The work of the Science Learning Activation Lab was borne out of a quest for a coherent, research-based approach to considering how to best support science learning opportunities across settings. The following questions motivated this work:

- How can we effectively and efficiently support children in grades K-5 to learn science in ways that develop and retain their ability to engage in critical thinking?
- What intervention outcomes tend to have a persistent impact over time and across settings?
- What types of learning opportunities are effective? Efficient? For whom? Under what conditions? In what combination & sequence?
- What is the role of setting in supporting/constraining learning opportunities?
- What trajectories of opportunities best support learning?

In collaboration with many across the field, we sought a coherent conceptual framework to organize the investigation and design of science learning experiences. We developed the concept of Science Learning Activation - a core construct to guide all of our work.

How can we activate children’s interest and curious minds in ways that ignite persistent engagement in science learning and inquiry?

This poster is intended to provide session attendees an overview of approach and activities of the Lab. The top section of the poster summarizes key aspects of the theoretical framework that we have developed to guide our research and measurement efforts. The bottom section of the poster summarizes study methodologies referenced across the multiple posters presented in this session.

### Theoretical Background and Study Methods

**The Science Learning Activation Lab**

**The Lawrance Hall of Science, University of California, Los Angeles**

**LRDC, University of Pittsburgh**

**SRI International**

**Theoretical Framework**

Science learning activation = a combination of actions, practices, and knowledge that enables success in proximal science learning experiences.

- **Dispositions** = attitudes, beliefs, values about self (vs. others) various aspects of science content and science processes.
- **Skills** = processes that can be used as resources to solve science-related problems and scenarios in productive ways.
- **Knowledge** = (explicit, declarative) understanding of science phenomena, theories, processes and social resources that are used together with skills to engage in scientific sensemaking and solve science-related problems and scenarios in productive ways.

Success =

1. Choice to participate in optional science learning opportunities
2. Positive engagement (affective, behavioral, & cognitive) during science learning experiences
3. Learning goals of the science learning experiences are met.

Three core hypotheses to be tested:

1. **Science learning activation enables success.** A combination of dispositions, skills, and knowledge enables a greater likelihood of success in a range of commonly occurring proximal science learning experiences.
2. **Science learning activation is malleable.** Well-designed experiences can increase activation; poorly designed experiences can deactivate.
3. **Science learning activation is predictive.** Activation by early adolescence is predictive of science-related future pathways and distal outcomes.

### Design Study 1: “The Spring Study”

Sixteen students were selected from the AESL study based on their response patterns to activation survey. Effort was taken to have a variety of activation levels and profiles (high in some dimensions but low in others) and to represent the variety of students in the larger population (i.e., gender, ethnicity). During Spring 2012, these sixteen students were videotaped 2 times while engaging in engineering activities in their classroom and 2 times while engaging in engineering activities in a local informal science center with their class. The engineering activities were designed specifically for this study, aimed to engage students in a build, test, and revise engineering design cycle. Twice, immediately following these engineering activities, subjects were interviewed to elicit attitudes about science and their reflections on the days activities. During this study all students completed the Achievement Assessment two times, the Engagement Survey four times, a Collaborative Scientific Sense Making Survey four times, and student Notebooks four times.

### Design Study 2: “The Summer Study”

Thirty 5th grade students self-selected to participate in a weeklong (15 hours total over 5 days) summer camp during July 2012. Content, predominately Caucasian (40%) or African American (30%), was a fairly even distribution of boys (60%) and girls (40%) and came from a range of socio-economic backgrounds. The camp focused on engaging students in designing and conducting scientific investigations, from conducting observations of being pond organisms to carrying out investigations at a local pond and about pond ecosystems. Each day’s programming was designed so as to vary the level of self-direction available to students in the two groups. In particular, students in the self-directed investigation group were able to generate their own questions and procedures for investigative activities, and choose the amount of time on the investigative activities. In the prescribed investigation group, by contrast, instructors assigned questions and procedures for investigative activities, and time frames for activities were prescribed. For this study all students completed the Achievement Assessment once, the Engagement Survey twice, and the Perceived Autonomy in a Science Investigation scale twice.

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**Theoretical Framework**

**Ways of refining activation**

**Engagement**

**Social**

**Cognitive**

**Affective**

**Behavioral**

**Proximal**

**Distal**

**Experiences**

**Pathways**

**Means**

**End States**

**Activities**

**Assessment**

**Strengths**

**Weaknesses**

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**Research Activities**

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