

The Akamai Light activity was taught during the 2017 Akamai PREP course, which is a 4-day intensive course that prepared the 29 Akamai undergraduate interns in various STEM fields for their upcoming 7-week internship. The main content goal of our inquiry activity was that learners should demonstrate an understanding of Snell's Law of Refraction by explaining a real world phenomenon. We specifically wanted learners to be able to articulate that refraction at a material interface is dependent on incidence angle, media, and wavelength. The learners had to design and carry out investigations and use the evidence that they gathered in their investigations to explain their phenomena. Learners spent much of their time engaged in these practices. The specific dimensions that we focused on were: discovering variables that are most relevant to the scientific question, planning procedures that will allow relevant measurements to be made with tools/technology at hand, and anticipating sources of error and calling it out during the design.

Our activity was done twice, with two different groups of students, so we were able to slightly alter the way in which we had the learners design their investigations in response to observing the difficulties some students had on the first day. The first day, we as facilitators went to the different groups and had the students verbally explain to us what they were testing. This proved not to provide the students with enough structure. The second day, we had the learners write out their plan, list the materials that they would need, and form a hypothesis. This gave the learners a more concrete idea of how they would carry out their investigations, and it gave us as facilitators something to check back in on if they seemed to be getting off track.

At the very beginning of the Akamai Light activity, learners formed groups based on interest in a particular phenomenon, such as Rainbows, the need for Goggles, or Fiber Optic Cables. In order to guide students to raise "how" and "why" questions, the facilitators created three stations and showed simple demonstrations of light and material interaction. The learners were then asked to write down questions related to what they saw, keeping in mind how it might help them explain the phenomena, and asking themselves how the question could lead to the design and carrying out of an investigation. This also introduced them to the materials available to them for their own experiments. Learners could use any of the materials provided in any method they chose, as well as approaching the problem by mathematical analysis and by drawing diagrams. Learners could start with experimenting then move to analytics or vice versa. Some of the available tools included fluids of various index of refraction, lenses of different shapes/power, many lasers of different colors, and more!

Akamai Light was designed such that each individual belonged to a single, overarching group which had an explicit purpose of describing a particular natural phenomenon. Throughout the course of the entire experience, each student consistently referred back to their phenomena: It influenced the questions they asked, it colored the way that they chose to design their investigations, and in general it provided them with a single point of reference to which they could return to help guide their experience. In essence, the students formed a group identity based off of their inquiry, which helped them to have a sense of continuity throughout the day and provided a guiding center

that they could follow. We believe that this identity is a form of STEM identity, with each student associating themselves with the practices of a scientist as they worked toward a singular goal of explaining a natural phenomenon. In fact, we performed our activity twice, and on the first day we had multiple different jigsaw-style groupings throughout the day. What we found was that the students didn't have as much direction on that day. By allowing them to have a single identity that persisted for the whole day, the students seemed to walk away with a better sense of why they had done what they had done.

For our culminating assessment task, learners had to explain their phenomenon to a small group, with each person in the group being from different Phenomenon teams. Each instructor had printouts of the content rubric for scoring as well as worksheets (which we did not collect in the end, but we did see them as they presented their explanations). The worksheets had them draw a diagram and answer questions as part of their explanation of the phenomena. Of the 29 students, 18 scored 4 out of 4, 3 scored 3 out of 4, and 8 scored 2.5 out of 4. In general, we found that the students who worked together to describe the same phenomenon did better than those who had different phenomenon/investigation groups.