Science learning activation is a state composed of dispositions, skills, and knowledge that enables success in proximal science learning experiences. The Learning Activation Lab conceptualizes learning experiences as a complex interaction between the learner, the social elements of the learning opportunity, the learning environment, and the engagement of an individual learner in the environment. Positive engagement during a science learning experience is one of the Activation Lab’s indicators of success for learners in an experience. This study looks at the relationships between the environment, the learner, and their engagement in a science learning experience to better understand the role of both the environment and Activation in shaping a child’s engagement in a science learning experience.

Research questions that guided this analysis include:
- What is the relationship between learning environment, activation, and engagement in a learning experience?
- Does the engagement of 5th graders with different activation "profiles" vary by type of learning environment?
- What can individual stories tell us about this relationship?

Data from this study has been depicted as three images of activation. The first image is a cross-sectional one that suggests that engagement (specifically the dimensions Maintains Focus, Values and Fascination) is related to the learners’ engagement during their science learning experience. A second image of engagement—profile analysis—combines activation dimensions into engagement profiles to show patterns of engagement consistent with these profiles. This suggests that engagement in a science learning experience can be largely explained and perhaps predicted by the learners’ activation profile. In order to further illuminate cross-sectional and profile trends, a third image of activation—individual case studies of two of the study subjects with differing activation profiles—is employed. Questions about the role that environments play in supporting engagement in learning experiences warrant future study.

**Research Design & Methods**

Data for the analysis presented herein was collected through the ALES ‘11 study conducted by the Science Learning Activation Lab. This analysis utilizes a subset of the data collected. In addition to the theoretical framework and instruments described in the other posters displayed in this session, this analysis utilizes multiple measures of engagement and video observations and interviews to support deeper analysis of the phenomena under consideration.

**Measuring Engagement**

Activation Lab reviewed existing methods for surveying individual engagement and adopted a framework that covers affective, behavioral, and cognitive engagement. A self-report survey and a researcher observation protocol were created to explore these aspects of the learner’s engagement during a science learning experience. The Self-Report Survey asks learners to report what they did, what they thought about, and how they felt toward a science learning experience. The Observation Protocol captures the extent to which learners demonstrate cognitive processes and participation behaviors, how they interact with the people, materials, and ideas in the learning environment and how they react to these features.

**Subjects and Setting**

250 fifth grade students from four Bay Area schools visited the Lawrence Hall of Science for a field trip. Students visited two exhibit halls, Dinosaurs and Engineering, with their classmates. After visiting each gallery for 30 minutes, students completed the brief self-report survey about their level of engagement in the exhibit. Researchers observed a subset of 61 students while they were in one of the exhibit halls. The students also completed the Activation Measure before and after their field trip. Further, four individual subjects (two female and two male) were selected as case study subjects. Those individuals were video taped and participated in two brief interviews (one after engagement in each gallery). Two of those are represented here.

**Images of Activation in Context:**

**Discussion & Implications**

As we consider the implications of our work to date for design we note several implications. First, while research to date has pointed to environmental features that support science learning, it is critical to understand that these features may impact and interact with individuals differently and may play a less significant role than expected. This analysis indicates that both activation dimensions and profiles serve to evaluate engagement in environments while differences in comparisons of engagement across galleries suggest that the environment itself has less of an influence on engagement than the individual.

The finding that environment did not appear to significantly influence engagement measures was contrary to what was anticipated. Possible explanations include the short time scale both within and between exhibits as well as their shared field trip context. This finding suggests additional questions to explore about the influences of duration, depth, and context of the science learning experiences on engagement.

The activation dimensions maintains focus, values and fascination significantly correlate with engagement in the exhibit galleries – this finding is consistent across both self-report and observed engagement measures. This implies that it is a learner’s level of activation when entering a science learning opportunity that largely drives level of engagement. Although this may suggest that environment has little to contribute to a learner’s engagement, the environment plays a role in how a learner’s activation levels may be influenced by the learning experience.

Perhaps most interesting of the findings to date is the relationship between activation profile and engagement. These analyses indicate that perhaps the best explanation and predictor of engagement is a combination of variables that represent a learner’s approach, philosophy, background and abilities. Individual case studies illuminate these findings further by providing some rich examples of what activation and engagement look like in contexts.

**Case Studies**

The Activation Lab’s Learning Experiences Framework characterizes the following as important elements of a learning experience:

- The learning environment: mission and outcomes, materials, accessibility, intellectually rich, expertise
- The social affordings: development & demonstration of expertise, belonging, supportive culture
- The learning experiences: relevant, authentic, engaging in fundamental practices of science, has choice/control, stimulation and enjoyment, increasing complexity and novelty

Future studies will investigate how these different elements interact with children with different activation profiles to influence engagement in a learning experience. These studies will also consider the role that learning experiences have in shaping future profiles/levels of activation for children with different entering activation profiles. These studies will focus on looking more closely on the impact of some of the features of learning experiences, (e.g., as opportunities to engage in collaborative scientific sensemaking and opportunities to engage in authentic practices of science) on success in learning experiences and on shaping future activation.

To explore in more detail the influence of environment on engagement, studies are being designed to look at this relationship both within and across more diverse situations (museum field trips, school classroom; single, short visit compared to continuing, longer term programs). These studies include data to support analysis of all three types of “images” depicted in this poster. Future analysis will also take into consideration variables such as prior experience and learner demographics (gender, socio-economics, etc.).

These future lines of investigation are designed to test the second hypothesis of the Lab: Science learning activation is malleable: well-designed experiences can increase activation; poorly designed experiences can deactivate.