SPIRAL

Supporting Professional Inquiry and Re-Aligning Learning through a structured digital portfolio system

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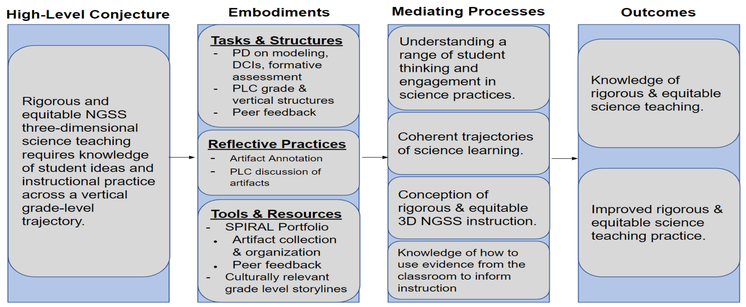
Project Description

The Next Generation Science Standards (NGSS) engage students in a small set of disciplinary core ideas in increasing depth and richness across non-consecutive K-12 grades.[1] This vision will require professional learning and collaboration among teachers both horizontally (within grade-levels) and vertically (across grade-levels)[2]; reflection rooted in artifacts that reflect authentic instances of classroom teaching and learning [3]; and tools that facilitate reflection and collaboration around this evidence.[4] However, science teachers often plan and teach in isolation, or in within grade-level teams.

The SPIRAL project addresses each of three elements: 1) A PD structure that involves grade-level and vertical collaboration in multi-site PLCs; 2) Reflection organized around multimedia classroom artifacts reflecting evidence of student learning trajectories along a particular DCI/storyline; 3) A suite of digital portfolio tools (SPIRAL iOS/Android app and Web portal) designed to allow teachers to efficiently capture, organize, and share multimedia classroom artifacts. We seek to understand how these vertical structures and digital portfolio tools may enable teachers to better understand students' learning trajectories across K-8 science so as to shape their own instructional practice.

Conjecture Map and Research Questions

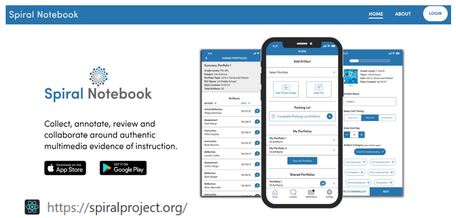
RQ1: How do vertical PLCs shape teachers' professional **knowledge** of DCIs (water and waves) and practices (modeling); use of evidence of student thinking to inform science instruction; and rigorous and equitable science teaching practices?
RQ2: How do vertical PLCs shape teacher's professional **practice** as reflected in artifacts of science instruction in their classrooms?
RQ3: How do SPIRAL digital portfolio tools shape teachers' professional knowledge and science teaching practice?

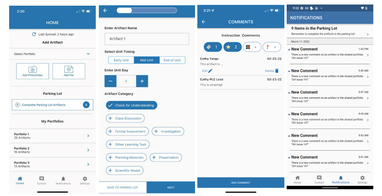


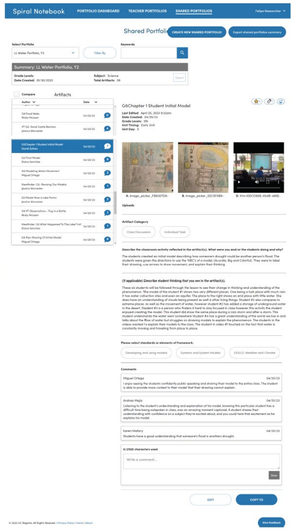
Methodology and Data Sources

2021-22 (Pilot), 2023-23 (Y1). Exploratory qualitative/quantitative research design includes teacher and student surveys[5,6], teacher knowledge grids, teacher interviews; video of in person and zoom PLC meetings and discussions; artifacts collected in the Spiral Notebook; and metadata of participant use and engagement with the portfolio system. Analyses include descriptive-correlational statistics, and qualitative coding of portfolio contents, PLC meeting interactions, and teacher interviews using deductive and inductive schema from existing *Dimensions of Quality Instruction in Science*.[7]

SPIRAL at a Glance







People & Structures

27 Little Lake K-8 Science Teachers

1200+ hours of PD

1,200+ Professional Development hrs, teachers put on their researcher hats to inform our understanding of how students develop their understanding of scientific concepts across grades.

Tools

Water & Waves Storylines

Spiral App & WebApp

The UCLA Science Project provided materials for the Water and Waves storylines. The UCLA Office of Advanced Research Computing developed the SPIRAL App for iOS and Android devices, and accompanying SPIRAL Web portal.

Engagement

300+ artifacts

Grade & Vertical sharing

Participant teachers captured hundreds of digital classroom artifacts with the SPIRAL Notebook App, and collaborated in grade-level and vertical teams to explore student learning trajectories and high-quality teaching in the NGSS.

Preliminary Findings

Spiral Teachers' Voices

"Now, I see how valuable their basic learning of concepts is in relation to upper grades. Models are very important!"
1st Grade Teacher

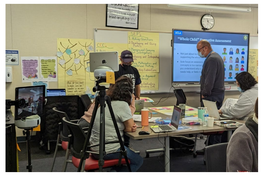
"Students' ability depends on their past experiences. If ALL grade levels engage students in these science practices, we will see more growth."
4th Grade Teacher

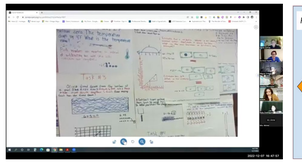
"I am blown away by what the younger grades are already capable of. It excites me to have them in a few years."
8th Grade Teacher

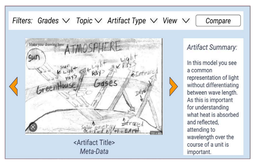
"I remember a middle school teacher was amazed at the video clips and seeing first graders use vocabulary…He even asked 'when do you guys teach this unit? Is that something we, as middle school teachers, can go observe and just watch all that learning?' That was nice to get that feedback because it feels like we're two different worlds, but really we're not."
4th Grade Teacher

But to see what they're learning in k-1st and 4th and how it connects to what they're going to be learning in 8th, gives me a better starting point…Whereas right now I say, "Who heard of waves?" And they may not know…but to see the connections in how they're teaching and what they're learning…changing to a higher pitch when the animal's happy or low when sad on their own in first grade, I was like, "Wow."

8th Grade Teacher

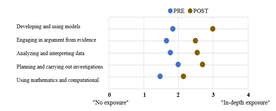






Survey Pre-Post Comparisons

Student exposure to NGSS practices (Teacher reported)*

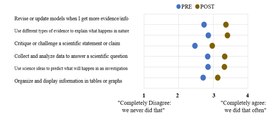


Teacher preparedness in NGSS instruction*

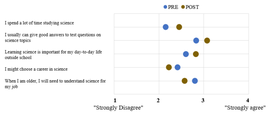
*Note: 7 stat. significant differences found. 5 largest shown

*Note: 15 stat significant differences. 5 Largest shown.

Student self-reported exposure to NGSS Practices*



Student self-perceptions around science*



*Note: 18 stat. significant differences found. 6 largest shown

*Note: 5 stat. significant differences shown (two unexpected negative)

Implications and Next Steps

- Vertical discussions address issues beyond curriculum gaps and redundancies (teacher positioning, community, teaching identity)
- Teachers bring different forms of discourse to grade-level and vertical PLC interactions (Complementary certainty and curiosity)
- Artifacts can serve as anchor for novel vertical PLC discussions

Next steps

- Qualitative coding, correlational analyses
- Software refinements/additions
- New teacher cohort in 2023-24 (Y3, n=15 teachers)

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References

1. NGSS Lead States, 2013; Corcoran, Mosher, & Rogat, 2011.
2. See Darling-Hammond et al., 2017; Desimone, 2009; Horn, Garner, Kane, & Basel, 2017; Turner, Christensen, Kacker-Cam, Fulmer, & Trucano, 2018.
3. See Darling-Hammond, Hyler, & Gardner, 2017; Desimone, 2009; Shulman, 1998; Stefani, Mason, & Pegler, 2007; Wilsey, Kloser, Borko, & Rafanelli, In review.
4. See Kloser, Floyd, Edelman, Martínez, & Stecher, In review; Little, 2003.
5. Kloser, Borko, Martínez, Stecher, & Luskin, 2016; Kloser et al., 2016.
6. Bandura, 2006; Cobern, 2000; Kane and Staiger, 2012.
7. Martínez et al., 2019.

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