Facilitating Teacher Learning with Video Clips of Instruction in Science

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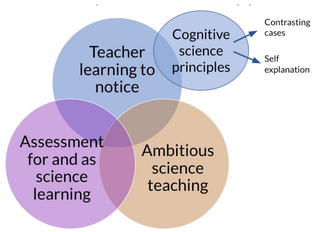
Project Goal

The project aims to build foundational knowledge about teacher learning by using video clips of science instruction within a professional development (PD) context.

- PD is centered around the analysis of video clips depicting the implementation of 3D performance assessments in science classrooms.

Key Theoretical Approaches



At the intersections of key theoretical approaches, the project explores science teachers' learning to notice teaching and student thinking in new ways by:

- focusing on the implementation of performance assessments in science classrooms, and
- engaging PD that integrates cognitive science principals.

Learning to Notice

Developing expertise in a profession in terms of seeing and making sense of complex situations in particular ways (e.g., Jacobs, Lamb, & Philipp, 2010; Konig et al., 2022; Sherin, Jacobs, & Philipp, 2011).

In this work, we focus on learning to notice student thinking, and its intersections with pedagogy, and we are seeking to build toward considerations of equity more explicitly (e.g., Louie, 2018; Tekkumru Kisa & Stein, 2015; van Es, Cashen, Barnhart, & Auger, 2017).

Video has been central to support this form of learning (e.g., Barnhart & van Es, 2018; Sherin, Richards, & Altshuler, 2021; Superfine & Bragelman, 2018).

Designing for Teacher Learning informed by Cognitive Science Principals

Self-explanation: An instructional principle in which learners are prompted to explain instructional content, problem-solving solutions, or expert examples. Self-explanation can help learners make connections between prior knowledge and new information, generate key principles and application conditions, notice and refine in their understanding (Chi et a;.,1989; Crowley & Siegler, 1999; Hausmann & VanLehn, 2007; Rittle-Johnson, 2006).

Contrasting cases: An instructional tool that uses analogical comparison to highlight critical features within cases. Contrasting cases can help learners identify and align critical features in cases rather than focusing on superficial details, and transfer principles from cases to their own behaviors when completing similar tasks (Gentner, Loewenstein, & Thompson, 2003; Mason, 2004; Tekkumru-Kisa & Stein, 2014).

Assessment for and as Learning: Performance Assessments in Science

"The classroom assessments you use are not an intrusion into what you do; they are an integral part of your teaching... Instruction, curriculum, and assessment must be tightly linked—coherent—if they are to successfully address learning that builds over time" (NASEM, 2017; p.22)

Performance assessments provide the opportunity for students to demonstrate their ability to use their knowledge and skills to solve real, puzzling questions (Darling-Hammond & Adamson, 2010), and for teachers to authentically surface and work on students' ideas so they deepen their learning during the course of the task (Kang & Furtak, 2021; Heritage & Wylie, 2018; Penuel & Shepard, 2016).

Ambitious Science Teaching

"Ambitious teaching, defined as engaging all learners with rigorous science in ways that value the diverse experiences the learners bring to the classroom" (Windschitl & Calabrese-Barton, 2016, p. 1106)

Ambitious teaching involves opportunities for students to reason about key science ideas, participate in discourses of the discipline, and solve authentic problems (Fennema et al., 1993; Lampert & Graziani, 2009; Newman & Associates, 1996; Rosebery et al., 2010; Windschitl et al., 2012).

Research Team:

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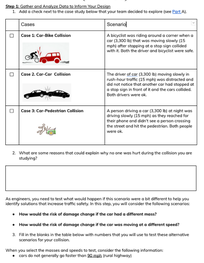
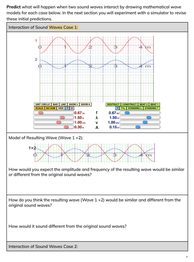
Design Efforts

Instructionally Embedded 3D Performance Assessments:

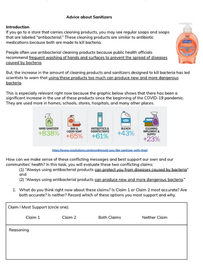
Cancelling out Noise Pollution (Waves)



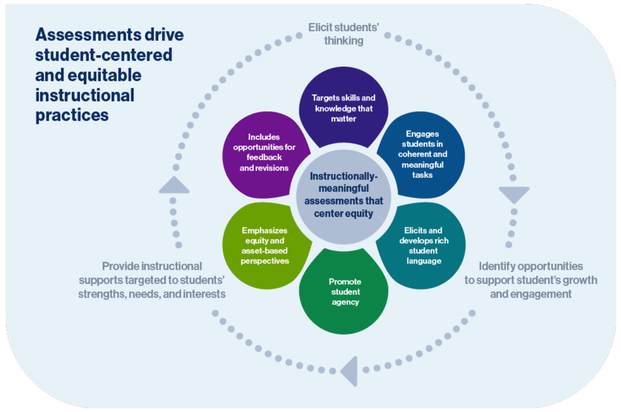
Advice About Sanitizers (Natural Selection)



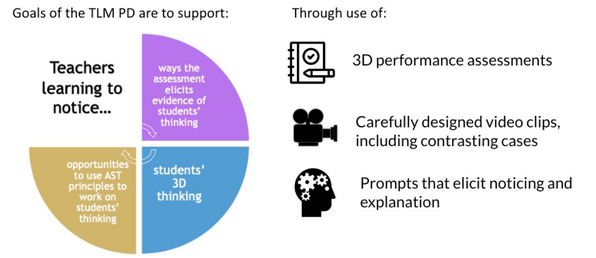
Safer Roads (Force & Motion)



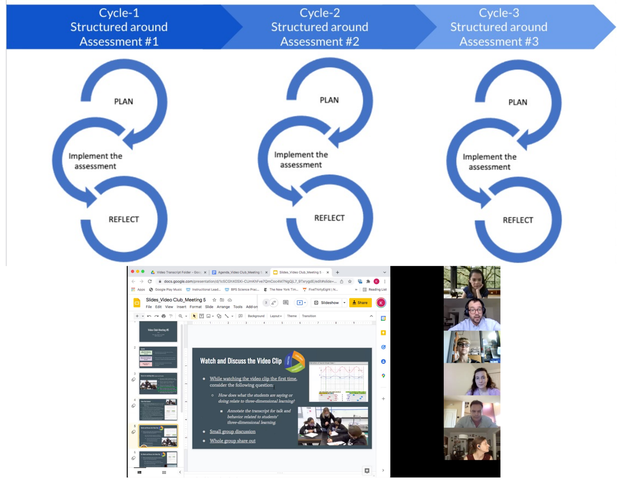
Assessment were co-designed with seven 8th grade science teachers (Tekkumru-Kisa, Wertheim, & Akcil-Okan, 2023) using SCALE's design principles for instructionally-embedded performance assessments (Wertheim, 2021).



Video-Based Professional Development on Implementation of 3D Performance Assessments



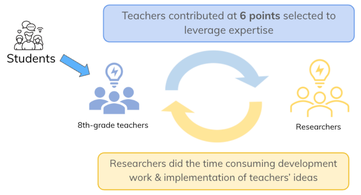
After a two-day workshop orienting teachers to the NGSS vision, 3D model of instruction and assessments, and assessments for learning, teachers engage in a year-long video-based PD model:



Teachers' thinking about, use of assessments, and the process of co-designing 3D performance assessments

- **Responsive co-design of 3D performance assessments**

Explores the ways in which the sciences teachers, who participated in the co-design of 3D performance assessments, shape the design of assessments, and perceive their experiences during the co-design of 3D performance assessments



- **Teachers' thinking about NGSS assessment**

Explores personal resources teachers bring to bear when describing NGSS assessments before and after their participation in co-design of 3D performance assessments

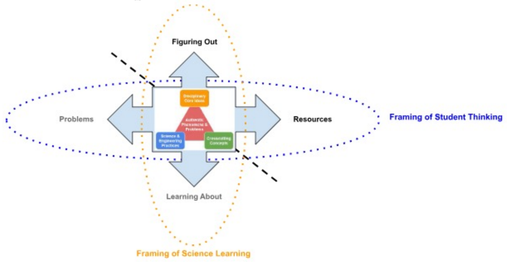
Resources evident across instruction and assessment initially: 3D learning; phenomena-based; active teacher facilitation

Shifts after co-design: More emphasis on collaboration among students; more emphasis on coherence across instruction and assessment

Teachers' learning to notice teaching and student thinking in new ways within the context of the PD

- **Frameworks for understanding nuances of teacher noticing**

Multi-dimensional noticing for teaching science-as-practice



Facets of teacher noticing

Focus: What do teachers attend to?

Stance: How do teachers unpack noticed events?

Specificity: At what degree of specificity?

Connections: How do teachers connect noticed events to other things?

- **Examinations of changes in teachers' noticing and various designed structures that could play a role in teacher noticing**

When presented with contrasting video cases, what do teachers notice?

In what ways teachers make connections between specifics of classroom interactions in the video clips and broader principals of ambitious teaching?

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