The Professional Development Program (PDP) is a flexible, multi-year program for scientists and engineers at the early stages of their careers, with a primary focus on graduate students. Participants in the PDP attend teaching workshops, join a design team, and then teach in a program or course. The PDP focuses on teaching lab-based courses at the college level, but participants learn general teaching strategies that can be applied to a range of teaching venues. PDP participants leave the program as highly trained, innovative, and reflective scientist-educators and engineer-educators, and use their PDP experience throughout their careers.

**THE 2015 PROGRAM INCLUDES THESE ELEMENTS**

**ISEE INQUIRY INSTITUTE**
4-day workshop for all participants
March 11–14, 2015 - Monterey, CA

**ISEE DESIGN INSTITUTE**
2.5-day workshop for all participants at one of the following locations:
April 9-11, 2015 - Toronto, Canada
April 17–19, 2015 - Santa Cruz, CA
May 1–3, 2015 - Waikoloa, HI

*Fee Waivers and Travel Support Available!*

**APPLY ONLINE**

For more information about the PDP, please contact:

Anne Metevier
ajmetevier@gmail.com
(707) 480-2372

Lisa Hunter
lhunter@ucsc.edu
(831) 459-2416
PDP participants teach in a range of ISEE affiliated venues that offer supportive environments for innovative teaching and piloting new activities. Venues are often workshops or programs, although experienced PDP participants may also teach in formal courses. The general teaching venues are:

- Undergraduate Research Programs
- Bridge Programs
- Technical Short Courses
- Summer Schools
- College Courses

For further details see 2015 PDP Team Formation

ISEE Headquarters, Chapters, Regional Sites

ISEE has grown to include a range of Chapters across the U.S. and internationally, and continues to expand to new regional sites. Chapter Liaisons and regional contacts work with ISEE to identify appropriate teaching venues, give input on participant selection, and decide on the topical or disciplinary focus for their site. Individuals connected with our sites listed below are invited to apply to the PDP. Other interested people are encouraged to contact ISEE headquarters.

UC Santa Cruz Headquarters
Primary contacts: Lisa Hunter (hunter@ucolick.org) and Anne Metevier (ajmetevier@gmail.com)

Akamai-Hawaii Chapter
Chapter Liaisons: Lisa Hunter (hunter@ifa.hawaii.edu), Michael Nassir (mikenas@ifa.hawaii.edu), and Jessica Lu (jessica.lu@hawaii.edu)

Dunlap Institute Chapter
Chapter Liaisons: Michael Reid (mike.reid@utoronto.ca) and Shelley Wright (saw@di.utoronto.ca)

UCLA Astronomy & Astrophysics Chapter
Chapter Liaison: Michael Fitzgerald (mpfitz@ucla.edu)

Santa Barbara - CSEP ISEE Chapter
Chapter Liaisons: Arica Lubin (alubin@cnsi.ucsb.edu) and Wendy Ibsen, ibsen@cnsi.ucsb.edu

Houston Chapter
Chapter Liaison: Jason Porter (JPorter@optometry.uh.edu)

Boulder Chapter
Chapter Liaisons: Seth Hornstein (seth.hornstein@colorado.edu) and Mark Rast (mark.rast@lasp.colorado.edu)

Pasadena, California
Primary contact: Anne Metevier (ajmetevier@gmail.com)

New York City
Primary contact: Emily Rice (emily.rice@csi.cuny.edu)

Lansing, Michigan
Primary contact: Devin Silvia (dsilvia@msu.edu)
PDP participants all design an “inquiry” activity – that is, one in which learners gain an understanding of scientific concepts by applying cognitive science & engineering research practices. The activity should mirror authentic scientific research or engineering design, and learners should come away with transferable cognitive skills that can be applied in other contexts. A few examples of past activities are included below. Also see the PDP team pages on the ISEE website.

<table>
<thead>
<tr>
<th>ACTIVITY NAME</th>
<th>AUDIENCE &amp; LOCATION</th>
<th>BRIEF DESCRIPTION OF ACTIVITY &amp; LEARNING GOALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Dogma of Molecular Biology</td>
<td>Preparation for Research Experiences (PREP)</td>
<td>Using the worm as a model organism, students design experiments to learn about how the integrity of a gene influences physical attributes. Students explain their findings, coordinating results from multiple experiments with findings from literature and databases.</td>
</tr>
<tr>
<td></td>
<td>UCSC Summer Research Institute</td>
<td></td>
</tr>
<tr>
<td>Shining Light on the Sun</td>
<td>Preparation for Research Experiences (PREP)</td>
<td>Students investigate solar phenomena with lab equipment to model the sun and actual satellite data. They learn about selectively applying theoretical models of radiation processes (specifically black body, emission, absorption lines) to the solar spectrum in order to infer physical properties of the sun.</td>
</tr>
<tr>
<td></td>
<td>LASP REU Program Boulder Chapter</td>
<td></td>
</tr>
<tr>
<td>Digitizing an Analog World</td>
<td>Technical Short Course Akamai-Hawai’i Chapter</td>
<td>Students choose a real-world imaging problem (e.g., tracking wildlife) and figure out optimal sampling rates (resolution) for both the temporal and spatial domains. They learn about digitization, translating a science goal into requirements, and supporting a solution while considering tradeoffs and constraints.</td>
</tr>
<tr>
<td>InGENEious Information: a Computational Biology Inquiry</td>
<td>Biomolecular Engineering 150 Course, UCSC</td>
<td>Testing hypotheses and controlling variables, students mine large genomic databases to predict gene function using homology. They learn how to effectively use and interpret results from computational tools, as well as gaining a deeper understanding of how evolution, mutation, sequence similarity, and gene function are related.</td>
</tr>
<tr>
<td>Optimizing Renewable Energy Systems</td>
<td>Workshops for Engineering &amp; Science Transfers (WEST), UCSC</td>
<td>Students use models of different sustainable technologies to evaluate efficiency of a real world scenario. They learn about optimizing a system for energy efficiency, relating conservation of energy in a system, and power conversion to evaluate and compare efficiencies.</td>
</tr>
</tbody>
</table>
PDP CYCLE OF ACTIVITIES

Reflective Community of Scientist- and Engineer-Educators

- Inquiry Institute: Workshops, Team Formation
- Design Institute: Workshops, Design Time
- Independent Design Time
- Facilitation Workshop: Multiple offerings
- Reflect & Report
- Teach

Color key:
- Preparatory training
- Activity design
- Teaching
- Evaluate experience
The Inquiry Institute Includes the following:

- "Comparing Approaches: Three Kinds of Hands-On Science" activity and discussion
- “How People Learn” discussion
- Inquiry activity and discussion (Light & Shadow or Analog-to-Digital)
- Equity and Inclusion workshops
- Introduction to "Backward Design"
- Articulating learning goals: content and practices
- Begin working with activity Design Team

Here, participants experience inquiry from the learners’ perspective, reflect on that experience, and are introduced to strategies for designing and teaching science/engineering inquiry activities inclusively and effectively.

Participants spend roughly one-half of Design Institute time working directly in their Design Teams, planning out and preparing to teach science/engineering inquiry activities. As they work, Design Teams consult with ISEE staff members and participate in relevant workshops, including:

- Practicing "Backward Design"
- Assessing students’ understandings
- Designing a sequence of activity components

Teams independently continue planning and preparing to teach their inquiry activity up until the scheduled teaching venue. Teaching generally occurs May – November.

Training in facilitation strategies, techniques, and how to effectively progress students toward learning goals is provided at several intervals close to the time of teaching.

PDP participants gain practical experience as they co-teach the inquiry activity they designed with their fellow Design Team members. Teaching experiences may range from fairly short (few hours) to week-long or longer activities. Teaching often takes place in ISEE affiliated programs and special courses.

Design Teams meet after teaching to debrief their experience, and each PDP participant completes a Post-Teaching Report. These activities help participants evaluate how well their design and teaching worked, in relation to their intended learning goals. It is also a time to reflect on the overall PDP experience.
PROGRAM INFORMATION & FAQs

Important Dates:

APPLICATION DEADLINE: December 15, 2014

NOTIFICATION DATE: January 15 2015

ISEE will let applicants know if they have been accepted and the status of any financial request made to ISEE by this date.

Who can participate?

• Individuals from UCSC and ISEE Regional Chapter in science or engineering fields who can make a commitment to participating in the full program, including teaching in ISEE projects
• The PDP is aimed at graduate students and postdocs who are given priority in acceptance; however, professionals in academic and industry positions are welcome and play an important role in the ISEE/PDP community

What is the cost to participate in the PDP?

The costs of the PDP include registration fee, transportation, lodging, and meals, with the total costs dependent upon participants’ location. PDP has a registration fee, which can be waived through ISEE grants and institutional funding, often contingent upon completing PDP teaching service in specific venues identified by the funding source. The full registration fee for the ISEE Inquiry Institute, the ISEE Design Institute and Facilitation Workshop is $3500, which covers all instructional and program costs. Please note that the PDP is not a conference, but is a comprehensive training program, so this registration fee is comparable to the cost of a course or certificate program. Participants may apply for a full registration fee waiver, or a reduced fee of either $500 or $2000, depending upon need. In addition, participants are expected to stay onsite at the Inquiry Institute so there is a lodging and meal plan cost, estimated to be $750/person for double occupancy. Finally, for participants outside of the Santa Cruz, CA area, transportation to and from the Inquiry Institute (Monterey) and transportation plus lodging for the Design Institute (at one of the three locations: Santa Cruz, Waikoloa, or Toronto) should be factored into cost planning. ISEE has grants specifically to help participants with transportation costs, so if an applicant has no other means of supporting these expenses (e.g. grant, fellowship, institutional support, etc.) they can apply for a travel award. However, applicants are strongly encouraged to find full or partial funding from other sources. Everything necessary to apply to the program, fee waivers, and travel award requests, is included on the PDP application. A PDP Cost Planning Worksheet is available to assist in working through these costs.
What is the PDP teaching requirement?

All participants are placed on a team that designs and teaches an inquiry activity in an ISEE affiliated program or course. These programs and courses are arranged by ISEE to ensure that all participants have an opportunity to teach in an environment that supports innovative teaching and the piloting of a new activity. Teaching “venues” are available at UC Santa Cruz where ISEE is headquartered and at ISEE Regional Chapters. Teaching commitments are most commonly a 6-8 hour activity spread over a two-day time period, but can also be spread over several lab periods. When participants teach in programs, they may also have the opportunity to teach other activities, such as giving a short lecture, arranging a panel presentation, or leading small group discussions. The program does not provide salary for teaching time.

How do participants get assigned to teams?

On the PDP application participants are asked about their interests and availability. During the selection process ISEE simultaneously places participants on a team while working carefully to place them in a venue that matches with their preferences. Regional Chapters may have limited choices, so applicants should look to see what is available, talk with Chapter Liaisons, and get in contact directly with ISEE. Applicants will be contacted if there is an opportunity to be placed on a team outside of their region or at a venue that was not indicated as one of their interests. Notification will include team placement, so that applicants know their team prior to confirming participation in the PDP.

What is the overall time commitment?

On average, PDP participants spend about 100 hours total on the program: participating in the two Institutes, working with their team, teaching, and debriefing their experience. It is important to remember that the PDP is designed to be a transformative experience for participants. The time spent designing and teaching one activity is a key aspect of the PDP approach to professional development, and should not be interpreted as an expectation that participants will spend this amount of time in the future when they design an activity. Some participants spend more time by choice because they become so enthusiastic, or because they choose a venue that includes more instructional time than the PDP-designed inquiry activity. For example, there are a number of one-week short courses that are excellent opportunities for extended teaching experiences.

What will I gain from participating in the program for a 2nd or 3rd time?

Participants are encouraged to attend for a second, third or even fourth year, with an increasing role in leadership within our community. Partially concurrent workshops are offered to returning participants. A number of discrete roles have been developed to facilitate the varied levels and interests of returning participants. Depending upon your role placement, you may gain experience in facilitating inquiries, leading a discussion, assessment, or other new roles defined each year. Returning participants are strongly encouraged to become Design Team Leaders, leading a small group of participants in the design of an inquiry activity. More than half of all PDP participants complete the cycle multiple times, and often feel their second experience is when it all comes together. Participants also come back to maintain an active role in the ISEE community, and derive many intangible benefits.
PDP ALUMNI

THE PDP IS MEETING A NATIONAL NEED TO BETTER PREPARE Ph.D.s

“Examples of important skills that Ph.D.-level employees typically need, whether they are employed in academia or elsewhere, but for which most new Ph.D.s are ill prepared include project management, leadership, the ability to work in teams, the expertise to address complex interdisciplinary problems, and the ability to teach.”

President’s Council of Advisors on Science and Technology, 2012

PDP PARTICIPANTS GET JOBS

- “The PDP has had the largest impact on my teaching philosophy than anything else in my academic career. The specific values and techniques taught in the PDP were directly cited as a major reason I was chosen for my current faculty position.”

- “During my interview I had to give a teaching demonstration and discuss inquiry and learner centered models of education. I felt confident doing this as a direct result of my participation in the PDP program.”

- “I just passed my tenure review … and based on the feedback I received about my teaching and mentoring, there is no question in my mind that I would not have been half as successful without my experiences with the PDP…”

AS OF 2013, AT LEAST 74 PDP ALUMNI HAVE MOVED INTO JOBS
Funding for participants in the 2015 PDP will come from a range of sources, including:

- National Science Foundation: DUE#1226140 (PI: L. Hunter); AST#1347767 (PI: L. Hunter); IIA#1243536 (PI: Isaacson)
- Howard Hughes Medical Institute (#52008112)
- Thirty Meter Telescope International Observatory
- Dunlap Institute, University of Toronto
- University of California, Santa Cruz:
  - Division of Social Sciences
  - Division of Physical & Biological Sciences
  - Division of Graduate Studies
  - Vice Chancellor for Research
  - Jack Baskin School of Engineering

The PDP is part of the Institute for Scientist & Engineer Educators at the Division of Social Sciences, University of California, Santa Cruz

Institute for Scientist & Engineer Educators
University of California, Santa Cruz
1156 High Street
Santa Cruz, CA 95064
Email: isee@ucsc.edu
Website: isee.ucsc.edu