SPIRAL

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

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Introduction

The Next Generation Science Standards (NGSS) focus on a small set of disciplinary core ideas that students come to understand with increasing sophistication throughout their K-12 education.[1] While research-informed,[2] this approach risks non-coherence when science teachers plan and instruct in isolation, or at best, within grade-level teams. The long-term success of the NGSS will benefit from new approaches to teacher collaboration and tools for professional development (PD).

The SPIRAL project seeks to develop and test such a model for PD that incorporates collaboration across vertical teams of teachers and which utilizes a set of open-access digital tools enhancing collaboration among these teams to support instructional improvement aligned to NGSS. We seek to better understand how teachers use a custom-designed digital portfolio to better understand students' learning trajectories across K-8 science so as to shape their own instructional practice with relation to the spiraled nature of NGSS.

Project Description

The spiraling model of the NGSS engages students across non-consecutive grades in scientific practices to better understand a small number of disciplinary core ideas in increasing depth and richness. What innovations does such a vision require? It requires, we believe: structured collaboration among teachers both horizontally (within grade-levels) and vertically (across grade-levels)[3]; professional learning rooted in authentic classroom artifacts[4]; and tools that facilitate the the collection of these artifacts and the sharing of these for productive discourse.[5]

The SPIRAL project explores each of these. First, it embeds within a long-term PD partnership between UCLA and teacher-leaders in a partner school district in Southern California. Teachers participating in SPIRAL will pilot a joint model of grade-level and vertical collaborations in multi-site professional learning communities (PLCs)

Second, the UCLA Science Project PD Team will facilitate PLCs, which will be anchored using multimedia classroom artifacts and will progressively focus on teacher understanding of student learning trajectories and the spiraling NGSS.

Third, these teachers-leaders will pilot and help improve a newly-developed suite of digital portfolio tools, called Spiral Notebook. This iOS- and Android-compatible app is intended to allow teachers to efficiently capture multimedia classroom artifacts, and then engage in meaningful, collaborative reflection on these artifacts both asynchronously and during PLC meetings.

Research will examine teacher-leaders during 3 academic years, exploring how professional knowledge and instructional practice are influenced by vertically-aligned PD, as well as how the Spiral Notebook digital tools intersects with these developments of understanding.

Research Questions

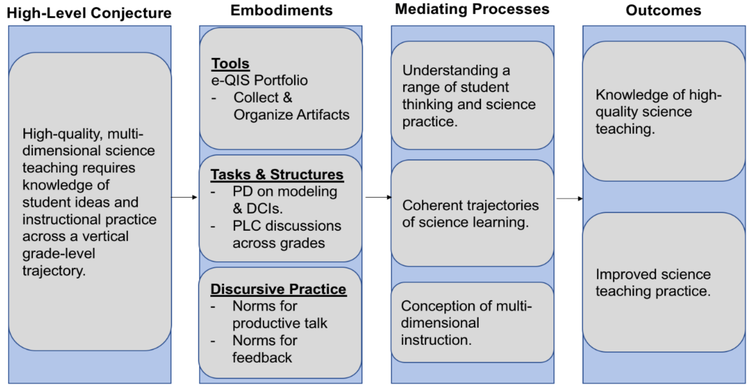
1. In what ways are forms of **professional knowledge** (e.g. knowledge of [a] content and standards; [b] student thinking; and [c] teaching practice) shaped by interactions in grade-level and vertical PLCs?
2. In what ways are aspects of **teaching practice** shaped by interactions in grade level and vertical PLCs?
3. How do the different components of **the digital tool influence professional learning** (at the nexus of making visible student thinking and adapting instruction in light of that thinking)?

Methodology and Data Sources

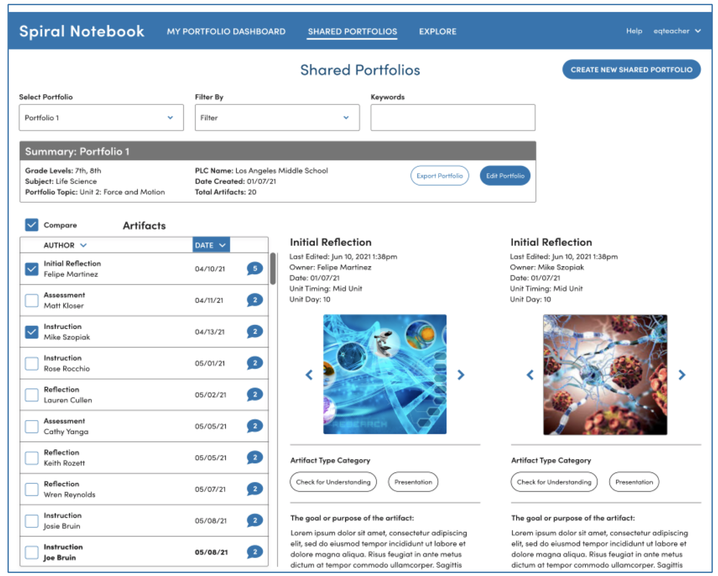
The project involves a combination of exploratory qualitative and quantitative methods. Data sources include baseline, midpoint, and final teacher surveys and semi-structured and stimulated recall interviews about professional knowledge and practice; student surveys of classroom practices and self-efficacy; PLC meetings and online discussions; portfolio contents (e.g. annotations, artifacts); and metadata of participant engagement using the Spiral Notebook digital portfolio system.

Surveys and interview protocols will be adapted from our own previous studies[6] and other existing batteries.[7] Survey analyses will involve a combination of descriptive and correlational statistics (appropriate HLM models will be used with student survey data nested within classrooms). Videos of PLC meeting interactions will be coded using both deductive and inductive coding schema related to existing *Dimensions of Quality Instruction in Science*;[8] emergent codes will also be added after multiple readings. (All qualitative coding will be done in DeDoose.)

Conjecture Map



Digital Portfolio Design



To view a virtual walkthrough of the mobile app and the online dashboard designs, please see the video attached to this presentation.

Implications

This project aims to impact research and practice in science and teacher education. Three products highlight its potential impact:

1. **Vertical PLC Model:** instructional improvement across grades, aimed at supporting teacher reflection and student learning of NGSS concepts across grades
2. **Shared Multi-Grade Portfolios:** stores of student artifacts along common DCI for researching learning progressions and trajectories of K-8 teaching
3. **Suite of Digital Portfolio Tools:** efficient communication and professional reflection opportunities, anchored in analysis of real artifacts reflecting student thinking

Additionally, the partnership with the school district will provide direct professional development for cohorts of teachers-leaders, and could also offer opportunities for replication, informing a broader field about these PD structures and tools.

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References

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

Disclaimer

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