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Vignettes for discussing interactions during teaching and learning

Title

Light and Shadow Vignette

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INSTITUTE for SCIENTIST & ENGINEER EDUCATORS

Light and Shadow Vignette

Institute for Scientist and Engineer Educators (ISEE)

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This paper was written and produced by the developers of the Professional Development Program (PDP) at the Institute for Scientist & Engineer Educators (ISEE) at University of California, Santa Cruz. The PDP was a flexible, multi-year program which trained participants to teach STEM effectively and inclusively at the post-secondary level. Participants were primarily graduate students and postdocs pursuing a broad range of science and engineering careers. Participants received training through two in-person multi-day workshops, worked on a team to collaboratively design an authentic, inclusive STEM learning experience (an “inquiry” lab), and then put their new teaching skills into practice in programs or courses, mostly at the college level. Throughout their experience, PDP participants used an array of online tools and received coaching and feedback from PDP instructors. The overall PDP experience was approximately 90 hours and was framed around three major themes: inquiry, assessment, and equity & inclusion. Leadership emerged as a fourth theme to support PDP teams, which were each led by a participant returning to the PDP for a second or third time, who gained training and a practical experience in team leadership. ISEE ran the PDP from 2001-2020, and there are more than 600 alumni.

CONTEXT FOR THIS PAPER WITHIN THE PDP

The Light & Shadow Vignette was used in the PDP to prepare participants for “facilitating” the inquiry activity that they designed. The term facilitation was used in the PDP for the small, in-the-moment moves an instructor makes to accomplish specific goals. This vignette was read by participants and then discussed in a workshop setting, prior to their teaching. The vignette, and the characters within it are fictional.

The PDP was a national program led by the UC Santa Cruz Institute for Scientist & Engineer Educators. The PDP was originally developed by the Center for Adaptive Optics with funding from the National Science Foundation (NSF) (PI: J. Nelson: AST#9876783), and was further developed with funding from the NSF (PI: L. Hunter: AST#0836053, DUE#0816754, DUE#1226140, AST#1347767, AST#1643390, AST#1743117) and University of California, Santa Cruz through funding to ISEE.

Light & Shadow Facilitation Vignette

A group of two students, Alice and Eve, is beginning an investigation in Light and Shadow. They have chosen a question and are discussing what materials they might need. During this discussion, a facilitator, Brian, walks over to the group's table, sits across from the group, and introduces himself as their primary facilitator for the inquiry.

"What question are you going to be focusing on?" asks Brian to the pair, making eye contact with both Alice and Eve.

"We are investigating why shadows look different for different light sources," states Alice, pointing to the question strip. Brian repeats the question back to the group, writes it down and, walks away. Alice and Eve continue their discussion.

The group has gathered some materials and is working on some preliminary experiments. Brian watches and listens to the group from a distance for a few minutes, then walks over to the table, and stands across from the group.

"What are you working on now?" Brian asks, looking at both Eve and Alice. Eve responds by describing the experiment they are working on. "Ok, let me make sure I understand what you're doing now," says Brian, and then repeats back to the group what Eve said. The group continues on with their experiment. Brian observes for a bit longer and walks away.

The group is now about a quarter of the way through the investigation. They have performed some initial experiments and are discussing how to move forward. Brian walks over to the table again and sits down across from the group, and listens to their discussion for a few minutes.

"So it looks like you are exploring the shadows you get from this long light source here?" says Brian, during a pause in the discussion, and pointing to the experiment the group was just working on. Eve nods and explains what they have done so far, and Alice describes what the group is planning on doing next. Brian notices that one of the conclusions, about which part of the light source they are using is producing which part of the resulting shadow, is incorrect. He does not say anything about this. He summarizes what Eve and Alice have said to him.

"You know, there's this interesting effect you get from this long light source you have here, that you might not have seen before", Brian continues. "Can I show you?" he asks. Alice and Eve nod. He demonstrates the effect to the team, and says, "Look at the shadow, that's interesting, right?"

The group is somewhat surprised by what Brian showed them, and they discuss and repeat Brian's demo for themselves to try to understand how what they saw fits in with their earlier conclusions. Brian walks away at this point.

The group is about a third of the way through their investigation. They are working on an experiment that is a modified version of Brian's demo from earlier. Brian approaches the table.

"What are you working on now?" asks Brian. Eve explains what the group is doing. The explanation turns into a discussion between the group, which Brian listens to. They are still not sure how the results of the demo and subsequent experiments on

their own fit in with the conclusions they drew earlier.

Brian jumps in during a pause in their discussion. He summarizes what they have found so far (including the incorrect conclusion).

“So based on what you’ve learned so far, what do you think the shadow will look like for this object?” asks Brian, picking up an object that Brian thinks the group has not experimented with yet. Alice and Eve discuss this for a minute, and come to a consensus on a prediction.

“Ok, so it sounds like you two have a prediction you can test,” says Brian. He walks away. He returns to the table immediately with a new light source for the group, which is a series of 3 bulbs.

“You may find this new light source useful for your next set of experiments,” Brian mentions as he puts the light on the table in between Alice and Eve. “You can turn each bulb on or off like this,” says Brian as he demonstrates how the new light source works. Alice and Eve thank him and Brian walks away.

He observes the group experimenting with the new light source, and then discussing what they observed. After several minutes of discussion, Brian approaches the group and asks whether or not they were able to confirm their previous prediction.

“We’re not really sure how you can get this shadow pattern here…” Eve trails off while Alice shows Brian the shadow from the new light source.

“Hmm, ok, why don’t you explain to me what you did in this last experiment?” Brian asks.

Eve starts explaining, and near the end of her explanation, she realizes the mistake the group made earlier. She explains to Alice where she thinks they went wrong, and they spend a few minutes discussing and experimenting. Brian stays out of the conversation, but is still listening. It is clear from the discussion that the group has now come to the correct conclusion they got wrong earlier. They have realized now that they can treat the long light source as the continuum limit of the three-bulb light source, and can correctly map light source to shadow. He walks away, while the group is still discussing their results and how to proceed.

The group is now mid-investigation. Brian observes the group experimenting and discussing. He walks over and asks how they are doing. Eve responds that they are now going back to their first experiments to try to explain the results in light of what they learned from the experiment and discussion about the new light source. Brian tells them they are making good progress on their question, and walks away.

The group is now about three quarters of the way through their investigation. Brian comes over to the table and asks what they are working on now. Alice describes that they think they have come to an answer on their original investigation question. Brian listens, and then asks the group to make a prediction about a slightly different phenomenon than the one they are studying. Alice and Eve briefly discuss this and quickly come up with a prediction, and an experiment that they would need to test this out. They already have all the relevant materials, so they quickly set up and perform the experiment, with Brian watching. The results agree with their predictions. Brian again tells them they are making good progress, and to maybe start thinking about what they might want to present on their poster.