



The Milwaukee Master Teacher Partnership: Enhancing Teacher Practice in Secondary Math & Science

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Cori Moran • School District of South Milwaukee



Agenda for the session

- About the Milwaukee Master Teacher Project
- Four examples of action research and its impact on teaching and learning
- Scaling up impact
- Fostering productive partnerships
- Discussion

The Milwaukee Master Teacher Project

- Five-Year Noyce Track 3 project
- 24 high school math and science teachers in Milwaukee Public Schools
- Four action research-based microcredentials “badges” per year
- Anticipating change in:
 - Teacher capacity for action research
 - Instructional practices related to focus of microcredentials
 - Quality of instructional practice overall

MMTP Theoretical underpinnings

- Practice-based teacher development
 - Action research as a means to develop content and pedagogical knowledge
 - Research-practice-research cycle
- Ensuring teacher voice
 - Choices in areas of inquiry (Years 2-5)
- Development of teacher leaders
 - Position teachers as professional developers within district
 - Develop next-generation district curriculum leaders

MILWAUKEE MASTER TEACHER PARTNERSHIP

Foundations



Action Research I



Action Research II

Leadership



Designing & Supporting Teacher Learning I



Designing & Supporting Teacher Learning II



Instructional Design I



Instructional Design II

Content Focused



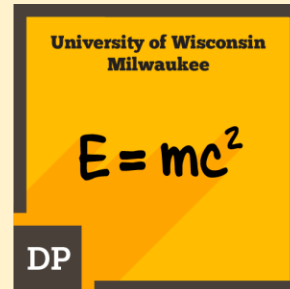
CCSSM & NGSS



Modeling I



Modeling II



Matter & Energy



Evolution

Pedagogy Focused



Student Engagement & Motivation



Cognitively Demanding Tasks



Productive Struggle

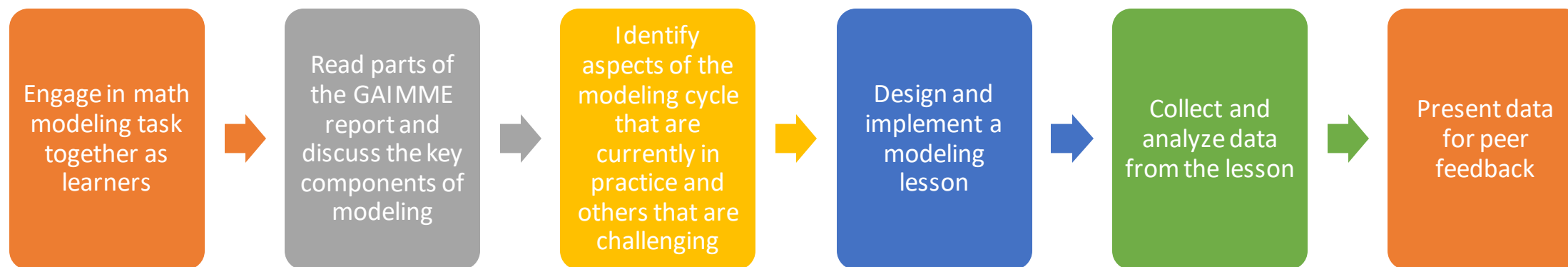


Questioning & Discourse

Structure of a microcredential

- Opening activity to orient to the construct under study
 - Do a math/science task, discuss experience with a pedagogical topic
- Engage in selected research-based readings and discussions
- Use research-based ideas to plan a lesson or series of lessons around the topic
- Collect data from implementation
 - Extent to which students met learning goals, with artifacts
 - Teacher reflection
 - Student reflection

Example: Modeling I



Action research goals

- Build shared conceptions of strong action research design and implementation
- Move beyond naïve, overly broad, and inappropriately causal constructions of research questions
- Empower teachers to see their own classroom as important sources of data that can inform rigorous inquiry



Teachers' Action Research Stories



Teacher Action Research

- John Kish: Teacher task selection
- Joan Masek: Facilitating meaningful discourse
- Stacy Knetter: Student Engagement & Teacher Leadership
- Cori Moran: Restorative Circles across microcredentials



Teacher Task Selection

John Kish

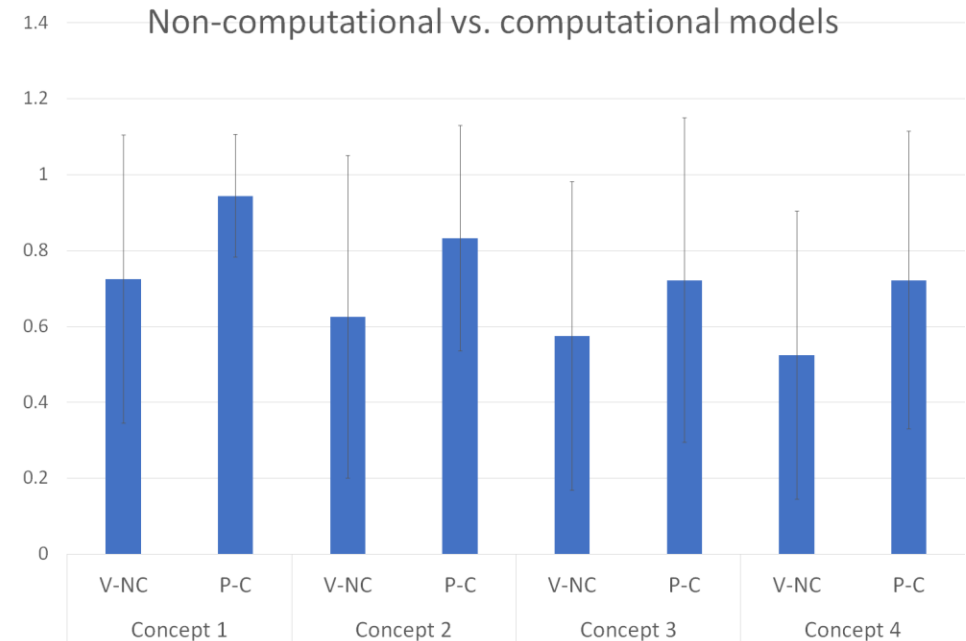
Rufus King International High School

Milwaukee Public Schools



Teacher task selection 1: using computational models

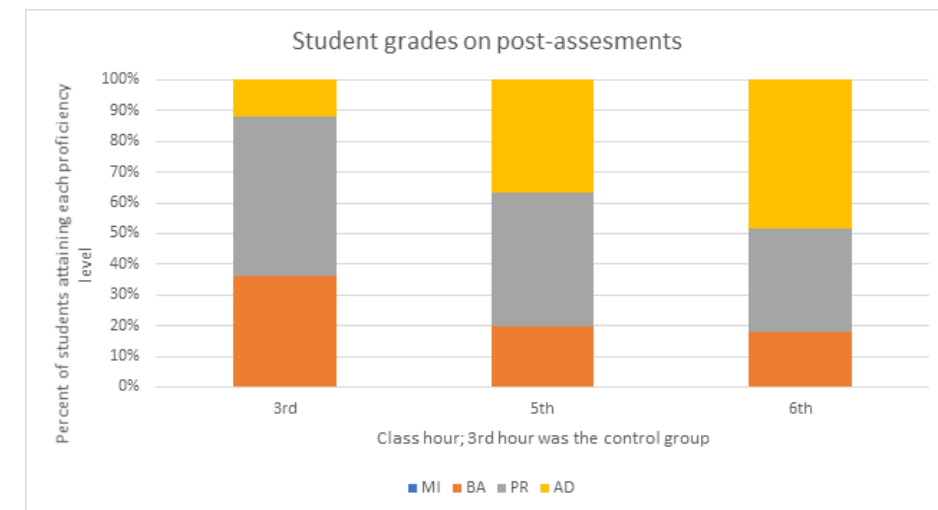
- Focus of microcredential:
 - Support students in mastering *evolution through natural selection*
 - Use a *computational model vs. non-computational model*
- Broader impact:
 - Teachers love modelling activities that promote an understanding of the qualitative nature of a concept, but computational modelling creates a deeper meaning
 - Teachers need to be more deliberate in finding more resources to encourage students to apply computational thinking to ideas that seem inherently qualitative or non-computational
 - This can be a challenge. How can this be used with topics essential to the IB curriculum cell structure? membrane flow? gene expression?



Students that practiced the application of the four "steps" of natural selection using a computational model performed better on the summative assessment than those that used a non-computational model

Teacher task selection 2: choosing how to approach labs

- Focus of microcredential:
 - Determine best approach to helping students understand connections between data, experimental setup, and calculations
 - All students did sample calculations, those students presented with errors in setup and asked to predict changes in the data demonstrated an improved mastery of understanding soda-can-calorimetry.
- Broader impact:
 - While cookie-cutter labs ease the stress of prepping, teachers need to be careful that students aren't just following a recipe and filling in a table
 - Understanding the PURPOSE of the lab set-up is essential to understanding how it's used to collect the data
 - This will require more prep on the part of the teacher and in-class pre-labs initially, the potential increase in depth of understanding, more ideas can be included and less re-explaining later makes this ideal



Using the MMTP model to create a new course for Milwaukee Public Schools

- Using the "action research model", two of us wanted to create a hands-on Environmental Health course for Milwaukee Public Schools applying the units developed by the WinSTEP program at UWM which include:
 - Discovering the process of science through worms
 - Using zebrafish embryos to determine the impact of alcohol/nicotine/caffeine on development
 - Observing the effects of lead on the mating behaviors of fathead minnows
 - Testing the effects of different stimuli on the learning behaviors of adult zebrafish
- 1. **Adapted syllabi** found online for an introductory environmental health course to define the scope of our course and apply for the MPS course code.
- 2. **Defined our units** based on the discoveries in the syllabus exploration and the WinSTEP units.
- 3. **Set goal for students** to design an individual research project to explore an aspect of environmental health on humans (*H. sapiens*) using worms/zebrafish/fathead minnows as model organisms. The project will be presented at the WinSTEP student research summit at UWM in the Spring.
- 4. **Designed using best practices** from the Understanding By Design model and rubric as a way to assess course development.
- 5. **Structured the learning sequence** for each unit to build up to a summative assessment as well as the culminating research project.

Now we just need the school year to start in order to teach it!



Facilitating Mathematical Discourse

Joan Masek

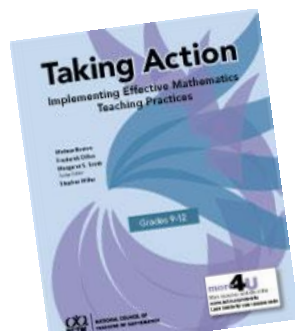
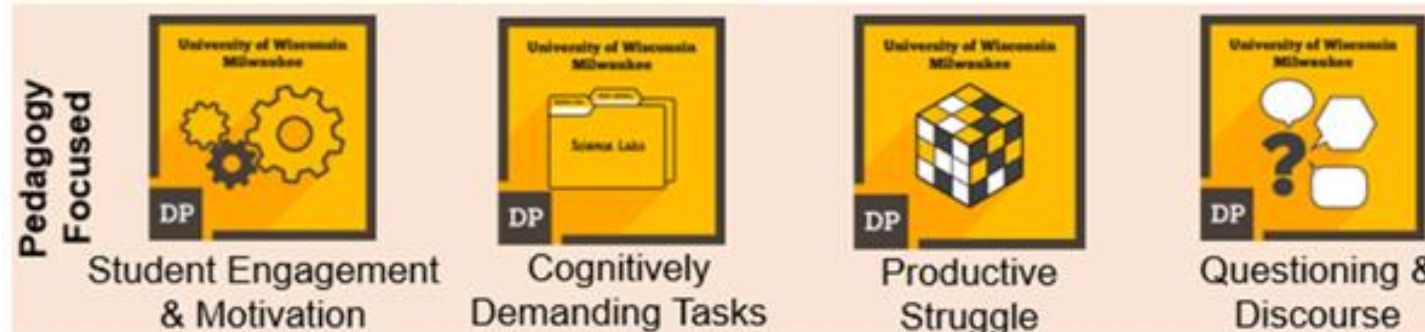
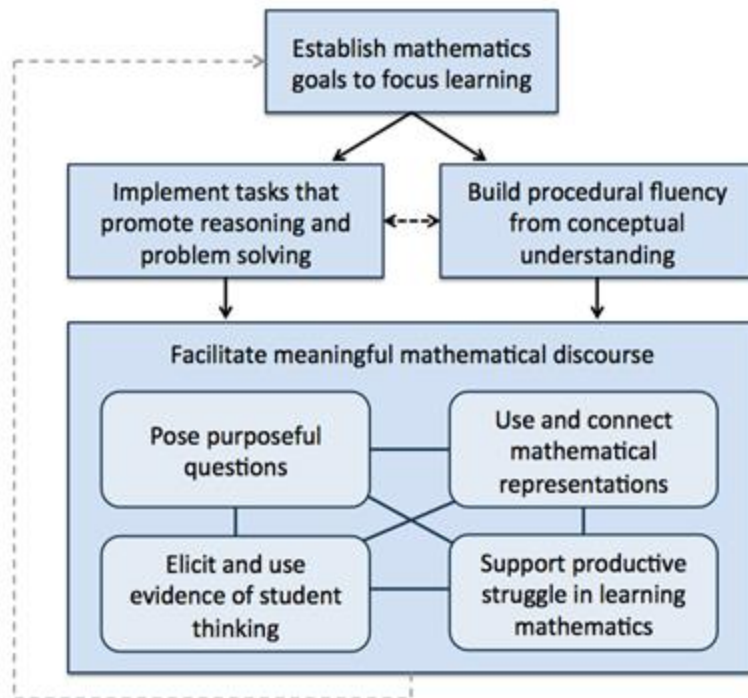
Alexander Hamilton High School

Milwaukee Public Schools



ACROSS MICROCREDENTIALS: Facilitating meaningful mathematical discourse

Effective Teaching Practices for Mathematics



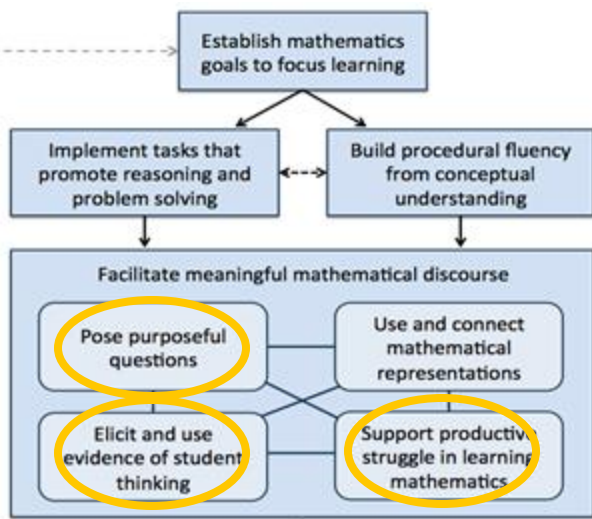
- A “connected” approach for implementing rigorous mathematical instruction
- Meaningful discourse results in improved student outcomes

ACROSS MICROCREDENTIALS: Facilitating meaningful mathematical discourse

FORMATIVE ASSESSMENT



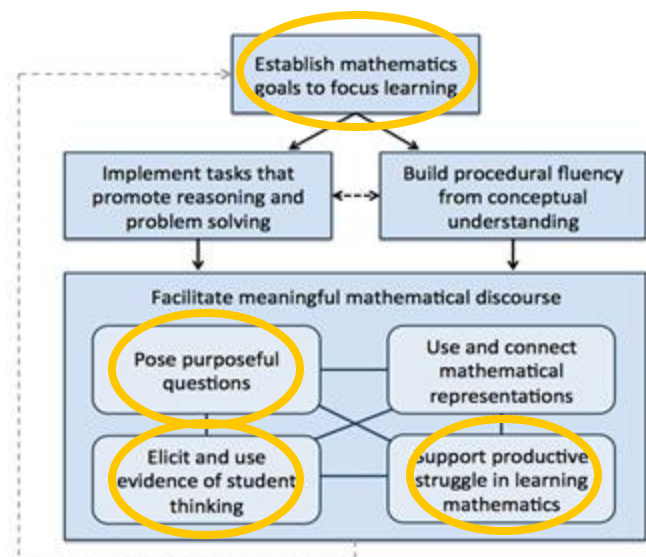
NAME:	DATE:	BLOCK:					
LEARNING INTENTION:							
SUCCESS CRITERIA:							
STUDENT SELF-ASSESSMENT							
<i>I'm proud of...</i> <i>I could help...</i> <i>I'm happy to...</i> <i>I will help...</i> <i>I can't help...</i> <i>I don't...</i>							
SOLVING PROBLEMS							
1 How do you feel about today's DO NOW problem?	😊	😐	😞	😡			
2 How do you feel about today's ACTIVITY ()?							
3 How do you feel about today's textbook problems?							
4 How do you feel about today's HANDOUT - practice problems?							
STUDENT MOTIVATION			🕒	HIGHLY	SOMEWHAT	A LITTLE	NOT AT ALL
4 How motivated did you feel during today's lesson?	12:15 - 12:45						
5 How motivated did you feel during today's lesson?	12:45 - 1:15						
6 How motivated did you feel during today's lesson?	1:15 - 1:45						
			GREAT	OK	AWFUL	ASLEEP	
OVERALL - RATE TODAY'S LESSON			😊	😐	😞	😡	
7 Why did you rate the lesson this way? What did you like/dislike? If you were sleeping or felt it was awful ---- tell me why?							



IMPACT ON STUDENT LEARNING:

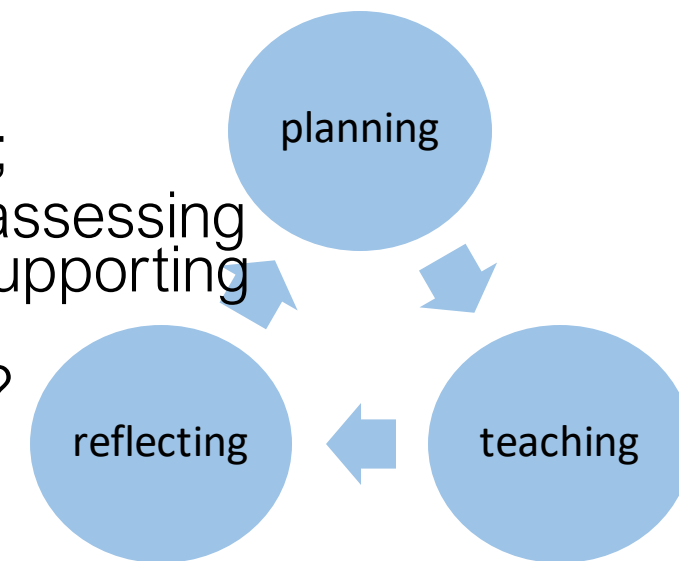
- Improves student motivation and engagement
- Supports student productive struggle
- Provides feedback to “drive” improved questioning and discourse

ACROSS MICROCREDENTIALS: Facilitating meaningful mathematical discourse



TEACHER PLANNING / REFLECTION:

- Planning – prior to lesson:
 - Anticipate student misconceptions;
 - Prepare purposeful questions (for assessing and advancing student thinking / supporting productive struggle)
- Did students learn what was intended?



STUDENT REFLECTIONS:

- Daily self-assessment sheet
- Did students learn what was intended?

IMPACT ON STUDENT LEARNING:

- Improves classroom culture and communication
- Supports student productive struggle
- Provides INSIGHTS to “drive” improved questioning and discourse



Student Engagement & Teacher Leadership

Stacy Knetter

Ronald Wilson Reagan IB College Preparatory High School

Milwaukee Public Schools



Voice & Choice for Students & Teachers

- Student Modeling & Engagement Microcredentials

- Focus:

- Using models to increase student content knowledge
 - Effect of choice on students' grades

- Findings & Broader Impact:

- Modeling will increase the learning of the natural world for students
 - Class discussion will increase and create common understanding of content
 - Student engagement and achievement will increase when given voice and choice

- Leadership & Teacher Learning Microcredentials

- Focus:

- Using effective PD models & creating PD opportunities
 - Mentoring student teachers and licensed teachers

- Findings & Broader Impact:

- Understanding teachers' needs will increase student learning outcomes
 - Creating effective PD will result in changes in teacher practices
 - Choice & voice in PD is crucial for teachers to refine pedagogies



Modeling & Matter/Energy



Student Engagement & Motivation



Designing & Supporting Teacher Learning I & II

Evolution of the Grant & Microcredentials

- **Year 1:**
 - Modeling with Students
 - Designing Science Tasks around Modeling
- **Year 2:**
 - Student Engagement & Achievement
 - Voice and Choice
 - Mentoring Student Teachers & Using PD models
- **Year 3:**
 - Mentoring New and Experienced Teachers
 - Furthering Voice and Choice for Students and Teachers
 - Standards Based Curriculum



Restorative Circles

Cori Moran

South Milwaukee High School

School District of South Milwaukee



Restorative content circles across microcredentials



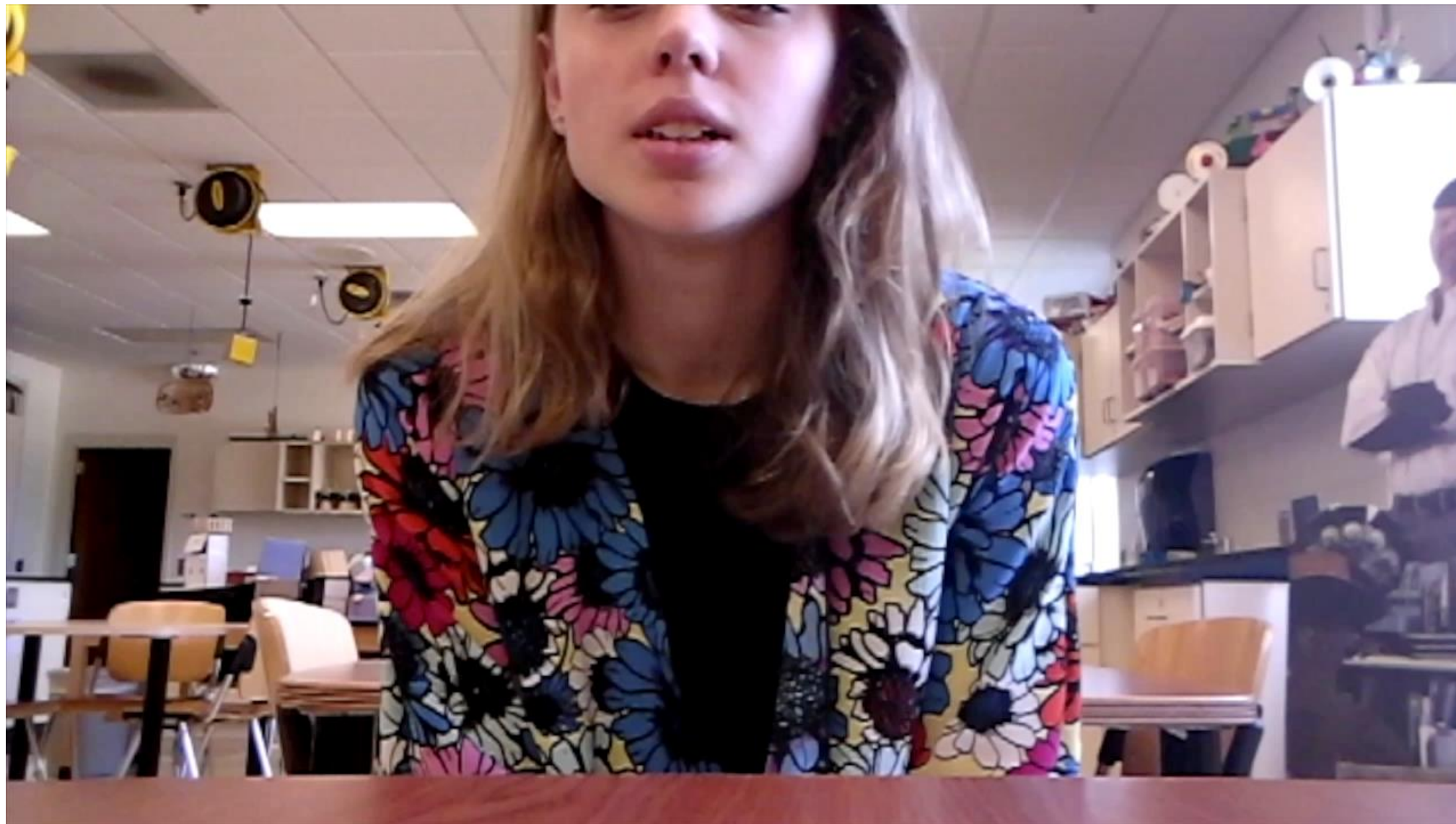
- Action research of Restorative content circles; topic implemented at my school
- Research "forced" continuation with opportunity to reflect on data
- Findings submitted to present nationally



- Researched effective PD methods
- Used research to reflect on PD
- Opened up opportunities
- Built confidence

Impact of grant

- *Next year* to implement something went to *what next?*
- Grounded with research
- Still teaching and feeling empowered
- Students felt more comfortable to share with more efficiency.
 - Circle 1 went from 3 responses/2 minutes to 14 responses/2 minutes
 - Circle 2 went from 13 responses/10 minutes to 14 responses/2 minutes
 - Students were willing to self-assess on current content at a 1 (low)
- More justification- day after circle students were saying "ok you going to Harvard/We going to Harvard"
- Student went from "They boring" to "I feel respected"





Scaling Up: Broadening the Impact



Broadening the project's impact

- Teacher Leadership within schools and district (SK, CM)
- Disseminating outcomes in the district, state, and nation (CM, JM)
- Revitalizing curriculum for students and teachers (JK, SK, JM)
- Next steps:
 - Professional development across contexts (K-8)
 - Strengthening within-building leadership
 - Fostering cross-site data collection and analysis



Fostering partnerships in your district



Microcredentials as a model

- More modular, compact learning experiences
- Grounds learning in teachers' classroom practice
- Over time, can address breadth and depth

Fostering Partnerships

- Ensure teacher voice at the design phase
- Work collaboratively to identify areas of study
- Find ways to challenge teachers productively while honoring their voices and choices
- A leadership team is important



Questions and Discussion

