

Designing professional learning that centers educational justice in K-12 science teaching & learning

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*Teachers care about
meeting the needs of
all of their students.*



*Dilemma: How do we make PD meaningful for teachers,
who are trying to meet the needs of all students,
without making Culturally Responsive Teaching an
add-on in professional learning?*

Disjointed Experiences

"The mornings in the afternoon felt like two different trainings. The morning felt like race and equity and then the afternoon was science. We couldn't figure out how the morning in the afternoon sessions had anything to do with one another. I mean, if they're somehow able to weave in together that would be awesome. But it just felt very like disjointed like two different courses, but we did sign up for this science curriculum course.

Be more deliberate and transparent about how we are working on Race and Equity within science and perhaps, start by posing a question about within science about racism and sexism. We need to be able to say why this is important." -2nd grade teacher, 2019

Sit & Get PD

Few opportunities to engage in sensemaking & disconnected from classroom experiences



Tensions in Teacher Learning

Individual and cognitive perspectives



Social, cultural, networks & social movement perspectives

Defining equity as inclusion and access



Critical perspective on equity considering identities, power and politics & rightful presence (Gutiérrez, Philips, Calabrese Barton)

Race-neutral Teaching Practice

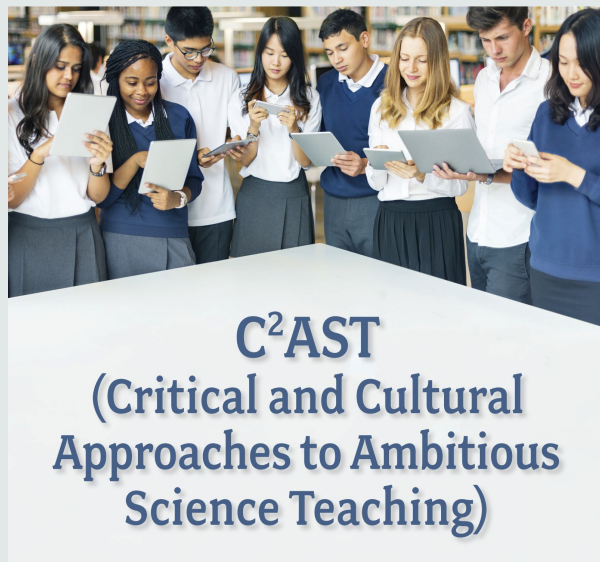
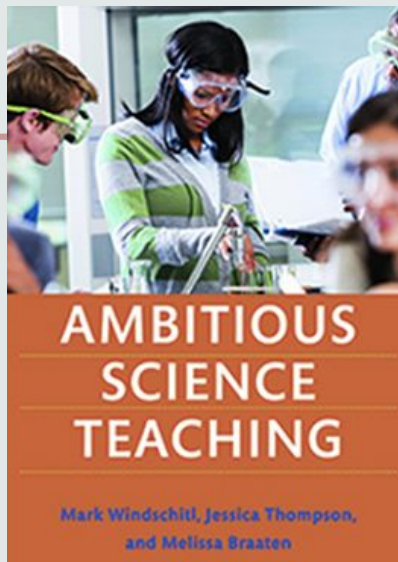


Race-conscious Teaching Practice (Shaw, Philips)

Settler-colonial Science and Instruction and Curriculum



Science Instruction and Learning for Liberation & Transformation (Bang, Warren & Rosebery)

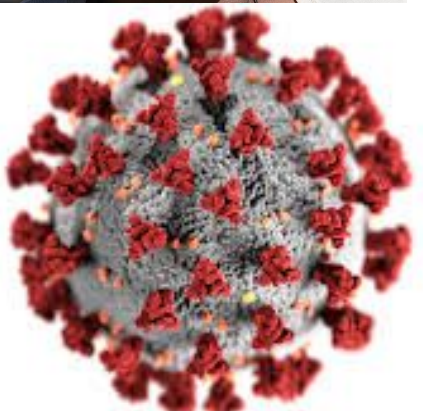


From Responsive Teaching Toward Developing Culturally and Linguistically Sustaining Science Teaching Practices

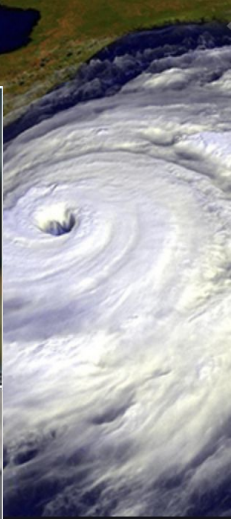
**JESSICA THOMPSON, KIRSTEN MAWYER,
HEATHER JOHNSON, DÉANA SCIPIO,
AND APRIL LUEHMANN**



WE SHALL
OVERCOME



Collective
Consciousness
& Racial Equity
and Justice in
Teaching



UNEMPLOYMENT APPLICATION

PERSONAL INFORMATION

SOCIAL SECURITY NUMBER

DATE OF BIRTH

DATE OF RESIDENCE

MOBILE

GENDER

2-Black

5-Asian Pacific

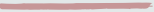
Have you worked in another state?

18 months?

18 months?

18 months?

To expand the economy,
invest in Black businesses



“Following June 2020, I talked a lot with some of my roommates who are also involved in education about ways, I'm like, “I can't I can't go back in August, and teach the same, like, there has to be a change of some kind.” And I just didn't know quite how to shift it...”

-8th grade teacher

“I am SO excited to move towards social justice in my teaching, I have SO many questions, wonderings, and how's but am excited to embark on the journey. & I want to move towards it being a daily practice embedded in EVERY lesson. Yes, I need help!”

- 1st grade teacher





Design Considerations

Have a multi-leveled theory of learning that designs for racial justice at each level

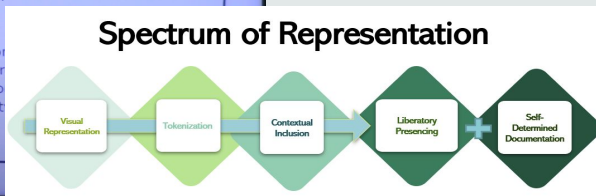
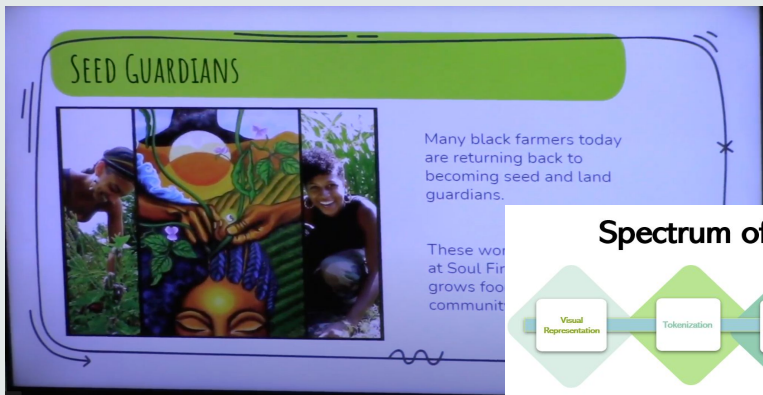
For student learning

For teacher learning

For networked learning



Center BIPOC expertise & expansive science



Critical reflection of knowledge we are learning today?

Decolonization/Anti-coloniality



Desettling Settler Colonialism

Indigenous Science



Land Based Pedagogies



Indigenous Systems & Data

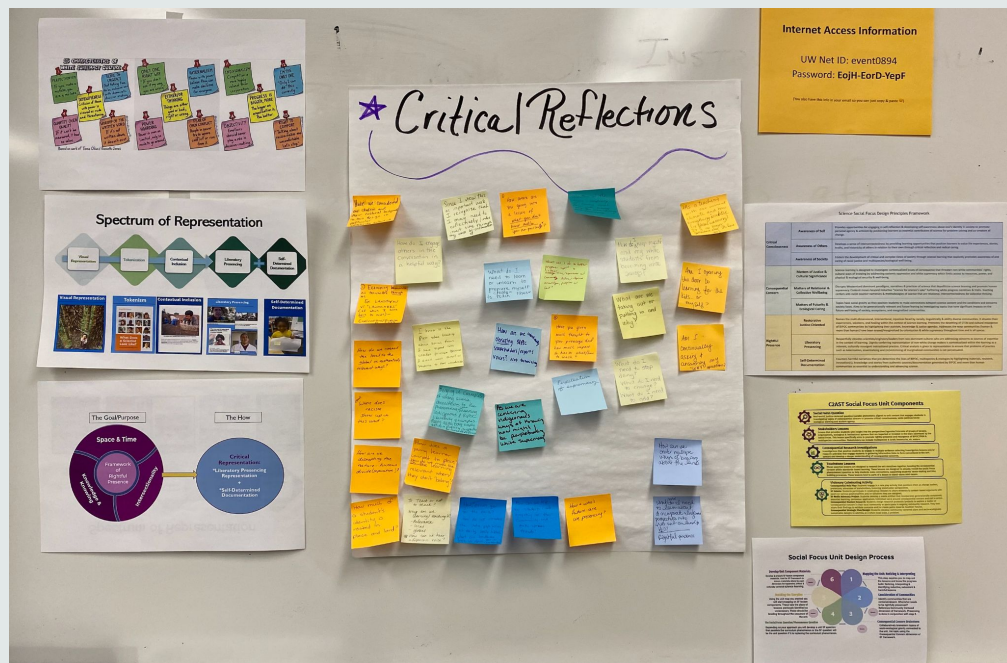


Relationality & Reciprocity

It's so powerful, and not in a way that it's just inspirational to hear everything. But it's impactful because of all the research that like is presented in each session. It amazes me because that I sit there and I'm like, I'm so behind on these certain like topics... I don't really have a chance to meaningfully have a professional development where I'm going back to research, I'm going back to my college days, really, to look into research and make some reason and try out some things like I love when I come to a session, I go back and I'm like, Okay, what can I try out now, because I just learned this.

- 3rd grade teacher





Develop a shared vision of what is possible with teachers, coaches, leaders

To be honest, they've been some of the best PDs that I've been to with science teachers, because they're actually pushing. They're teaching me more things that I haven't encountered elsewhere and *pushing me to, to incorporate that social justice focus, which I've always that's like a huge value of mine, but not I haven't felt equipped to do.*

So I think the the first one we talked about the different tenants with white privilege in teaching or of white culture in general and those have stuck with me. And then really, the work around storylines phenomenon. Like I was saying before, like keep the whole unit focused on that social issue and not have it be a one off lesson at the end or something in the middle that never addressed again. That's been really helpful. -4th grade teacher

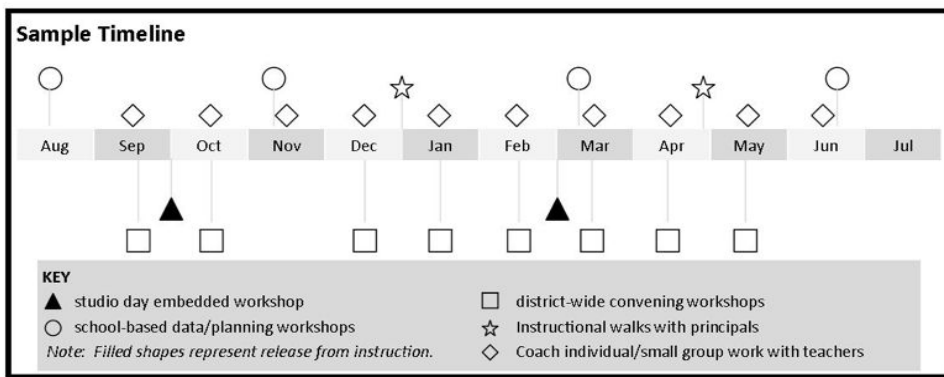
"It's messy. We're essentially developing our own critical consciousness while at the same time not waiting to understand it all to do something about it. There is an active tension to wait to do it right. Radical agents of change are continuously learning (because we know we'll never arrive) and doing the work at the same time. Our students cannot wait.

This is THE work that needs to be centered in education right now. When we talk about all the buzz words around equitable learning experiences, this is what we really mean and want. Teachers are seeing and experiencing learning in a whole new way. They are tackling their positionalities, developing their own critical consciousness while at the same time creating expansive opportunities for students.

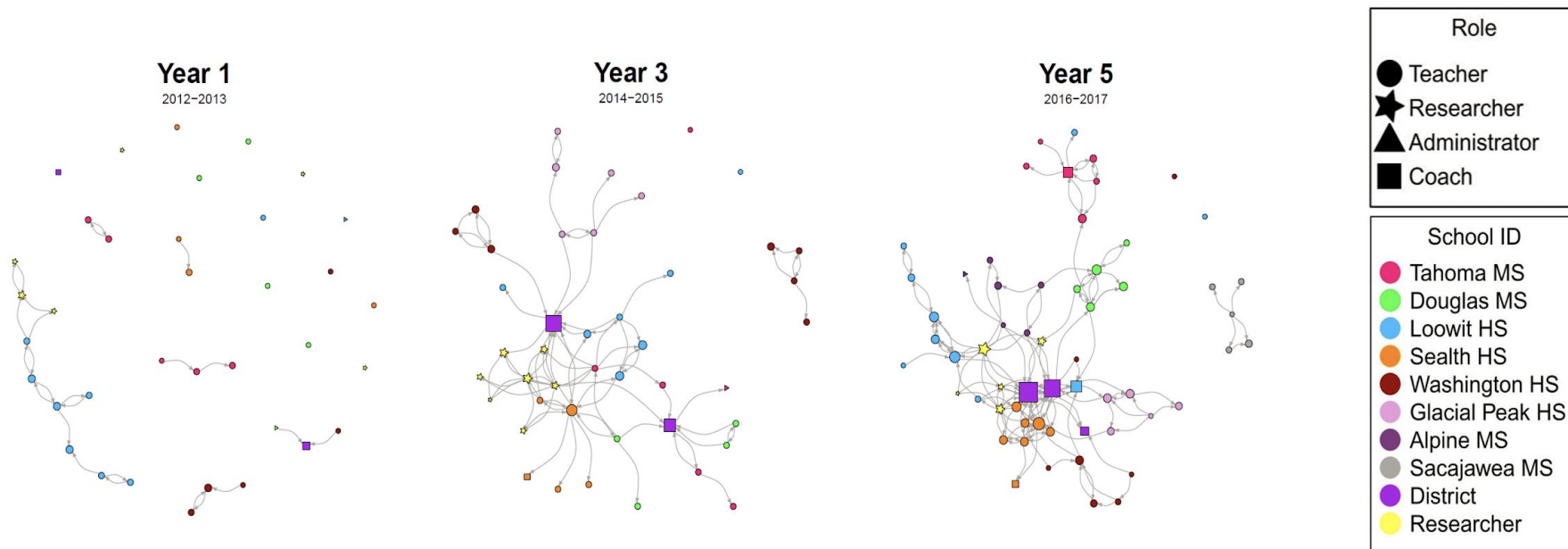
This project is a humbling experience. With this new lens, so much is uncovered that I want to change. Within myself, my instruction, in the curriculum.

-District Coach

*Use models that center students and teachers' perspectives
& question: Which practices work? Under which conditions?
And for whom?*



Network knowledge in systems & study spread



C₂AST



Dr. Jessica Thompson
Networked learning for
C2AST



Anastasia Sanchez
Social Focus



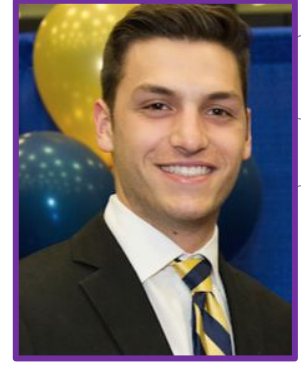
Kelsie Fowler
Student Modeling &
curriculum



Sarah Clancey
School leadership for
C2AST



Caroline Long
Teacher agency &
Storylines



Chris Mangogna-
NGSS curriculum &
equity teams



Dr. Liz Sanders
Teacher learning & network
analyses



Olga Mashnitskaya
Science Coach/
Partner Lead



Allison Grandberry
P-5 Science Specialist/
Partner



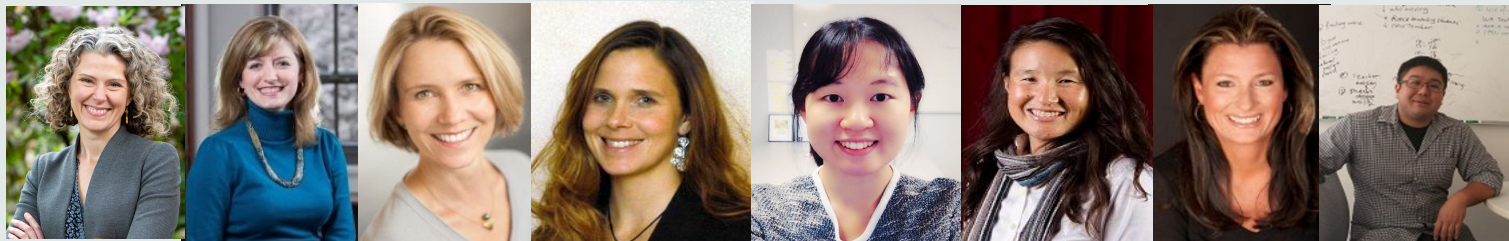
Alissa Berg
Science Manager/
Partner



Joshua Simondet,
Science Coach/ Partner



Tools for Ambitious Science Teaching



Dr. Jessica Thompson, Dr. Jen Richards, Dr. Karin Lohwasser, Dr. Christine Chew, Dr. Soo-Yean Shim,
Dr. Kerry Soo Von Esch, Dr. Liz Sanders, Dr. Nathan Abe

Dr. Manka Varghese, Dr. Anna Van Windekens, Bethany Sjoberg, Ann Morris, Allyson Kemp & Carmen Gonzales

Website: <https://www.education.uw.edu/nic/>

Recent Publications on Professional Learning

- Shim, S-Y & Thompson, J. (2022). Four years of collaboration in a professional learning community: Shifting toward supporting students' epistemic practices. *Science Education*, 1–32.
- Thompson, J., Richards J., Shim, S-Y., Lohwasser, K., Chew, C., Sjoberg, B. & Morris, A. (2019). Networked PLCs: Footholds into Creating and Improving Knowledge of Ambitious and Equitable Teaching Practices in a RPP. *AERA Open* <https://doi.org/10.1177/2332858419875718>
- Thompson, J., Hagenah, S., McDonald, S & Barchenger, C, (2019). Improving Model-based Instructional Practices and Tools with a Professional Learning Community. *Science Education*. 103(6), 1423-1455.

Please reach out with any questions

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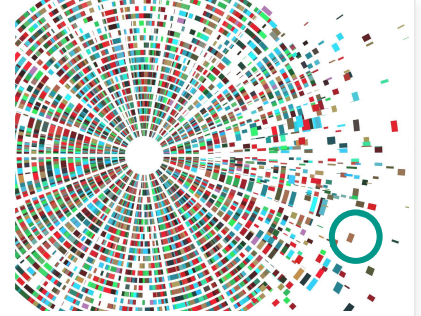
With gratitude to my colleagues, the teachers, leaders & students I have the privilege of working with, and to NSF



Extra Slides



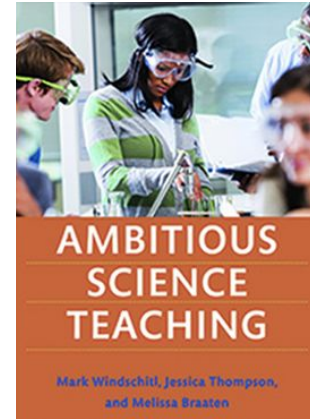
Theory of Classroom learning



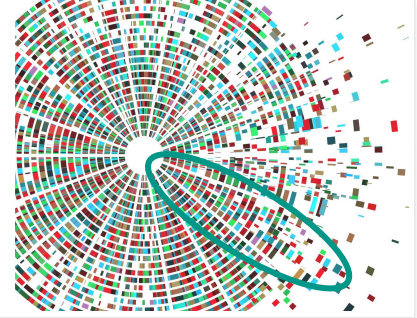
Ambitious Science Teaching & Rigor & Responsiveness. Engaging students' prior knowledge as an equity move to help learners feel connected & respected for their experiences (Kang, Windschitl, Stroupe, & Thompson, 2016; Stroupe, 2014; Thompson et al., 2016; Windschitl, Thompson, & Braaten 2018)

Culturally Responsive Teaching. Building on students' funds of knowledge with a focus on culturally & linguistically diverse students' knowledge (Hammond, 2014; Suárez, 2020; Villegas Lucas, 2007)

Critical Approaches to Science Teaching. Leveraging science practices to address historicized inequities and injustices (Calabrese Barton & Tan 2020; Gutierrez, R., 2002; Paris & Alim, 2014; Winn, 2018)



Theory of Teacher Learning



Designing Science Instructional Materials. Supporting teachers in learning through designing curricula that addresses issues of consensual concern for students and society, that rightfully presences BIPOC communities & liberation, centers multi-justice thriving and the development of students' critical consciousness (Sanchez, 2021; Tzou, Bang & Bricker, 2021)

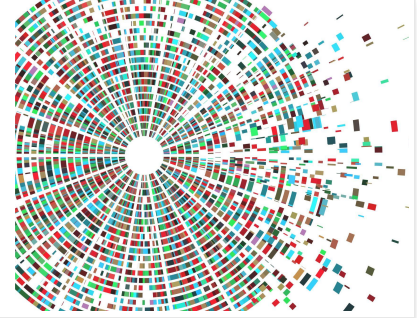
Inquiry in Networks. Supporting teachers in maintaining a stance towards inquiry, focus on student learning, and support group collaboration (Borko, Koellner & Jacobs, 2014; Cheung, Reinhardt, Stone & Little, 2018; [Thompson, Richards & Shim, 2019](#); Wenner & Campbell, 2017)

Situated Professional Learning Communities. Building capacity for sustained learning and improvement (Cobb, McClain, de Silva Lamberg, & Dean, 2003; Jackson & Cobb, 2012; Richmond & Manakore, 2011)

Practice-Oriented Teacher Development. Supporting professional learning of practices, tools and principles. (Thompson et al., 2013, Windschitl, Thompson, Braaten & Stroupe 2020; Thompson, Mawyer, Johnson, Scipio & Luehmann, 2020)

Development of Critical Consciousness. Supporting teachers to notice for equity and equity in action (Patterson, Higgs & Athanses, 2019; VanEs & Hand, 2017)

Theory: RPPs & NICs



RPPs. Research-practice partnerships have strong potential to generate and improve collective knowledge and novel solutions over time (e.g., Coburn & Penuel, 2016):

- Mutualistic collaborations between practitioners and researchers
- Oriented toward situated problems of practice

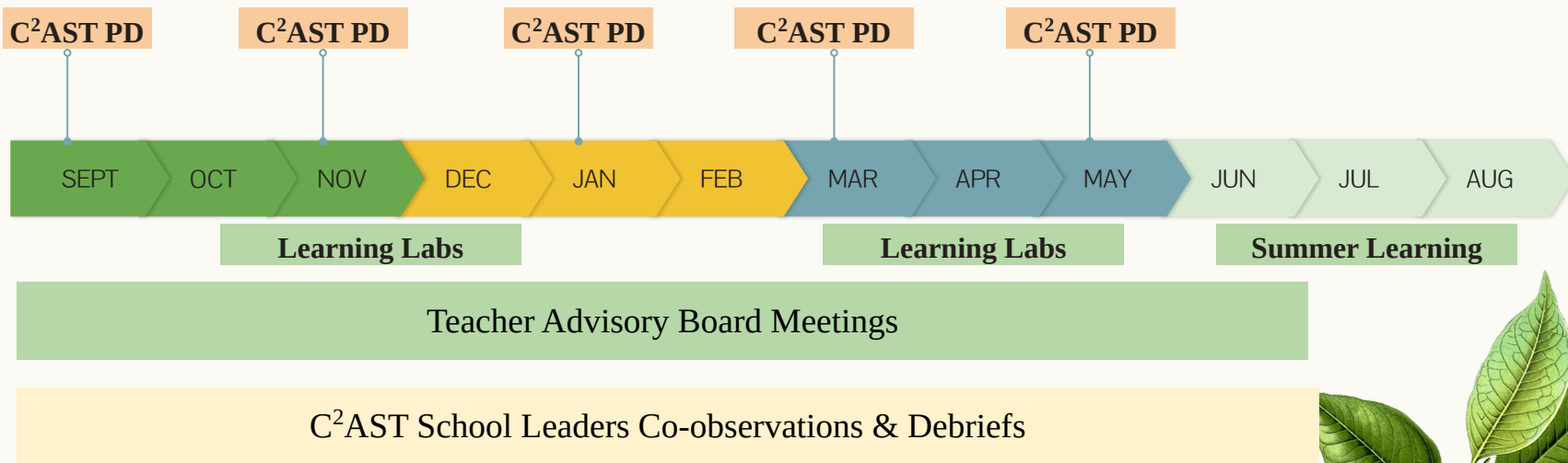
NICs. Across institutions, a commonly shared set of core practices, along with its tools, could evolve over time to improve and innovate within the work of teaching (Bryk, Gomez, & Grunow, 2011; Hiebert & Morris, 2012)

RPPs & Racial Realism. RPPs can participate in the struggle toward humanity and collective healing, disrupt systemic oppression, and engage in transformative action (Lewis & King, 2022)



Timeline Year 1

All comer teacher PD
Teacher Advisory Board
School & District Leadership



Fall



Goal: Introduction to C2AST theoretical concepts

Expansive science, critical consciousness & the culture of white supremacy, rightful presencing, issues consequential concern

- UW Role: Lead PD, & deepen our understanding of C2AST
- Teacher Role: Deepen understanding of C2AST

Winter



Goal: Support theory to practice at grade levels

- 1) Grade-level social focus curriculum development
- 2) Try on new AST practices & explicitly reflect on C2AST theory

- UW Role: Guide on the side/ curriculum & tool drafter
- Teacher Role: Adapt AST tools, vet curriculum, apply ideas to middle unit

Spring



Goal: Collaborative research on practice & networking

- 1) Putting it all together social focus unit with AST practice, & C2AST reflection
- 2) Sharing examples across the network

- UW Role: Tailoring, focus on student learning & support teachers with being responsive
- Teacher Role: adapt, implement & adapt

2021-2022

By the end of the year...

- **Notice how race, power, histories, futures, and identities matter to science learning** by unpacking how white supremacy culture is in play in your classroom (de-centering whiteness) and examining opportunities for expansive science and rightful presencing (centering global majority communities with attention to histories, futures, places, ways of knowing, and multiple identities)
- **Incorporate AST practices** for eliciting students' ideas and stories (student-generated hypotheses, modeling), engaging in expansive dialogue (back-pocket questions, why level questions, attention to multilingual learning, critiquing models/ideas), and developing evidence-based explanations (summary tables, gotta-have checklist, revising models)
- **Create expansive opportunities for students** to engage in perspective taking, critique white dominant culture (esp. grades 4-6), talk about liberatory presencing (how cultures contribute to a better future), consider multi-species justice, address issues of consequential concern (matters of justice, wellbeing, futurity, ecological caring), and develop critical consciousness (reflect on self, others and society)

NIC with a common aim & practices

GOAL:

Improve all students' written and spoken science explanations, arguments & models for all students and for EB students in particular



PRIMARY DRIVERS:

Making the language of science explicit

Equitable talk for how/why explanations

Using evidence to construct and revise explanations

Revising models with evidence

SECONDARY (ACTIONABLE) DRIVERS:

Using language functions as lens for reading, writing, and modeling

Yr2: 1 school
Yr3: 1 school
Yr4: 1 school

Structured talk for how/why reasoning

Yr 1: 1 school
Yr 2: 4 schools
Yr 3: 2 schools
Yr 4: 1 school
Yr 5: 2 school

Peer feedback to deepen written explanations

Yr 3: 1 schools
Yr 4: 3 schools
Yr 5: 6 schools

Revising lists of student generated hypotheses with evidence

Yr 2: 2 schools

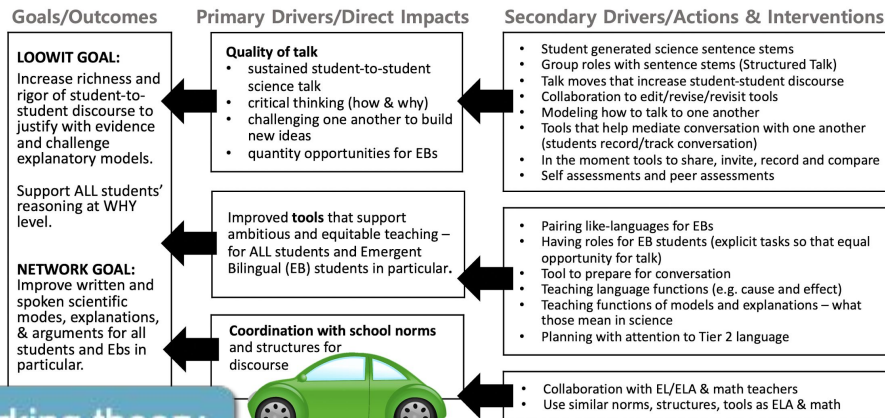
Sequenced share-out of models

Yr 2: 2 schools
Yr 3: 2 schools
Yr 4: 1 schools
Yr 5: 1 school



Learning Loops

Driver Diagram — Loowit High School



Working theory of student learning



...ed in structured talk with a partner, which of the following did you try? (check ALL that apply)

- Idea _____
- I agreed with my partner's idea
- I added on to my partner's idea
- I disagreed with my partner's idea
- I used scientific evidence to support my idea
- I asked a clarifying question

- ☐ I could revoice my partner's idea
- ☒ My partner and I looked for similarities and differences in our ideas
- ☒ I used a sentence stem to explain my idea
- ☐ Other _____

What did you and your partner talk about? Be specific.

My partner and I talked about our own thinking about what are the optimal ranges of an array and what could have gone better? My discussion because we both listened and build off our ideas.

explain one thing in this unit that you understand better or differently after talking with your partner today.

Now understanding better about how enzymes catalases works and how they are affected by different variables.

Teaching Practice

Practical measurements

1. Sharing your ideas

- I think _____ happened because _____
- I think if _____ then _____ because _____
- Evidence that supports my idea is _____
- My idea is _____
- I'm not sure, but I think _____
- My question about this is _____



2. Revoice (paraphrase)

- I thought I heard you say _____
- Is this what you mean: _____?
- Would you clarify what you mean by _____?
- Could you explain again? _____



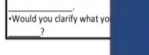
4. Compare/contrast Ideas

- We agree about _____ (partner's name)
- I agree about _____
- We both thought _____
- We disagreed about _____ (partner's name)
- I said _____ but I was thinking _____



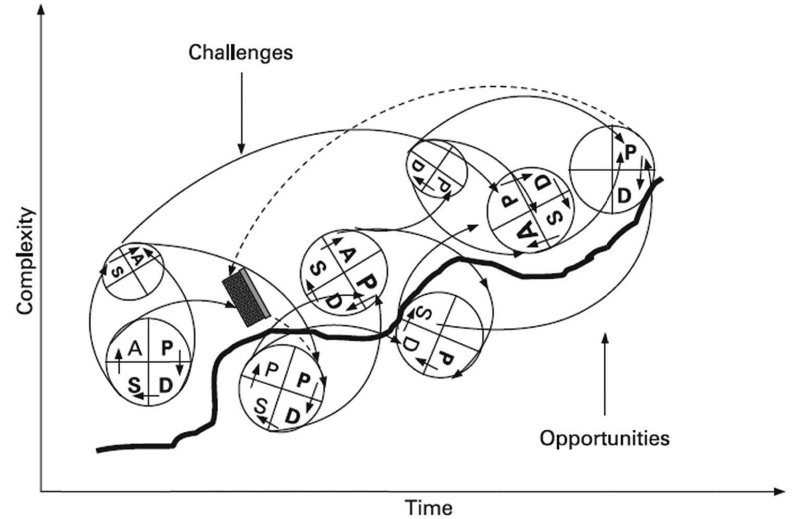
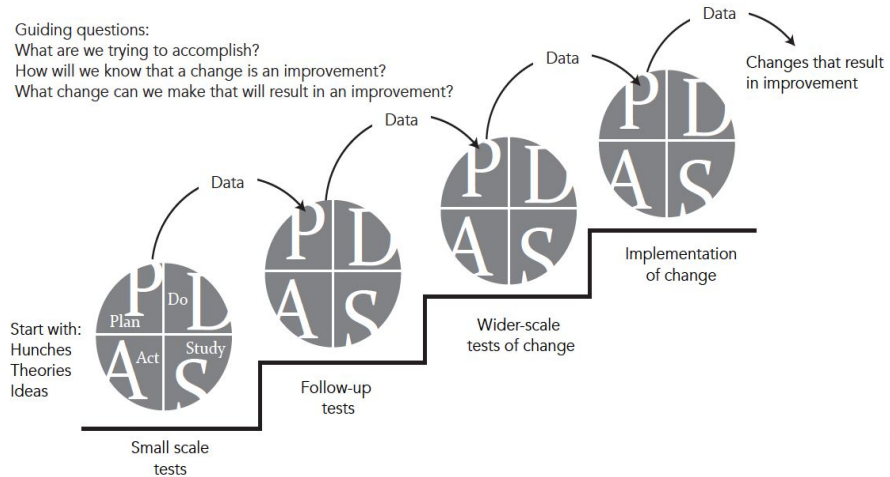
3. Responding to Revoice


- Yes, _____ is what I meant.
- No, what I meant was _____
- That's close but _____
- That's partially correct, however _____
- Yes, that's right. I agree that _____
- Would you clarify what you _____?



What can we do to improve?

PDSA Cycles with PLCs



P = Plan D = Do  = Barrier — = Direct flow of impact
 S = Study A = Act - - - - = Lingering background impact Arrowhead = Feedback or feedforward
 Different sizes of letters and cycles and bold letters = denotes differences in importance/impact

