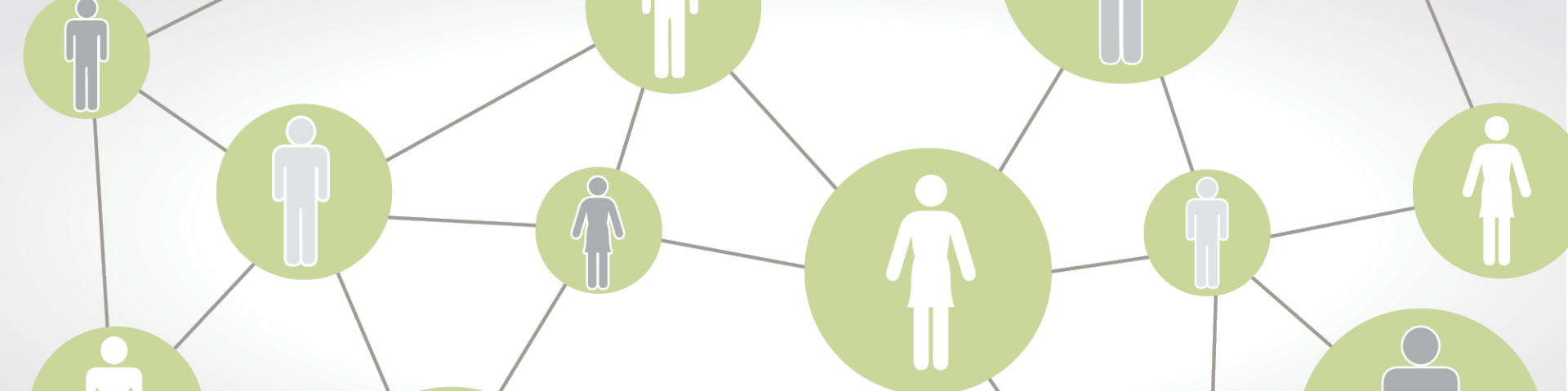# The Power of Teacher Leadership to Transform CS Education

Teacher Leadership in CS Micro-credential Pilot

Verna Lalbeharie, Catherine Jacques, Theresa Goltermann, David Lockett
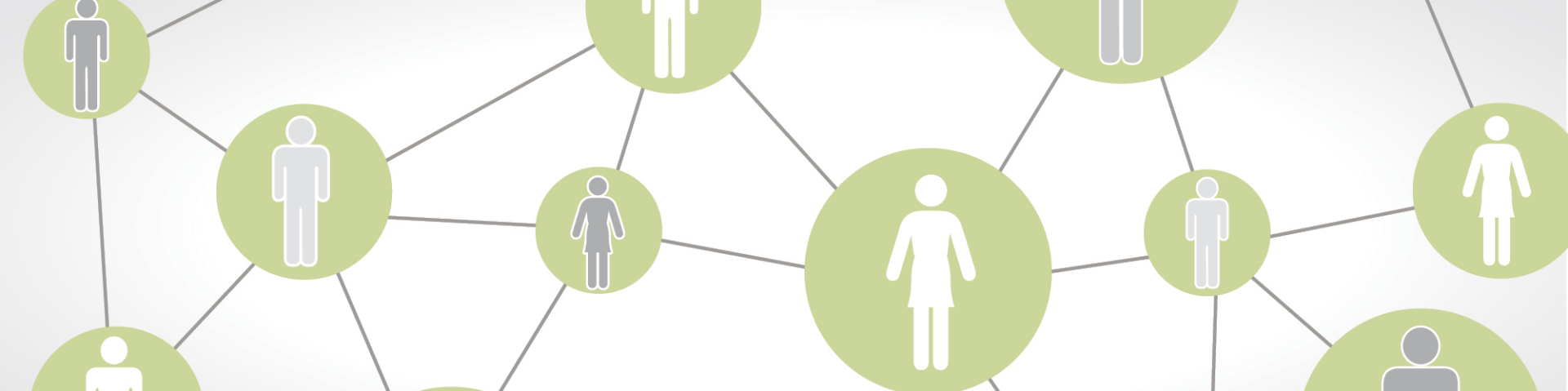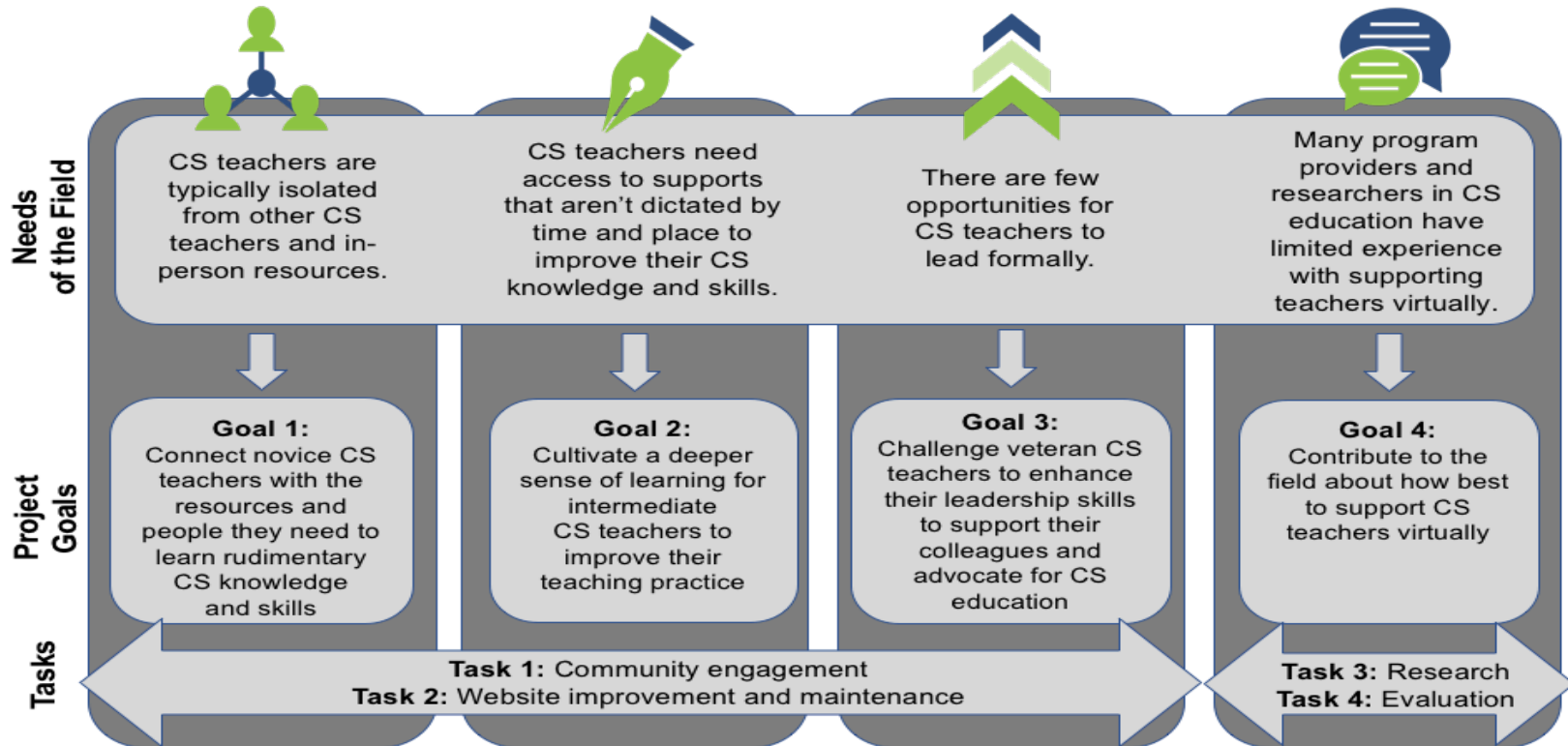
Introduction

CS for All Teachers and Micro-Credentials

Empowering CS Teachers through a virtual Community of Practice….

Vision: To become the go-to source for virtual support for teachers of computer science in the United States.

Project overview: Logic model

Needs of the Field	CS teachers are typically isolated from other CS teachers and in-person resources.	CS teachers need access to supports that aren't dictated by time and place to improve their CS knowledge and skills.	There are few opportunities for CS teachers to lead formally.	Many program providers and researchers in CS education have limited experience with supporting teachers virtually.
Project Goals	**Goal 1:** Connect novice CS teachers with the resources and people they need to learn rudimentary CS knowledge and skills	**Goal 2:** Cultivate a deeper sense of learning for intermediate CS teachers to improve their teaching practice	**Goal 3:** Challenge veteran CS teachers to enhance their leadership skills to support their colleagues and advocate for CS education	**Goal 4:** Contribute to the field about how best to support CS teachers virtually

Tasks

Task 1: Community engagement
Task 2: Website improvement and maintenance

Task 3: Research
Task 4: Evaluation

CS for All Teachers
By the Numbers

Between June 2020 – May 2021

7,851 Total Community Members

7,625 Members
CS in the Wild
General CS Group

1,804 Members
CS in Middle School

469 Members
Equity and Access in CS*

2,820 Members
Computer Science Principles (CSP) Open Group

4,190 Members
Exploring Computer Science (ECS) Open Group

1,107 Members
CS in Elementary School

* New group as of September 2020

1,344 Total Crowdsourced Resources
- Robotics
- Elementary coding
- CSP performance tasks
- ECS assessments
- Computational thinking
- Integration of CS into STEM
- Virtual reality
- *Lots more!*

11,011 Twitter Followers

3 Twitter Chats Hosted

@csforalltchrs

236,104 Total Page Views
(between June 2020 – May 2021)

647 Average Daily Page Views

15 interactive webinars
from June 2020 – May 2020
1-2 each month on a variety of subjects for teachers of grades PreK-12

The CS for All Teachers project is managed by American Institutes for Research and funded by the National Science Foundation under Grant No. 1836310.

CS for All Teachers supports CS teachers and educators through:

- Resources
- Groups
- Webinars
- Events

Using:

- Website
- Twitter
- Youtube

Problems With Professional Learning for Teachers
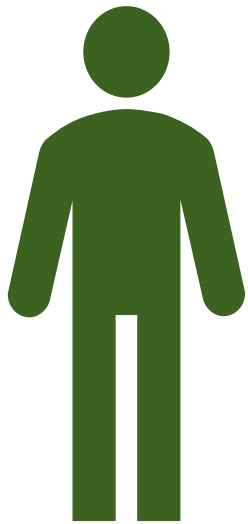
one size fits all

6%–9% of school budgets spent on professional development (PD)

20%

satisfaction

$50B

spent annually

100M hours on PD

"The Mirage," TNTP, 2015; "Learning Is Not a Spectator Sport"; Carnegie Mellon University, 2015; "Teachers Know Best: Teachers' Views on Professional Development," Bill & Melinda Gates Foundation, 2015.

CS for ALL TEACHERS

Why Micro-Credentials?

Grounded in the authentic application of skills/competencies

Fosters evidence-based professional learning

Focuses on specific skills for each educator, facilitating differentiation and personalization for teachers

Supports self-paced professional learning system

Reduces cost

What Are Micro-Credentials?

A *micro* form of certification indicating that that an educator has *demonstrated application* of a specific *competency*.
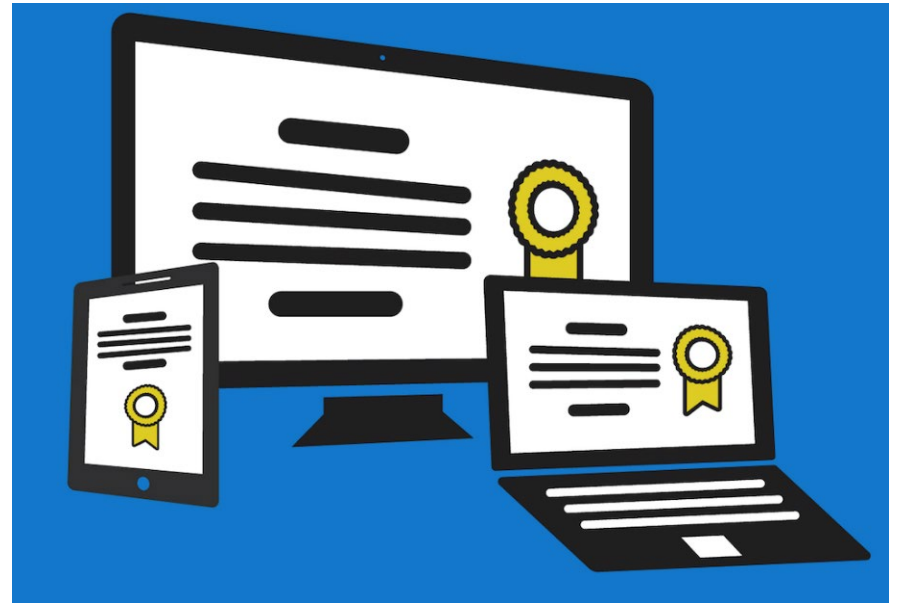
What Are Micro-Credentials?

What they are:

✔ Competency-based

✔ Personalized, self-directed

✔ Demonstration of new or existing expertise

✔ Available on demand

✔ Job embedded

✔ Learning by doing and applying

What they are NOT:

✖ Seat-time based

✖ One size fits all

✖ Separate from teachers' classroom contexts

✖ Available only at set times

✖ Traditional online course or class

✖ Learning by absorbing information
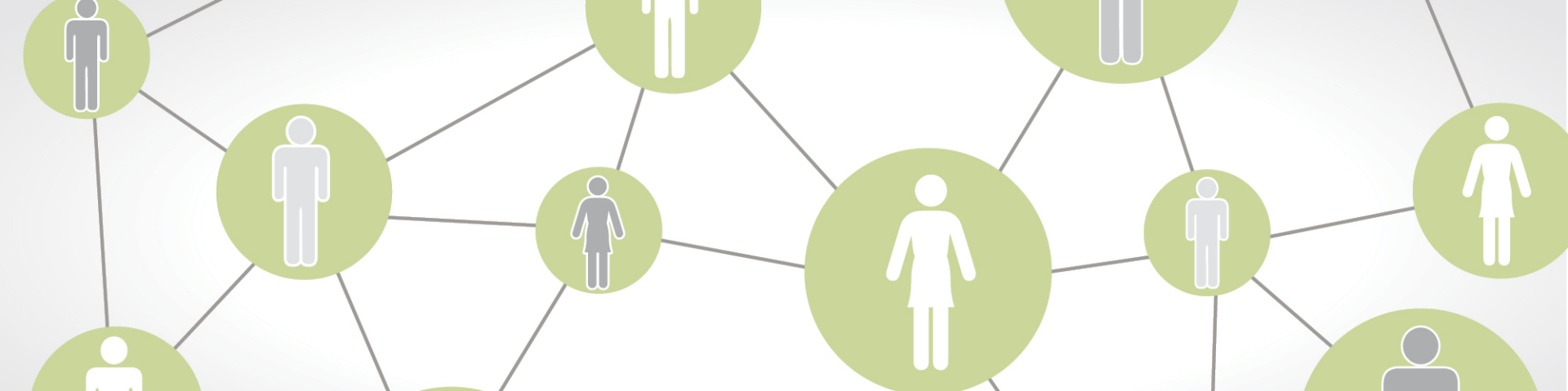
Teacher Leadership in Computer Science Micro-Credential Pilot

Why Teacher Leadership in CS?

- CS teachers face challenges above and beyond that of teachers in more established subject areas

  - Building a program

  - Collaborating with colleagues

  - Addressing equity and opportunity gaps, biases, etc.

  - Actively engaging in advocacy and policy efforts

- To be successful as a CS teacher, one has to demonstrate both teaching skills AND *teacher leadership* skills

Why Teacher Leadership in CS?

- CS teachers often have fewer immediate colleagues in their schools or districts with whom to network, collaborate, etc.

- To be successful as a CS teacher, one can greatly benefit from mentor and peer feedback, collaboration, inspiration, and support.
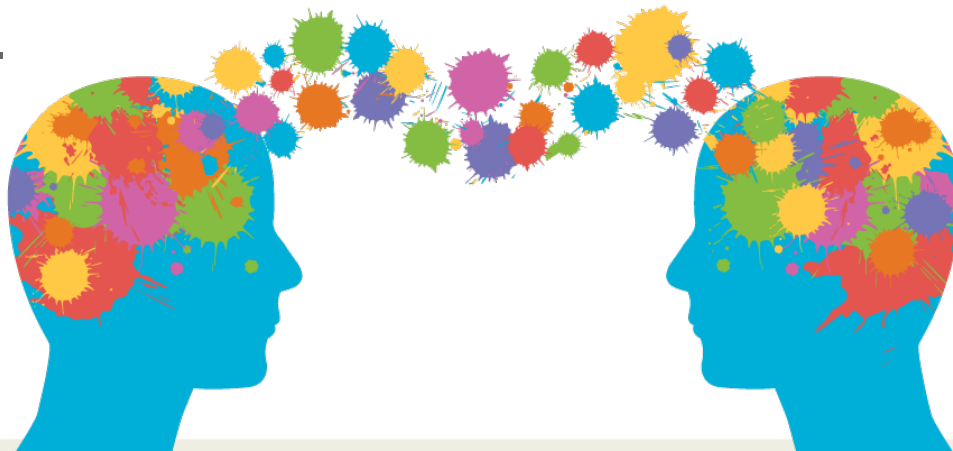
Why Teacher Leadership in CS?

- CS teachers often have to advocate for themselves and their students more than other teachers
    - Building buy-in for cross-content area collaboration
    - Procuring funding for equipment
    - Securing time and credit for applicable professional learning
        - To be successful as a CS teacher, one can greatly benefit from learning how to communicate clearly and succinctly about one's accomplishments and goals for CS education.

Our Goals for the Teacher Leadership in CS Micro-Credential Pilot

- Establish key Knowledge, Skills, and Actions (KSAs) that define the work and expertise of Teacher Leaders in CS

- Give CS educators the opportunity to get professional learning credit for unacknowledged work they are already doing

- Forge professional connections between CS educators

- Build CS educators' sense of self efficacy and expertise

Teacher Leadership in CS Micro-Credential Cluster

Equity in CS

Building a CS Program

Collaboration in CS

Advocacy in CS

Policy in CS

Foundational Standards

CS Teaching Standards

- CS Teaching Standards

Teacher Leader Standards

- Teacher Leader Model Standards
- NBPTS Teacher Leader Competencies
- CSTP Teacher Leader Skills Framework

CSTA Standards		Teacher Leader Model Standards	Teacher Leader Competencies	Teacher Leadership Skills Framework	Key Terms / Concepts
Standard	Indicator				
CS Standard 2: Equity and Inclusion Effective CS teachers proactively advocate for equity and inclusion in the CS classroom. They work towards an intentional, equity-focused vision to improve access, engagement, and achievement for all of their students in CS.	2a. Examine issues of equity in CS Examine how systemic barriers and social and psychological factors contribute to inequitable access, engagement, and achievement in CS among marginalized groups. Reflect on how issues of equity manifest in their own CS teaching context.	Teacher Leader Model Standard 6c: Facilitates colleagues' self-examination of their own understandings of community culture and diversity and how they can develop culturally responsive strategies to enrich the educational experiences of students and achieve high levels of learning for all students;	Technology Facility: Demonstrates appropriate use of existing technology to further learning for students and adults, communicate with diverse audiences, and offer learning opportunities that would otherwise be inaccessible, extending the experiences of learners.		• Barriers • Equity • Bias
	2b. Minimize threats to inclusion Develop purposeful strategies to proactively challenge unconscious bias and minimize stereotype threat in CS.				

KSA Examples with Standards Alignment

| Create inclusive teacher collaboration and school culture	Teacher Leader Model Standards: 1d: Strives to create an inclusive culture where diverse perspectives are welcomed in addressing challenges. NBPTS Teacher Leader Competencies: Group Processes: Skillfully manages group dynamics, collaborates, and guides groups through challenges, controversy, conflicts, and adversity, while applying an understanding of diversity and what that diversity contributes to group work CSTP Teacher Leader Skills Framework: Communication: Risks inviting and honoring diverse views. CSTP Teacher Leader Skills Framework: Collaboration: Modeling/valuing diverse opinions CSTP Teacher Leader Skills Framework: Systems Thinking: Embraces the opportunity to work with those with diverse views

Ensure curriculum instruction, assessment, school organization, and school culture is accessible and equitable	CSTA Standards for CS Teachers: 2c. Represent diverse perspectives: Incorporate diverse perspectives and experiences of individuals from marginalized groups in curricular materials and instruction. CSTA Standards for CS Teachers: 4a. Analyze CS curricula: Analyze CS curricula for implementation in their classrooms in terms of CS standards alignment, accuracy, completeness of content, cultural relevance, and accessibility.

KSA Domains
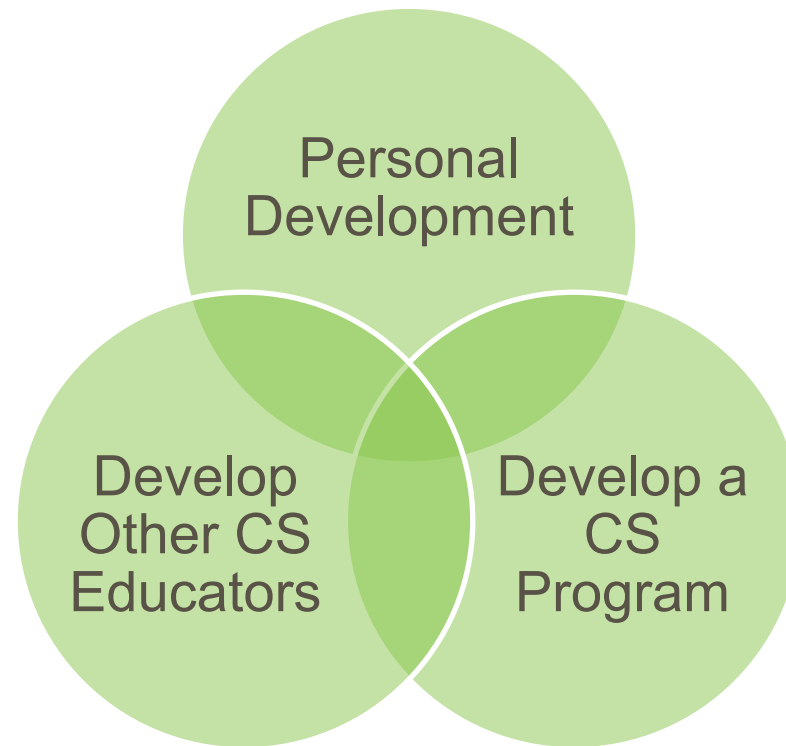
KSAs in the Micro-Credentials

Equity in Computer Science Knowledge, Skills, and Actions and Related Standards Crosswalk		
Domain	Key Knowledge, Skills, and Actions	Associated Standards
Personal Development	Understand barriers to equity in CS and for marginalized groups	CSTA Standards for CS Teachers: 2a. Examine issues of equity in CS: Examine how systemic barriers and social and psychological factors contribute to inequitable access, engagement, and achievement in CS among marginalized groups. Reflect on how issues of equity manifest in their own CS teaching context.
	Examine and counteract personal bias and reflect on own agency	CSTA Standards for CS Teachers: 3c. Examine and counteract personal bias: Examine how their personal perspective, privilege, and power impact student success and classroom culture and continuously work to counteract biases.
	Develop personal teaching philosophy related to equity	CSTA Standards for CS Teachers: 3d. Commit to the mission of CS for all students: Develop a personal teaching philosophy reflecting that all students can and should learn CS.
Develop CS Program	Ensure curriculum instruction, assessment, school organization, and school culture is accessible and equitable	CSTA Standards for CS Teachers: 2c. Represent diverse perspectives: Incorporate diverse perspectives and experiences of individuals from marginalized groups in curricular materials and instruction. CSTA Standards for CS Teachers: 4a. Analyze CS curricula: Analyze CS curricula for implementation in their classrooms in terms of CS standards alignment, accuracy, completeness of content, cultural relevance, and accessibility.
	Develop strategies to address unconscious bias	CSTA Standards for CS Teachers: 2b. Minimize threats to inclusion: Develop purposeful strategies to proactively challenge unconscious bias and minimize stereotype threat in CS.
	Develop data-based strategies to increase CS access	CSTA Standards for CS Teachers: 2d. Use data for decision-making to improve equity: Create and implement a plan to improve access, engagement, and full participation in CS using classroom data to inform decision-making. Teacher Leader Model Standards: 4a: Facilitates the collection, analysis, and use of classroom- and school-based data to identify opportunities to improve curriculum, instruction, assessment, school organization, and school culture.

KSAs   Standards

CS for ALL TEACHERS

Rating Micro-Credential Submissions

Reflection 1: What is [MC Topic]?

200–500 words

Reflection 2: KSA Application

700-2,000 words + 4 or more artifacts

Reflection 3: Summary

200-500 words

Documenting Mastery of KSAs

Reflections state what the educator has done that fully meets the KSA and associated standards

Artifacts substantiate and provide context for reflections. They do not have to "prove" reflections.

The educator must have "demonstrated" ratings for ALL reflections to earn the micro-credential.

Ratings

- ## Demonstrated
  - Addresses all required information coherently
  - Includes evaluator feedback on additional things to potentially consider or potential future actions

- ## Progressing
  - Addresses only some required information *or* does not include required references/artifacts
  - Includes evaluator feedback on missing information and additional things to potentially consider

- ## Not Met
  - Does not adequately address any required information – off topic, vague, or without specifics
  - Includes evaluator feedback on missing information and/or additional learning resources (if off-topic)

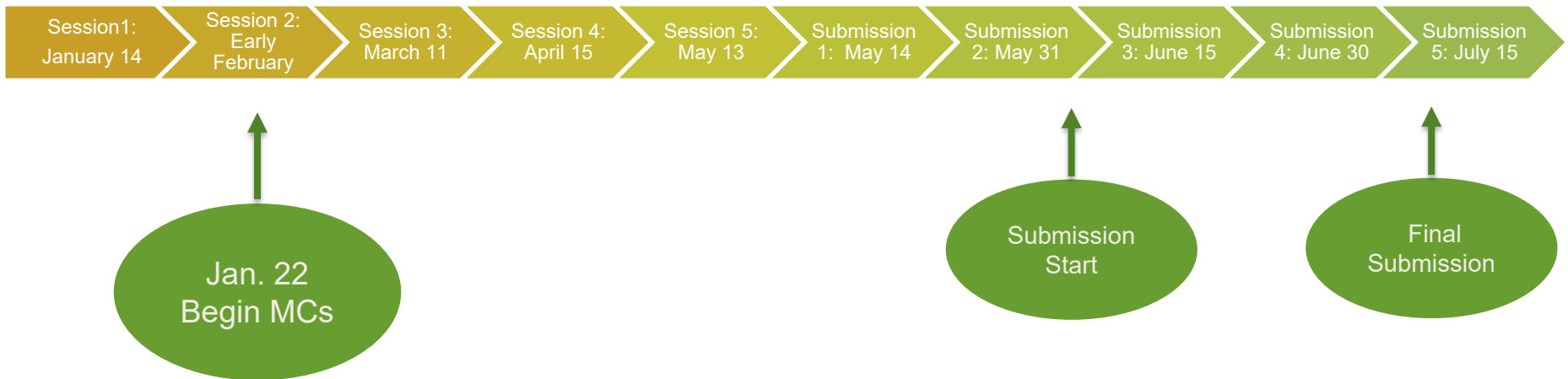# Reflections, Artifacts, Rubrics, and Scoring

Reflection 2 Submission Example (Partial)

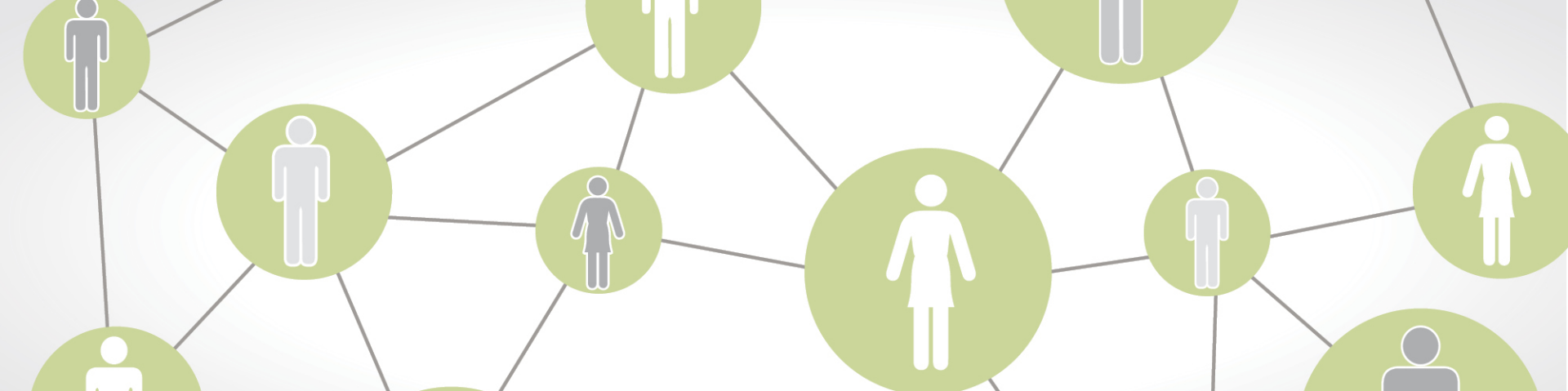| Domain	Standards	Key Knowledge, Skills, and Actions
Personal Development	CSTA Standards for CS Teachers: 3c. Examine and counteract personal bias: Examine how their personal perspective, privilege, and power impact student success and classroom culture and continuously work to counteract biases.	Examine and counteract personal bias and reflect on own agency

I am passionate about getting more girls excited about CS, but I realized that I haven't tried to get low-income students excited about CS because I didn't want to draw attention to disparities in home access to technology and make them feel unwelcome. Because many of our low-income students are also students of color, I may have accidentally contributed to racial inequities in CS at our school (ex: 37% of our school's students are black, but only 8% of our CS students are black; 41% of our school's students qualify for FRPL but only 12% of our CS students qualify for FRPL). This year I studied barriers to CS participation (including emotional barriers), taught two lessons focused on the many types of inequities in CS, established stricter behavioral norms to make our program feel more welcoming to all students, and began actively recruiting more low-income students and students of color who might enjoy CS. Next year I will identify a diverse group of at least five guest speakers to show students that anyone can be successful in CS. I will also spend 30 minutes weekly working with students individually to learn how to support their success.

Pilot Timeline

| Session1: January 14 | Session 2: Early February | Session 3: March 11 | Session 4: April 15 | Session 5: May 13 | Submission 1: May 14 | Submission 2: May 31 | Submission 3: June 15 | Submission 4: June 30 | Submission 5: July 15 |

Jan. 22
Begin MCs

Submission Start

Final Submission

Educator Experiences with the Teacher Leadership in CS Micro-Credentials
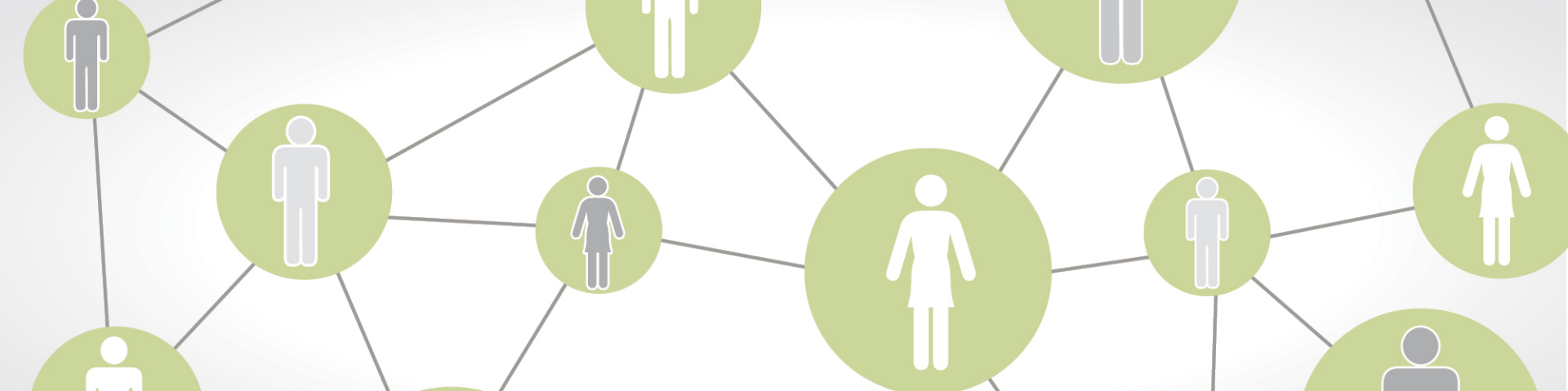
Theresa Goltermann

Theresa Goltermann

- Theresa has more than 20 years of teaching experience and is currently a CS teacher leader in York Public Schools, Virginia.

- Micro-Credentials Completed:
  – Building a CS Program
  – Advocacy in CS

Educator Experiences with the Teacher Leadership in CS Micro-Credentials

David Lockett

David Lockett

- David has more than a decade of teaching experience and is currently a CS teacher in Lake Wales, Florida. David is also currently serving as an Einstein Fellow.

- Micro-Credentials Completed:
  - Equity in CS
  - Policy in CS

Questions?

For More Information Please Contact:

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Thank You!