

# Developing teachers' capacity to promote argumentation in secondary science

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## Project Goals

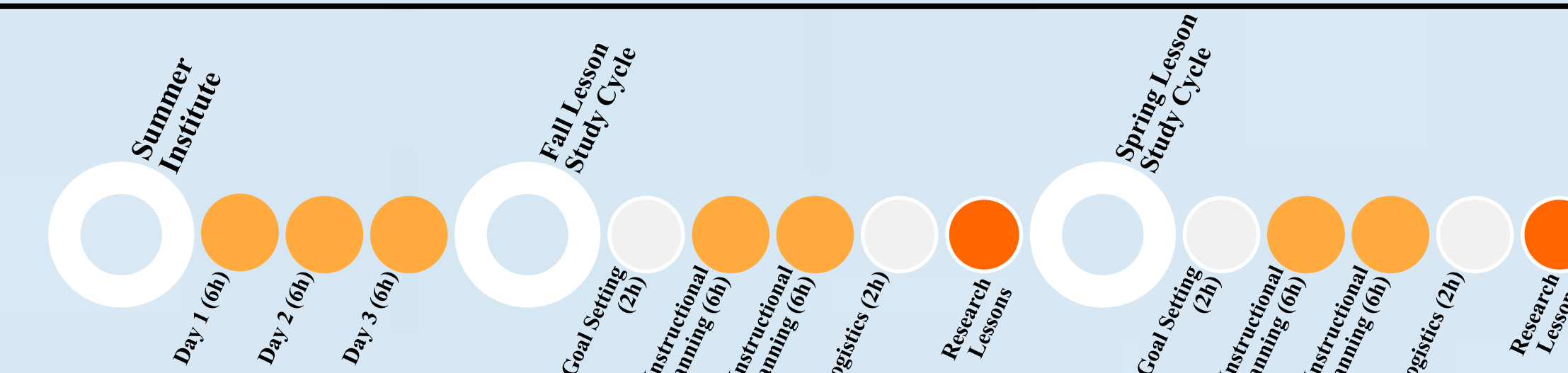
1. Develop an instructional model for argumentation aligned with NGSS
2. Develop a professional development model and resources to support NGSS enactment
3. Collect evidence of changes to teaching practice
4. Collect evidence of students' opportunities to engage in argumentation practices

## PD Structure

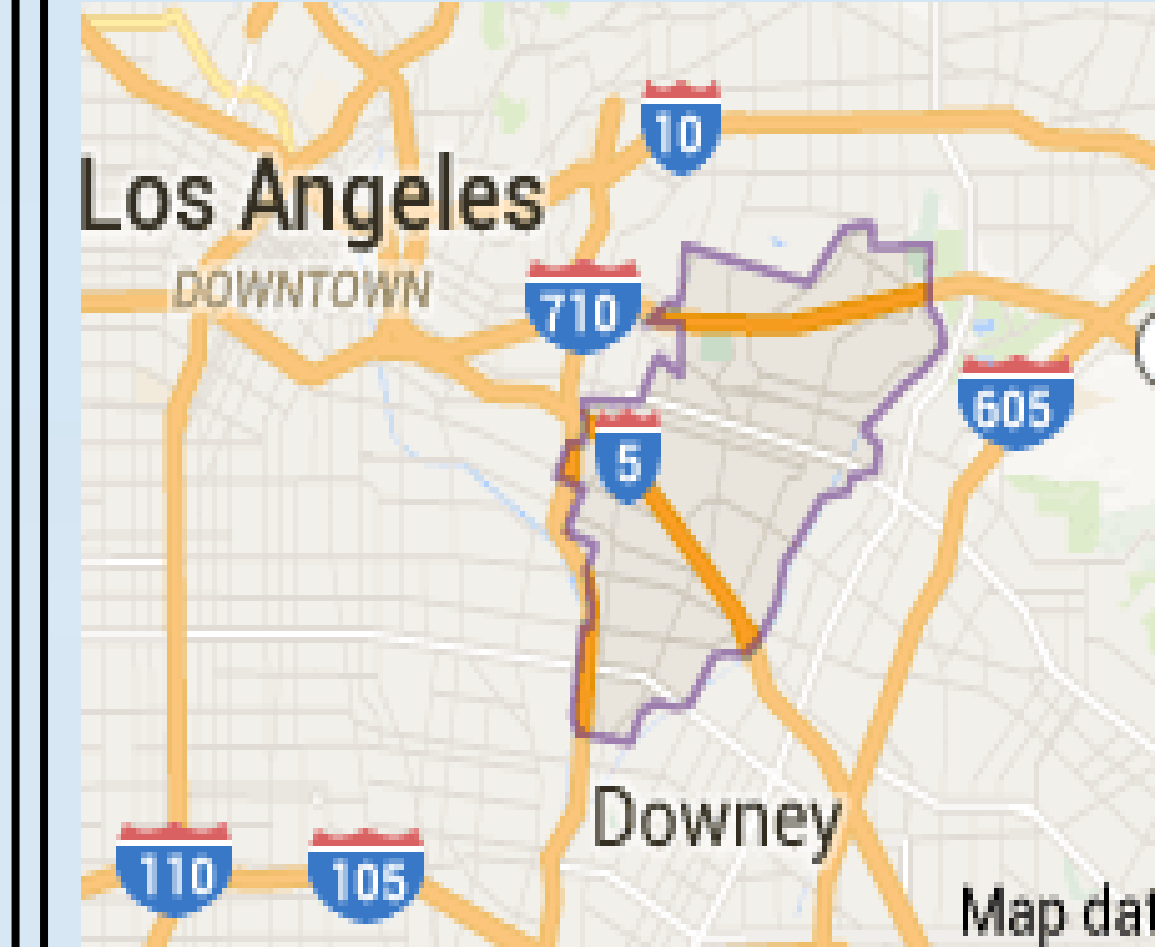
Year 1: "open up" space for practices

Year 2: Promote argument discourse

Year 3: Authentic student work



## Context



- District
- 32k Students K-12
  - 96% Latinx
  - 31% EL
  - 87% Free/Reduced Lunch
- Lead science teachers
- 11 grades 7-8
  - 14 grades 9-12
  - 7 grade/subject teams

## Changes in Teachers' Practice

### Measuring discourse quality – LIDO\*

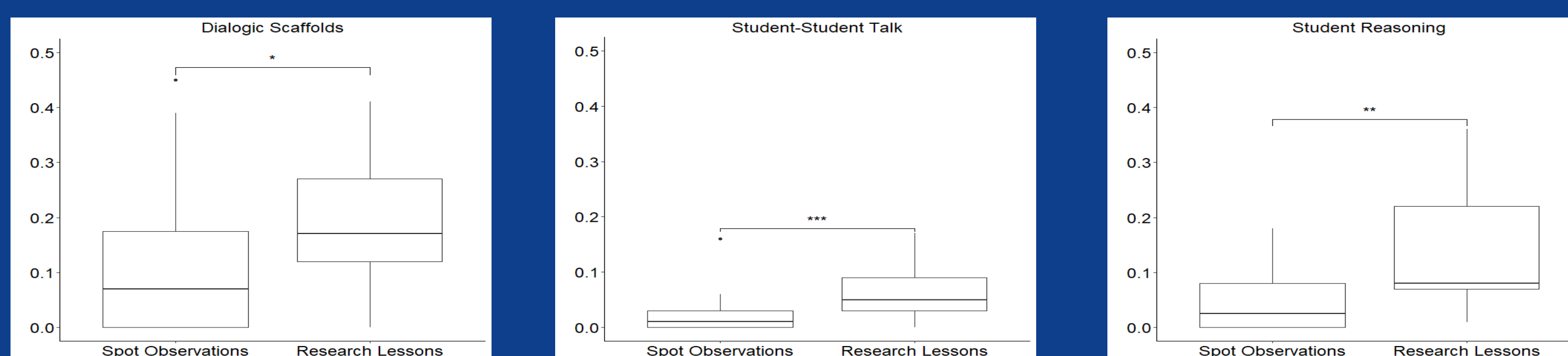
Teacher Code	Description
T1	Get student(s) to respond to another student's turn
T2	Ask student to explain, clarify, or provide reasoning
T3	Attempts to get student to continue speaking
T4	Poses truly open, contestable question
T5	Poses semi-open question, with a circumscribed answer set
T6	Poses a closed, uncontested question, or a test question

Table 2  
Correlations between LIDO codes

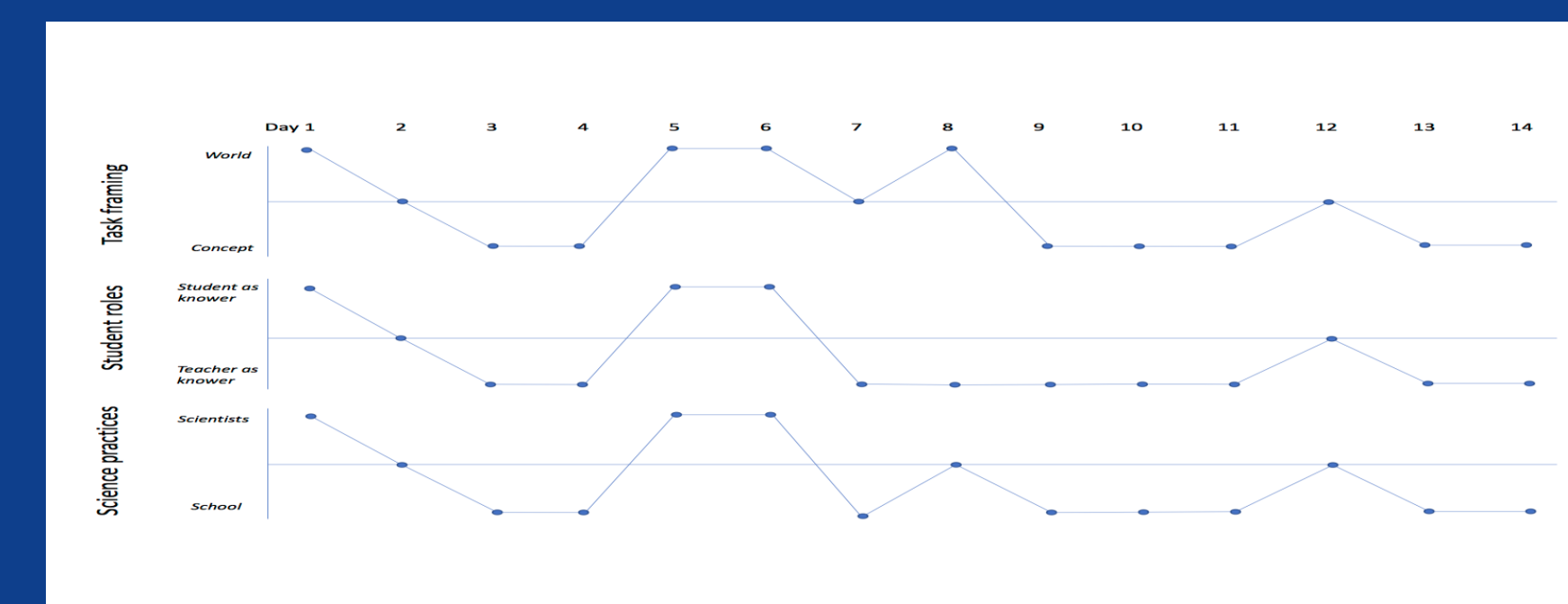
	T1	T2	T3	T4	T5	T6	S1	S2	S3	S4	S5
T2	-.18										
T3	-.06	.46*									
T4	-.06	.25	-.10								
T5	.40	-.06	.06	-.09							
T6	-.32	-.54**	-.41	-.41	-.70***						
S1	.13	.13	.57**	.06	-.08	-.17					
S2	-.00	.35	.19	-.13	.20	-.27	-.05				
S3	-.21	.83***	.56**	.25	.16	-.64**	.14	.15			
S4	-.20	.12	-.05	.02	-.10	.06	-.11	-.23	.06		
S5	-.26	.02	.40	.41	.01	-.23	.14	.03	.18	-.06	
S6	.33	-.40	-.59**	-.42*	-.05	.45*	-.22	-.10	-.57**	-.22	-.87***

Note: \* indicates  $p < .05$ ; \*\* indicates  $p < .01$ ; and \*\*\* indicates  $p < .001$

### Slow changes to discussions



### Characterizing unit-level practice



	Day 1	Day 2	Day 3
Task framing	Create an initial model of a car crash	Complete teacher-given lab by the end of the period	Connect experiment to a science concept
Student roles	Decide on how and what to represent in a model	Decide how to complete missing procedures	Respond to teacher initiated questions
Version of practice	Initial models available for revision	School verification lab	Version of IRE, school discussion

## Lessons Learned

- PD Challenges & Opportunities
- Storylining an effective planning tool
- Anchors phenomena
- Organizes SEP engagement
- Identifies opportunities for talk
- Curricular revision may be too difficult for teachers
- Teacher Thinking & Practice
- Choose productive phenomena with practice
- Students need content before practice
- Deficit thinking
- Uncertainties around organizing talk
- Fear chaos of misconceptions
- Unsure "right" answer will emerge
- Link productive talk moves to traditional goals
- Need to reflect on purposes of learning science

## Changes in Teachers' Thinking

	Student Responsibility				Science Practices				Science Relevance		
	Reduce Direct Instruction	Remove Procedures	Student-Centered Projects	Students Share Explanations	To learn method	To assess	To learn science concepts	To reinforce learning	Everyday Examples	Applying Science	Explain World
Y1	6	8	4	5	9	7	7	4	10	5	0
Y2	11	3	9	21	5	8	7	4	2	2	13