

## **Paper #2 - Exploring the Domain of Practice: Documenting Outcomes of PDs by Examining Teachers' Instructional Practices**

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### **Abstract**

Using the IQA-SOR instrument, we analyzed participating teachers' classroom implementation of instructional resources and models. Teachers who collaboratively designed their materials for the focal lessons demonstrated more rigorous implementation, while those who only experienced the focal lessons during the PD experience did not implement as rich of instruction. However, all participating teachers did show strengths in implementing particular aspects of the focal lessons.

### **Introduction and Research Question**

While there has been a multitude of efforts to support science teacher learning in PD, much of the data collected to evaluate science teacher PD are self-reported, and typical results of such studies relate primarily to high levels of satisfaction, increased confidence, and positive feelings of professional renewal and empowerment (Capps et al., 2012). Unfortunately, rigorous studies that examine the influence of these programs on teacher practice are few (Banilower et al., 2018; Grigg et al., 2013), and there is little understanding of the mechanisms through which these programs exert their influence (Wilson, 2013). In this component of the larger research project, we explore the difference in outcomes of the PD models by examining teachers' instructional practices fostered by the PD. As such, the research question that drives this work is: *What are the differences in instructional practices of teachers from the LCD PD compared to teachers from the LTP PD?*

### **Methods**

This study drew on classroom video recordings for the teachers implementation of two of the focal lessons from the PD: *Characteristics of Life* and *Mechanisms of Evolution in Venezlean Guppies*. To describe the instruction seen in these class, we focused on the instructional quality, that is the degree to which instruction engaged all learners in rigorous science tasks – with rigor being understood as student engagement in high levels of thinking about disciplinary core ideas and crosscutting concepts in the service of answering a question (Authors, 2015). Recordings of teachers' classroom instruction and their lesson plans were scored using the Instructional Quality Assessment - Science Observation Rubrics (IQA-SOR) for rigor (Tekkumru-Kisa et al., 2021). The two IQA-SOR rubrics used in this work assess the quality of instruction found in different aspects of the lesson, including: the *potential* demand of the task for students' rigorous thinking (R1) and the rigor found in the *task's launch* (R2).

### **Findings**

The scores used to assess the instructional quality of teachers' lessons for the two focal lessons are found on Table 2. These scores suggest that both groups of teachers used tasks that were relatively rigorous (scoring between 3 or 4, with the highest rigor score possible being a 5). Such high scores are not surprising in that these tasks were identified for use by the PD team. These scores allow us to understand a difference between the two tasks with the

*Characteristic of Life* requiring a less focused emphasis on the integration of content and practice than that found in the *Coloration of Guppies*. These scores also allow us to see that the LCD group, who worked together to revise these lessons before enacting them, were successful in increasing the rigor of this task over that found in the course materials, work that the LTP group did not participate in.

Table 2. Mean Instructional Quality Assessment for Science Observation Rubric (IQA-SOR) Scores for Teachers from LCD and LTP PD Groups

Lesson	PD Group	Number of classes	IQA-SAR Mean Scores	
			Task Potential - R1	Task Launch - R2
<i>Charateristics of life</i>	LCD	17	3.75	3.06
	LTP	12	3.00	1.80
<i>Coloration in Guppies</i>	LCD	12	4.00	2.00
	LTP	12	4.00	1.00

The scores for the quality of the task's launch (R2) provide further differences into instruction undertaken by teachers from these two groups. In examining *Characteristics of Life* lessons, there was a much more marked drop in rigor between the time of the tasks launch by teachers in LTP than LCD, with the launch of the LCD teachers maintaining a moderate degree of rigor (in which students were positioned to understand disciplinary ideas/practices and applying these ideas/practices in an activity). LTP teachers tended to launch the task by framing it as something that needs to be completed for credit or “doing school”. This reduction in rigor is documented in the literature (Schellinger et al., 2021), and it is noteworthy that teachers in the LCD were better equipped to maintain rigor than the teachers in the LTP group.

These findings suggests that the work involved in collaborating on the redesign of instructional materials and sensemaking about their use served to support teachers in enacting rigorous instructional practice in science, and these differences will be important in understanding changes seen in student learning across these two groups.

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