 |
| Overall | 2.17 | 12 |

Average Rating by Grade Level



Culturally Relevant Inventory

| | Self & Others | | | Knowledge | | | Social Relations | | |
|----|---------------|---------|---------|-----------|---------|---------|------------------|---------|---------|
| | Frequency | Percent | Average | Frequency | Percent | Average | Frequency | Percent | Average |
| ES | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 6 | |
| | 2 | 8 | 40 | 1.4 | 7 | 28 | 1.28 | 9 | 56 |
| | 1 | 12 | 60 | | 18 | 72 | 6 | 38 | 1.7 |
| MS | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 2 | 16 | 64 | 1.64 | 9 | 45 | 1.45 | 12 | 75 |
| | 1 | 9 | 36 | | 11 | 55 | 4 | 25 | 1.75 |
| HS | 3 | 2 | 8 | 0 | 0 | 0 | 0 | 0 | |
| | 2 | 11 | 44 | 1.6 | 4 | 20 | 1.2 | 7 | 35 |
| | 1 | 12 | 48 | | 16 | 80 | 13 | 65 | 1.35 |

1 (Leans toward CRP)
2 (Neutral)
3 (Leans away from CRP)

Perceptions of CRP knowledge not demonstrated in class artifacts

Problem with integration of CRP and STEM content!!!!

REFLECTIONS ON CONCEPTIONS OF TEACHING STEM FOR SJ

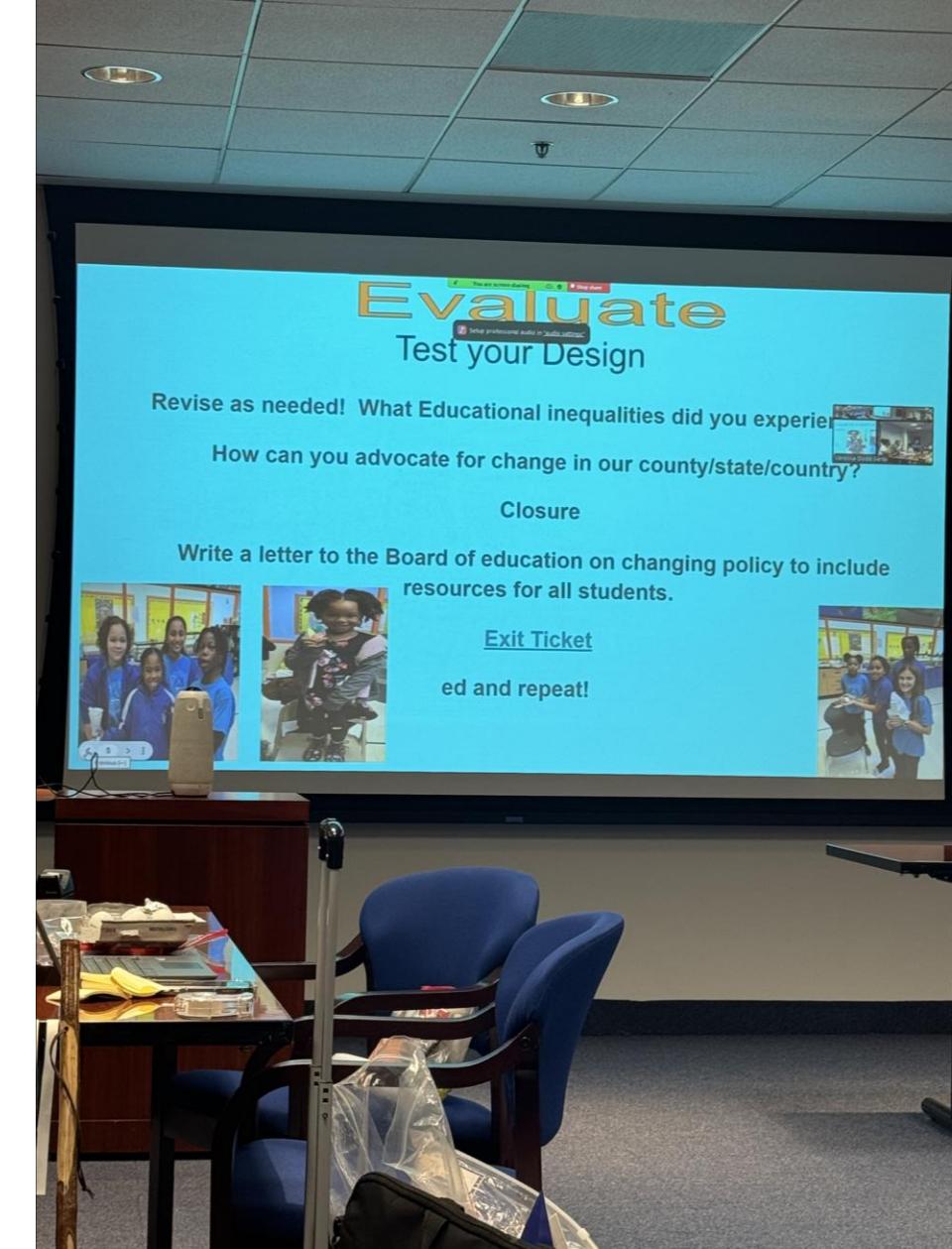


1. ARE YOU STILL IN THE SAME PLACE YOU BEGAN? EXPLAIN?
2. ARE ANY OF THESE CONCEPTIONS STILL A CHALLENGE?
3. WHICH CONCEPTIONS DO YOU THINK ARE GROWTH AREAS?



Participants Areas of Growth and Challenges Post JCSP Training

| | Areas of Growth | Challenges |
|------------|---|---------------------------------|
| Elementary | Cultural competence Community connection | Building critical consciousness |
| Middle | Community connection Cultural competence | Personal insecurities |
| High | Community connection | Time |



Discussion & Our Continued Work

- Unfamiliar with teaching STEM for SJ
- Engaging in JCSTEMP curricula deepens CRP and SJ knowledge
- Integrating CRP and SJ into STEM content is challenging
- Challenges to JCSTEMP vary according to grade level

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