

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

January 18, 2025

ASTE 2025: Fearless Science Education

The Westin Long Beach
Jan 15 - 19, 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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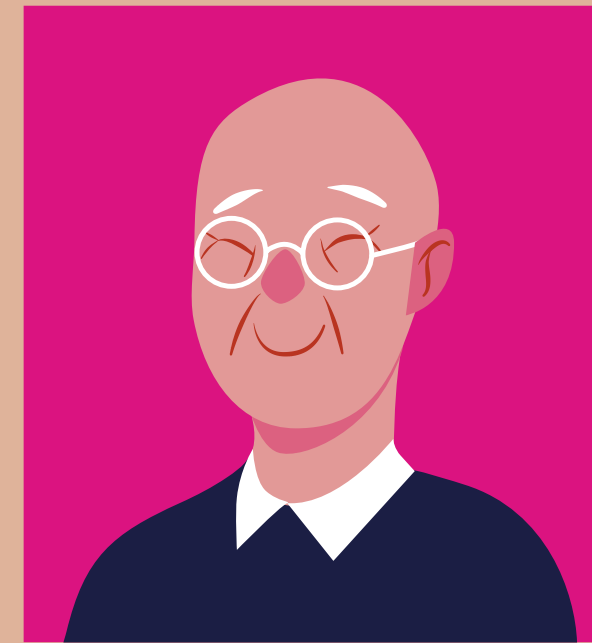
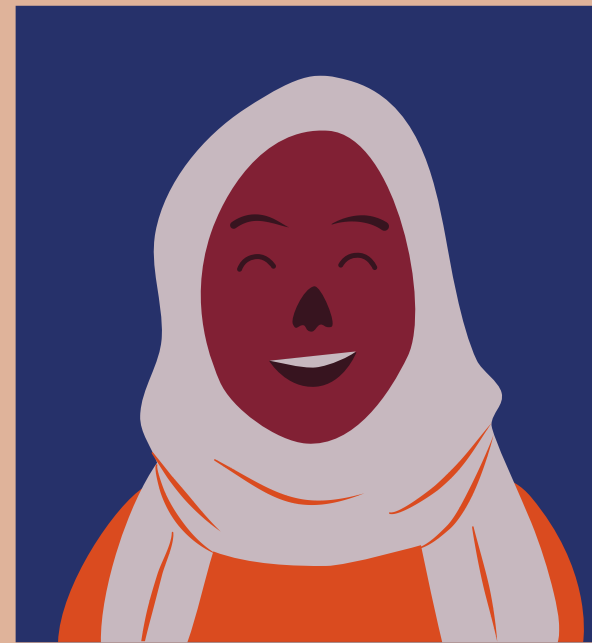
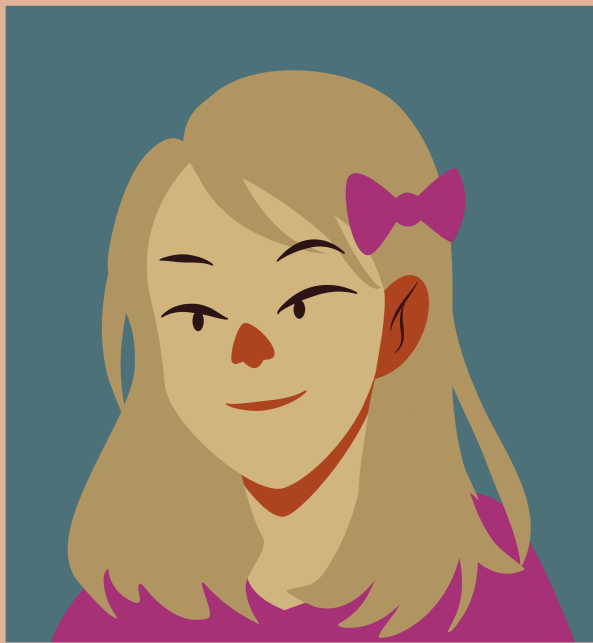


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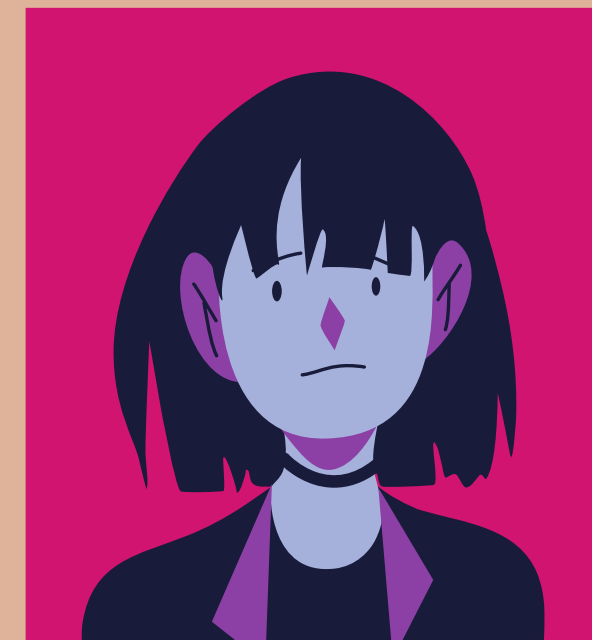
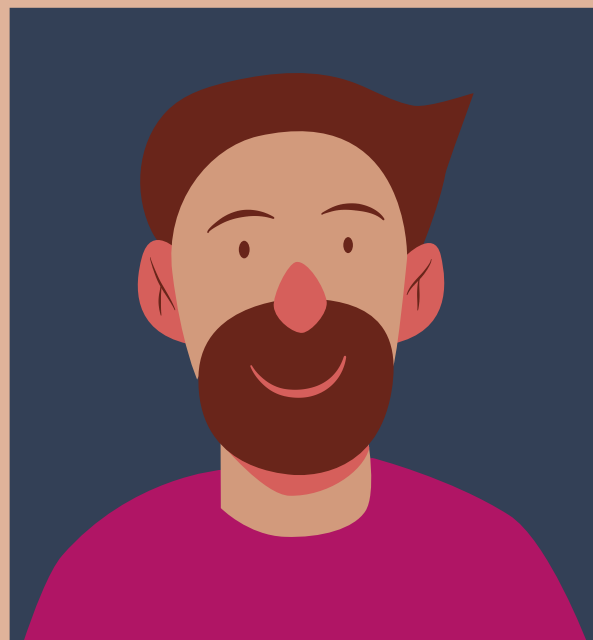
This presentation is based upon work supported by the National Science Foundation under Grant No. 2243461 and 2243462. Any opinions, findings, and conclusions, or recommendations expressed in this presentation are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.





GOAL

Explore how in-service teachers' understanding of teaching STEM for social justice is deepened as they engage in learning about and developing justice-centered STEM curricula.



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**.



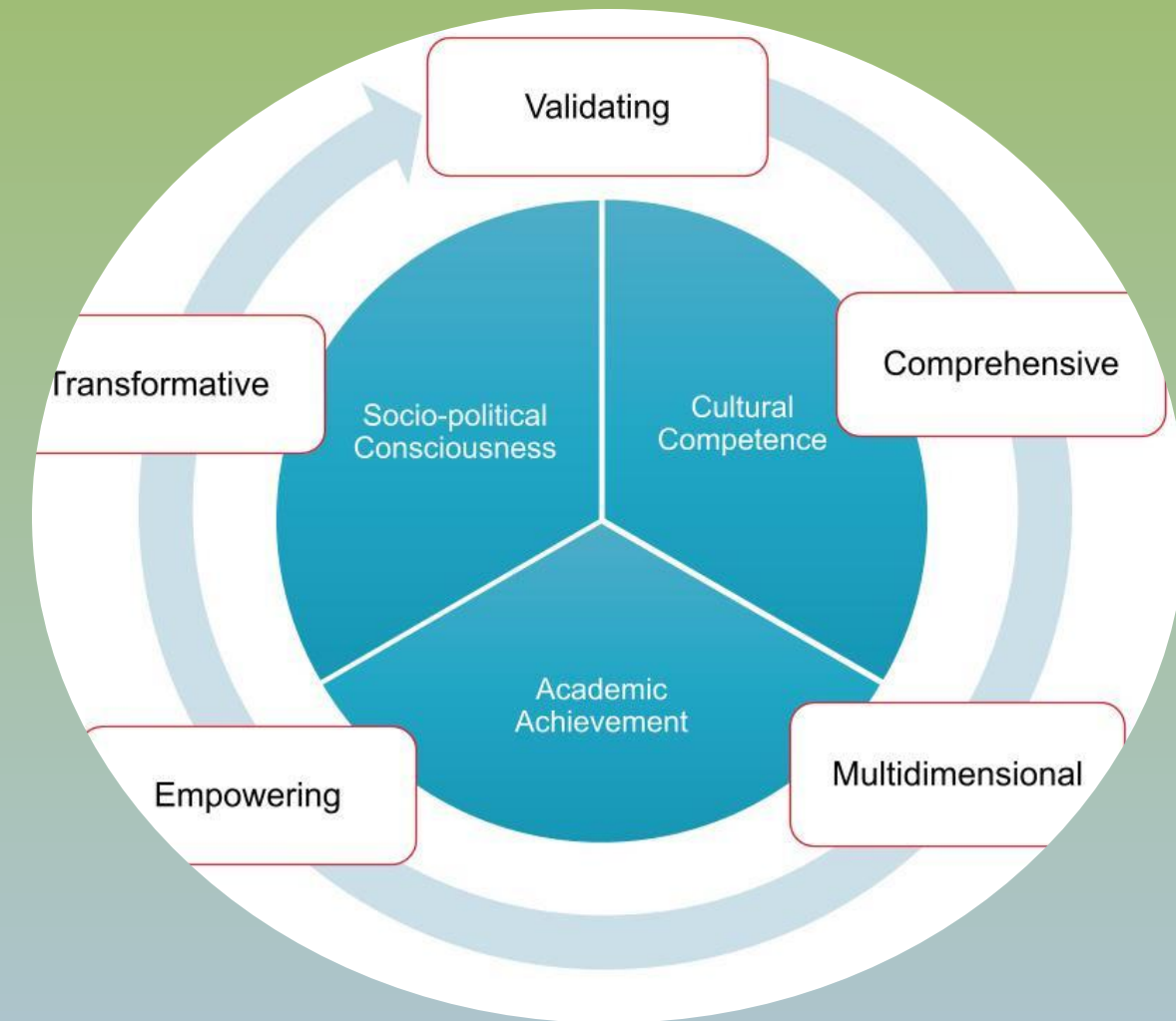
Use or development of **justice-centered STEM curricula**.



Significance

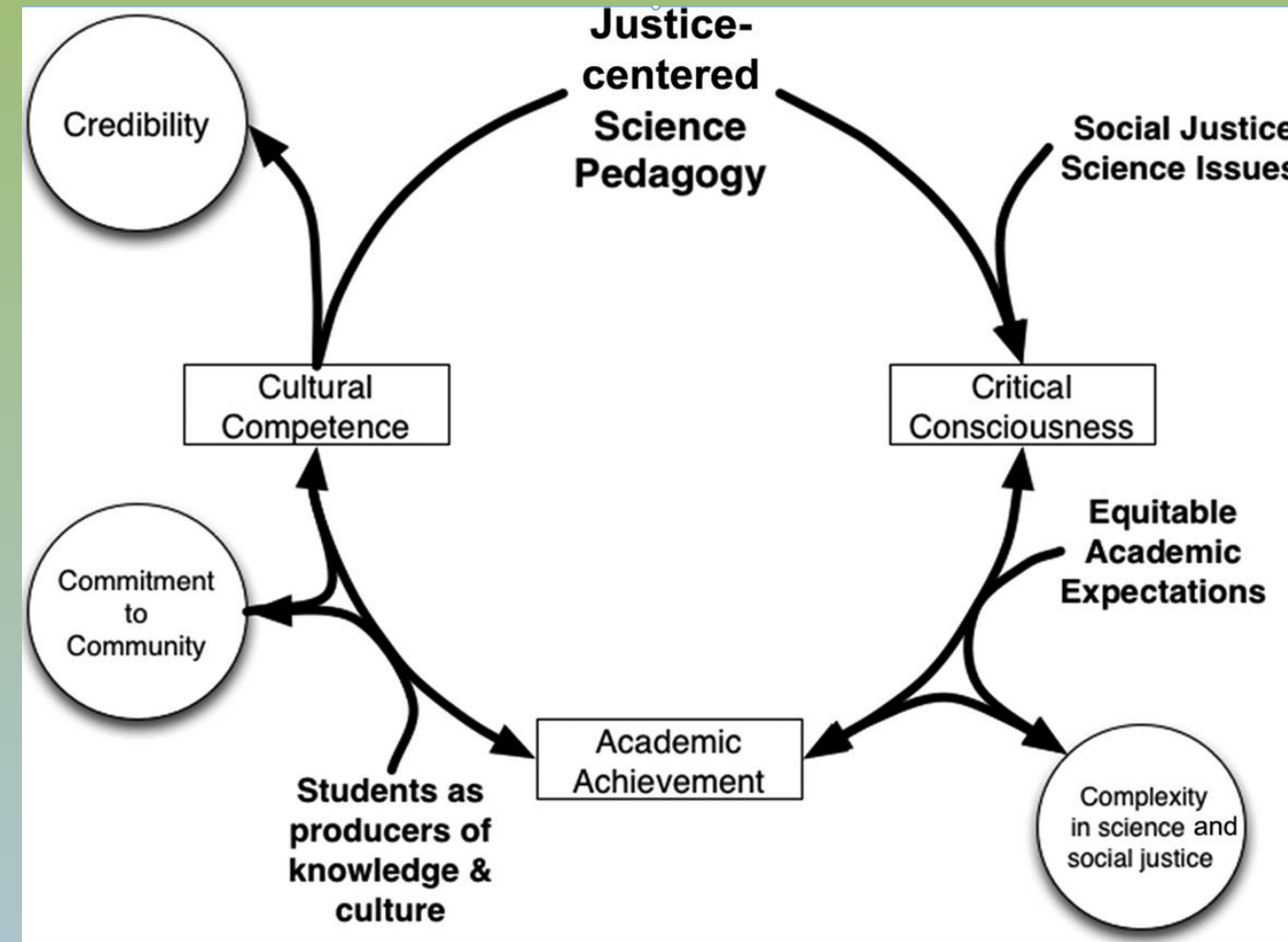
Shows that engagement in **explicit social justice learning tasks** allows STEM teachers opportunities to critically reflect on their beliefs, attitudes and practices; opportunities to grow cultural, community, and social justice knowledge that can **elicit a growth mindset**; and **foster a commitment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

Conceptual Framework

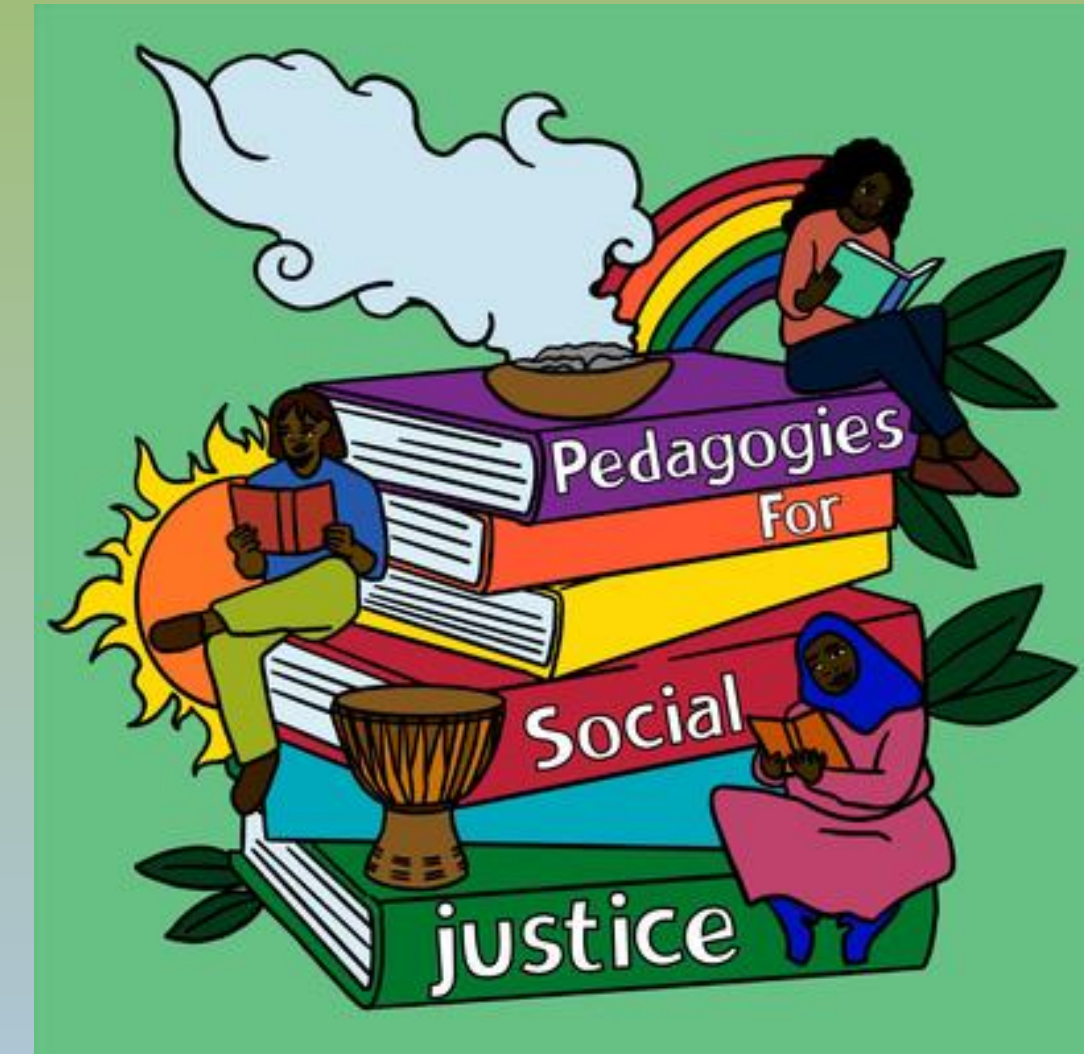


Culturally Relevant Pedagogy (CRP)
 Gloria Ladson-Billings (2009)

Culturally Responsive Teaching (CRT)
 Geneva Gay (2018)



Justice Centered STEM Pedagogy (JCSP)
 Daniel Morales-Doyle (2017)



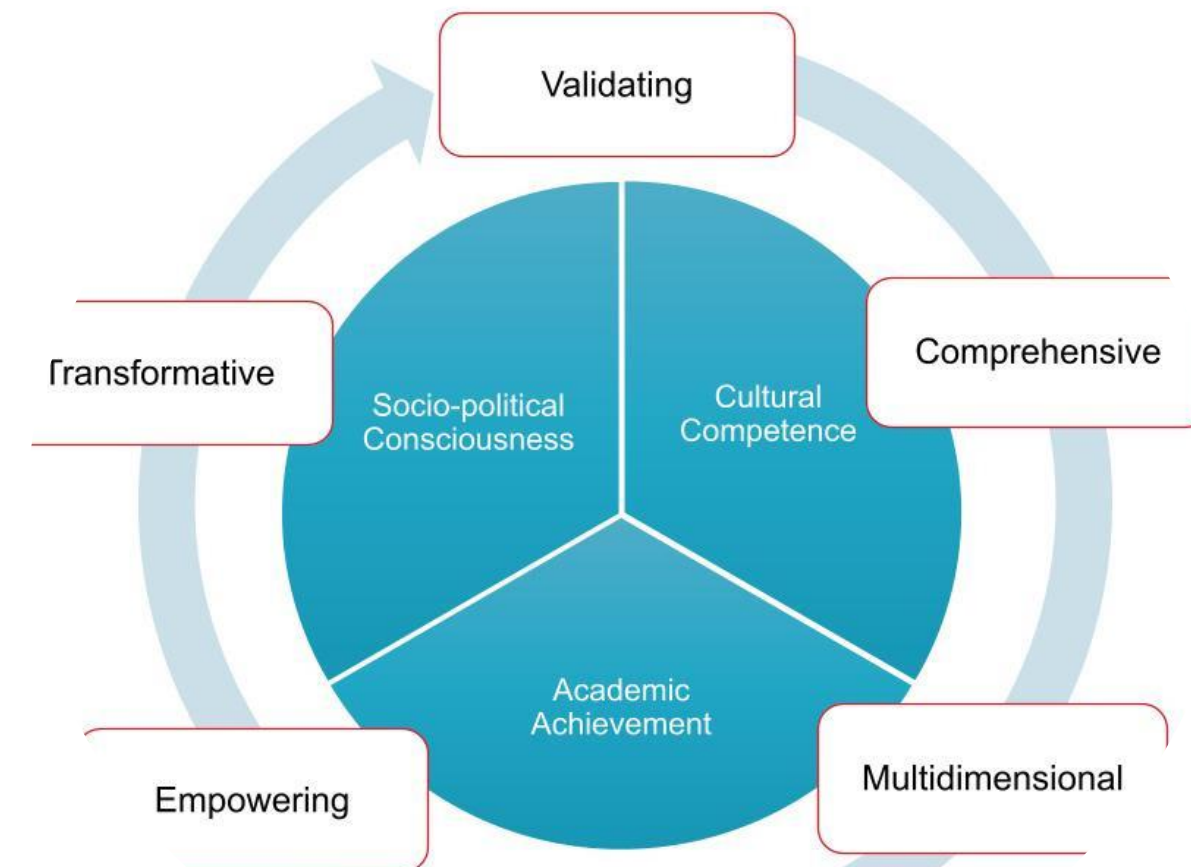
Teaching for Social Justice (TSJ)
 Larry Ludlow & Sarah Enterline
 (2008)

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?



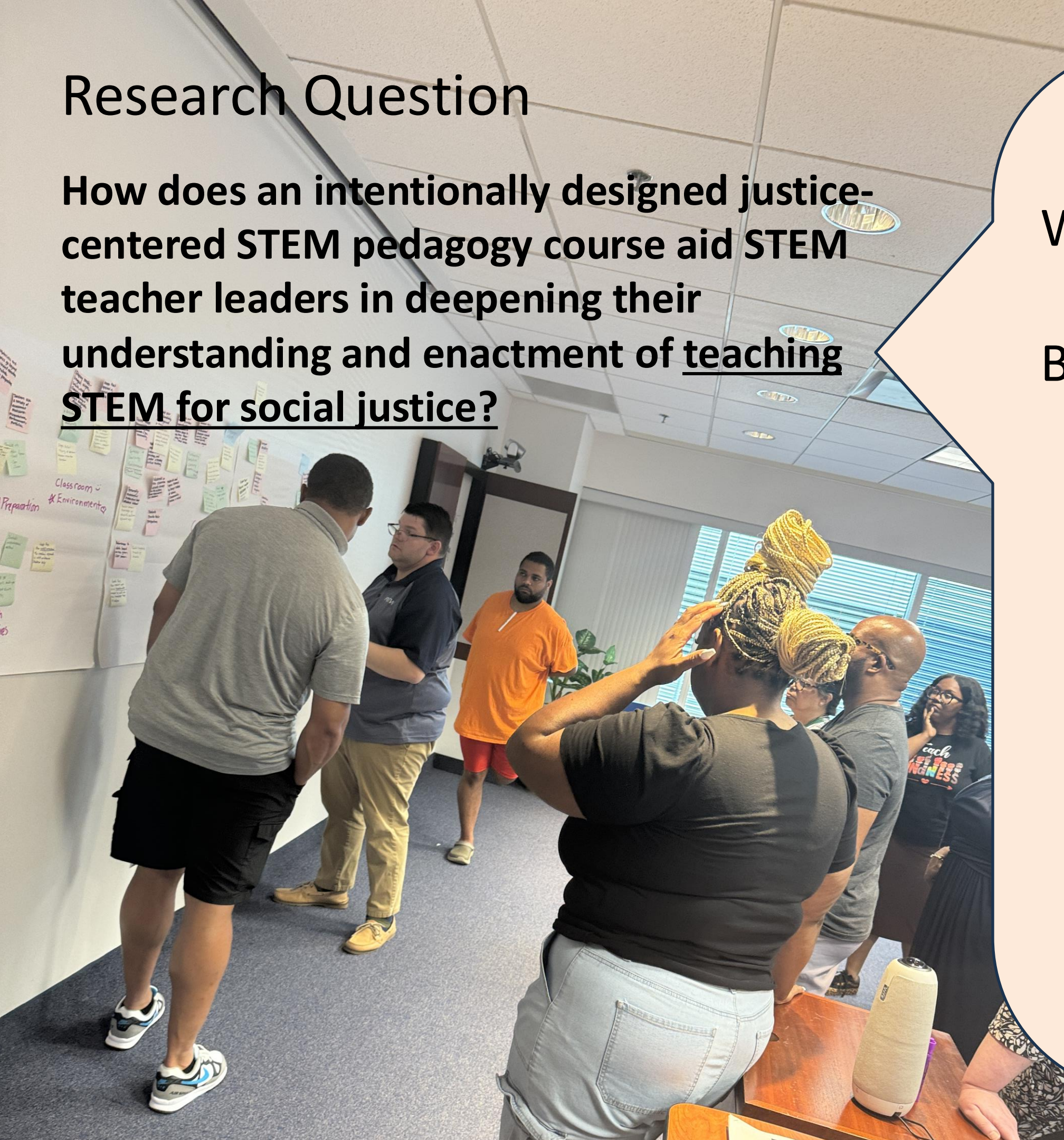
Module 2:
Culturally Relevant Pedagogy & Culturally Responsive Teaching: What's the difference and how do I do it? What does Social Justice have to do with it?



Module 3:
Develop Justice-Centered STEM Curricula

Research Question

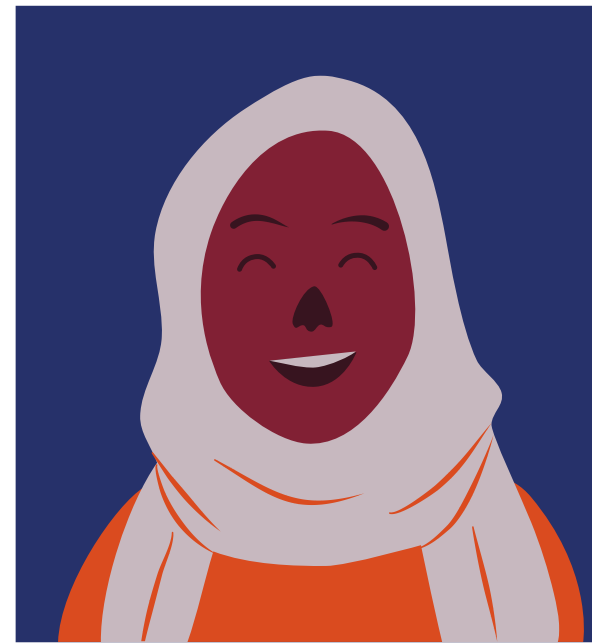
How does an intentionally designed justice-centered STEM pedagogy course aid STEM teacher leaders in deepening their understanding and enactment of teaching STEM for social justice?



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



PARTICIPANTS

- 15 K-12 STEM teacher leaders
- Master teachers enrolled in a non-degree program at a Mid-Atlantic University. Making STEM Matter – Noyce Track 3 Fellowship
- 5 elementary, 5 middle, and 5 high school teachers



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.

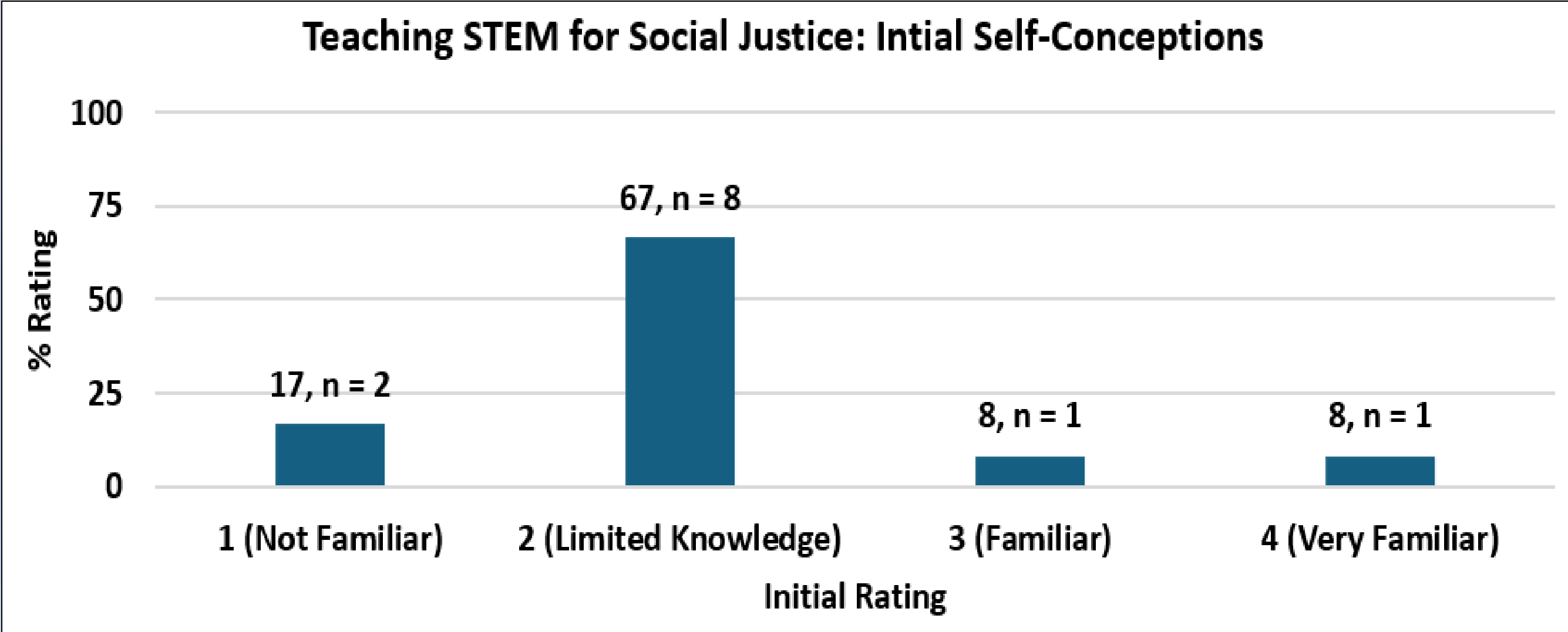
- *Initial Conceptions of teaching STEM for Social Justice*
- *Culturally Relevant Inventory (3 scales)*
- *Reflective journal prompt*

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 Self-Conceptions of Teaching STEM with a Social Justice Lens



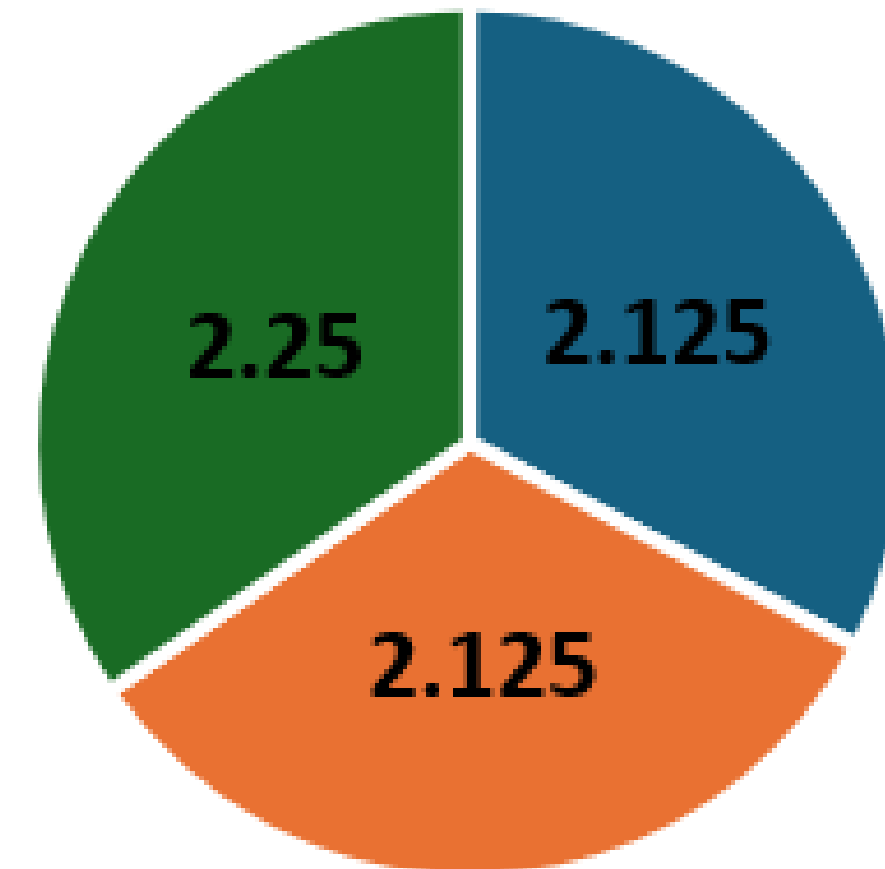
INITIAL CONCEPTIONS OF TEACHING STEM FOR SJ

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



■ Elementary ■ Middle ■ High

Culturally Relevant Inventory

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

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

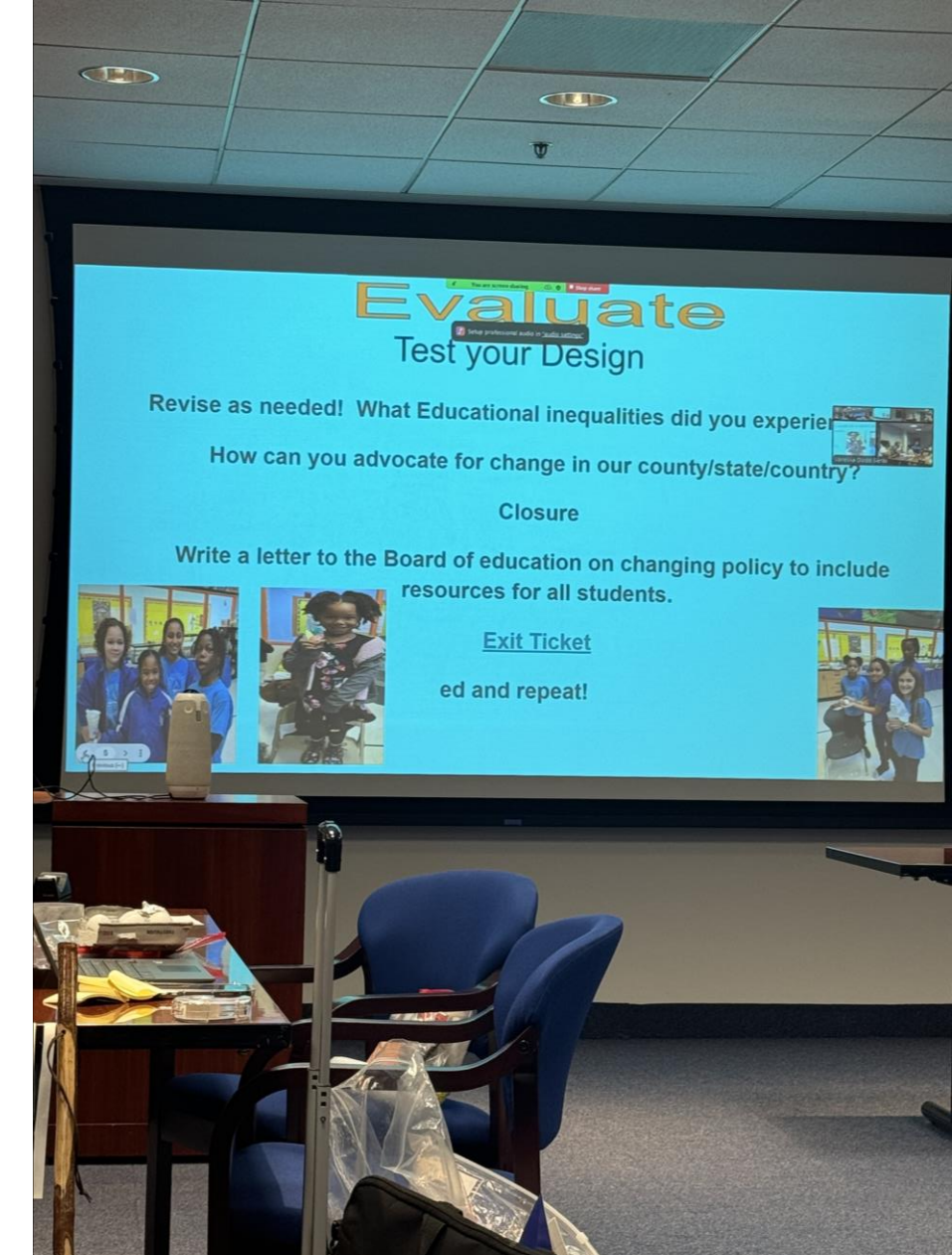
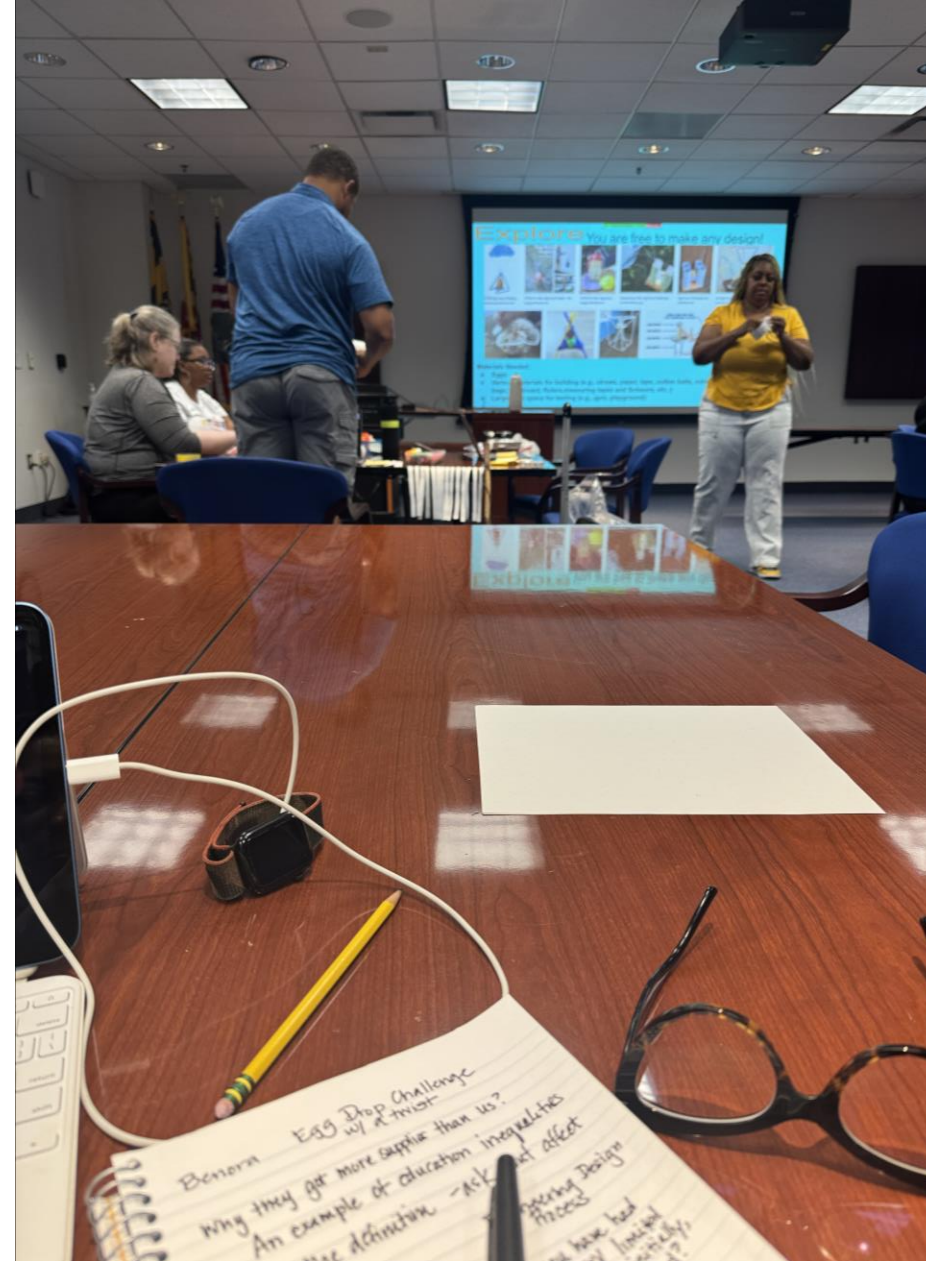


1. ARE YOU STILL IN THE SAME PLACE YOU BEGAN? EXPLAIN?
2. ARE ANY OF THESE CONCEPTIONS STILL A CHALLENGE?
3. WHICH CONCEPTIONS DO YOU THINK ARE GROWTH AREAS?



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

Acknowledgments

- Noyce track 3 Funded Project
- ASTE
- Morgan State University
- Towson State University
- Carroll Community College



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