ISEE Exchange

Institute for Scientist & Engineer Educators

Issue 02 Summer 2013

From Our Files

Why Do We Need STEM Workforce Development?

The STEM (science, technology, engineering, and mathematics) enterprise includes individuals with a wide range of degrees, from associate to doctoral levels, working in academic, government, private, and non-profit sectors. Policy makers, funding agencies, and other stakeholders are increasing their attention on STEM workforce development and the big challenges faced in the U.S.:

- Graduate students, as well as undergraduates, often lack important professional skills relevant to academic and non-academic jobs (see Reports & Literature).
- Many college students interested in STEM leave without STEM degrees, and retention is considered to be the lowest cost, fastest policy option to providing a STEM workforce (see From our Files).
- The demographics of STEM are unbalanced, and large (and growing) segments of the U.S. population are not participating.
- Influencing career choice (e.g. to choose a STEM career) requires much more than inspirational talks and role models (see Reports & Literature).

This issue of the ISEE Exchange focuses on the concerns above and highlights the way that ISEE is approaching workforce development through the Professional Development Program (PDP; see page 8) and other programs.

Advancing Effective, Inclusive Scientist & Engineer Educators

this issue

To Our Readers

This issue of the ISEE Exchange is focused on science, technology, engineering and mathematics (STEM) workforce development – the advancement of well-prepared professionals into STEM, inclusive of individuals from a broad range of backgrounds.

STEM Workforce Development

STEM workforce development is the endeavor to create, sustain, and retain a workforce that optimally advances science, technology, engineering, and mathematics (STEM). While workforce development efforts may be complemented by "outreach," these two types of efforts are distinguishable and require different programs, partnerships, and expertise. *Outreach* is generally focused on increasing the public's interest in STEM; *workforce development* is focused more specifically on training current and future STEM professionals. The high attrition rates of college students from STEM majors is a major issue – only about 40% of students intending to major in STEM actually finish a STEM degree. For students from some groups this number is as low as 20%.

Achieving Retention in STEM: The CfAO Internship Program Model

ISEE has been engaged in STEM workforce development since 2001, originating as the NSF Center for Adaptive Optics (CfAO) Education & Human Resources program. The CfAO developed a program model intentionally designed to increase retention rates and broaden participation in STEM. The model includes elements designed to support students who come from a range of backgrounds, and specifically those from groups underrepresented in STEM. The program places students at observatories, companies, and academic sites for a 7-week summer project. Outcomes from the program have produced retention rates far above national rates. The program located 200 students three years after their internship, and found that 81% are still on a STEM pathway. Program components support both students and mentors with a focus on productive projects – that is, projects that are beneficial to the student and the host organization (see Partnerships) and elements to support the development of a positive STEM identity (see PDP Focus Areas in Practice).

2002-2009 Internship cohorts, 3 years after completing the program	TOTAL (N=214)
Participants located	93%
Percent's below calculated from the 93% of participants located	
A. In STEM Workforce	42%
B. Enrolled in undergrad STEM	16%
C. Enrolled in grad level STEM	23%
D. All on STEM Pathway (A+B+C)	81%
(women)	(80%)
(Native Hawaiians/Pacific Islanders)	(79%)
(all underrepresented minorities)	(79%)

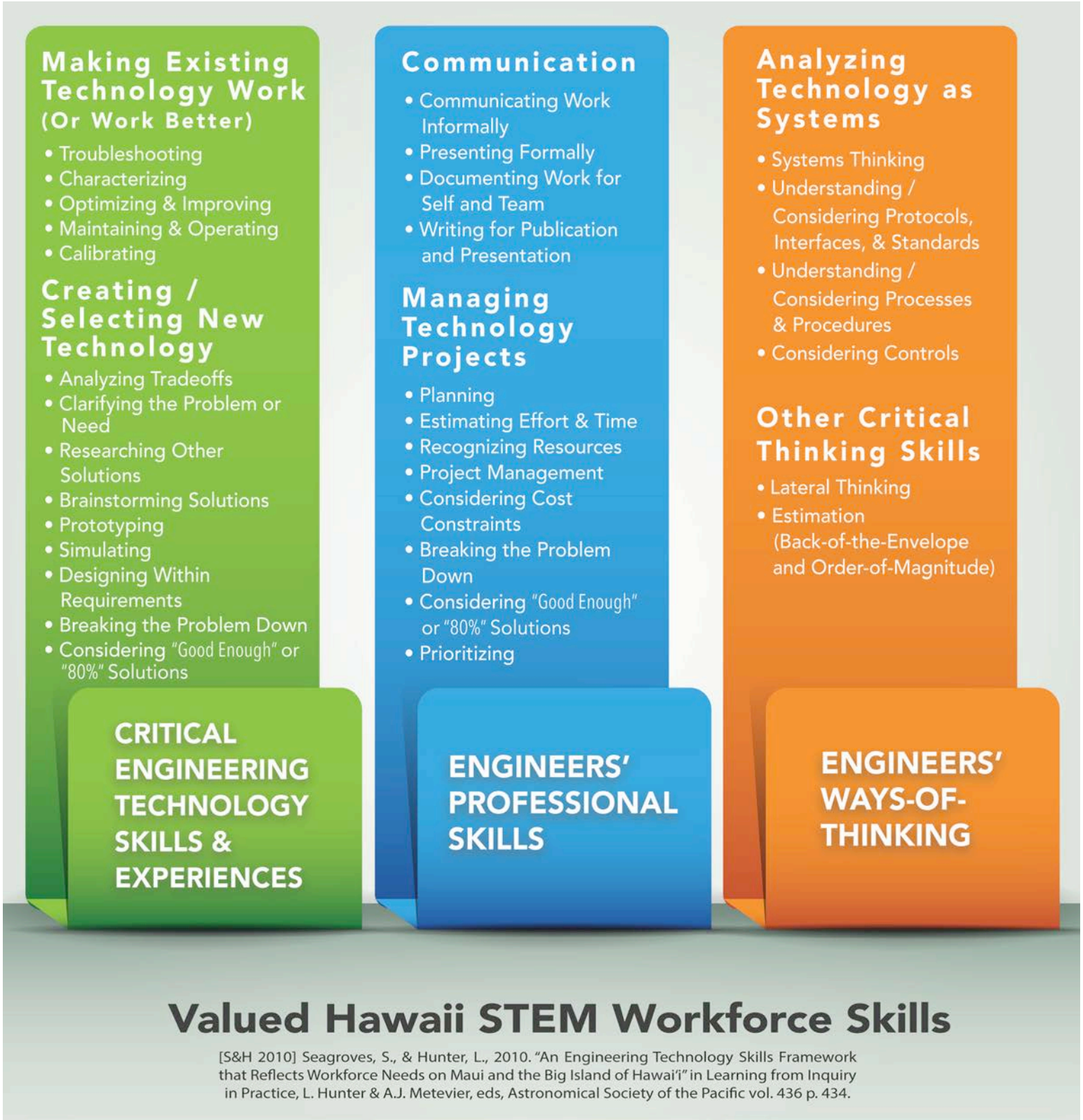
Aligning Education with Workforce Needs

Early in the current Akamai Workforce Initiative (AWI) project, we undertook a survey of the STEM workforce needs in Hawai'i. We examined years of Akamai Internship projects [AWI1, AWI2] to try to situate the kinds of practices interns were engaging in within existing engineering skills frameworks from K-12 and post-secondary settings. When this work seemed to lead in interesting directions, we followed up with structured interviews of industry partners to determine what kinds of activities they value in their work and what skills they would like to see in new employees [AWI3].

Synthesizing these many inputs – curricular ways of thinking and industry perspectives – led to an engineering technology skills framework [S&H 2010] that continues to inform AWI's workforce development efforts in curriculum, co-curricular education, internships, and more. The table summarizing this framework from S&H 2010 is reproduced at the end of this article.

Distinctive features of this framework include:

- Workforce needs span a continuum from approximately associate's degree level, through bachelor's degree levels and on to graduate and post-graduate training.
- Skills needed in "real" positions do not cleanly divide this continuum: Some entry-level positions require relatively advanced skills, and positions that require more training nevertheless rely heavily on "technician-like" skills as well.
- Project management skills are not only required of group leaders, middle managers and above, but are increasingly needed from every position in the industry no matter the level.
- A consensus among our industry partners was that these skills and practices are at least as important as – and some argued are more important than – technical expertise and content knowledge.



Valued Hawaii STEM Workforce Skills

[S&H 2010] Seagroves, S., & Hunter, L., 2010. "An Engineering Technology Skills Framework that Reflects Workforce Needs on Maui and the Big Island of Hawai'i" in Learning from Inquiry in Practice, L. Hunter & A.J. Metevier, eds, Astronomical Society of the Pacific vol. 436 p. 434.

References

[AWI1] Hunter, L., Hoffman, M., Armstrong, J., Reader, E., Seagroves, S., & Raschke, L., 2009. "Internship Skills Inventory: Review of Akamai Internship Projects on Maui" Technical Report #1, Akamai Workforce Initiative, Pukalani, Maui, Hawaii. http://kopiko.ifa.hawaii.edu/akamai/

[AWI2] Seagroves, S., Hunter, L., & Armstrong, J. 2009. "Internship Skills Inventory: Review of Akamai Internship Projects on the Big Island" Technical Report #2, Akamai Workforce Initiative, Pukalani, Maui, Hawaii. http://kopiko.ifa.hawaii.edu/akamai/

[AWI3] Seagroves, S., & Hunter, L. 2009. "Building a Community Consensus Engineering Technology Skills Framework for Maui and the Big Island of Hawai'i" Technical Report #3, Akamai Workforce Initiative, Pukalani, Maui, Hawaii. http://kopiko.ifa.hawaii.edu/akamai/

[S&H 2010] Seagroves, S., & Hunter, L., 2010. "An Engineering Technology Skills Framework that Reflects Workforce Needs on Maui and the Big Island of Hawai'i" in *Learning from Inquiry in Practice*, L. Hunter & A.J. Metevier, eds, Astronomical Society of the Pacific vol. 436, p.434.

PDP Focus Areas in Practice

Creating Equitable Learning Environments to Broaden Participation

ISEE's vision is to advance a new generation of STEM professionals that contribute to making STEM an inclusive environment through their teaching, mentoring, interacting in groups, and leadership. Through the PDP, participants gain an understanding of issues related to the demographics of STEM, and in particular the challenges in higher education and the transition from undergraduate and graduate degrees into the STEM workforce. The PDP uses ISEE's Diversity & Equity theme – five "focus areas" that frame the PDP and help participants learn about and implement research-based strategies to create an equitable learning environment with an emphasis on factors that affect groups underrepresented in STEM. PDP participants are expected to put what they learn into practice, so emphasis is placed on curricular changes that can be applied in a lab unit or a multi-day short course, as well as the kinds of things an individual can do day-in and day-out to make a difference. For example, recognizing how actions and behaviors that collectively create the STEM culture in higher education and workplace environments can discourage and disadvantage non-dominant groups, and how they can be changed to be more inclusive.

All participants in the PDP integrate inclusive strategies into to the unit they design and teach. Based upon what they learn in the PDP, participants think carefully about what would indicate to them that an environment is equitable, in their particular teaching context. They consider what strategies they could use, put those strategies into practice, and then reflect after teaching. The examples that follow illustrate the ways that PDP participants implement what they learn in practice. On the surface, the examples below may seem like small changes; however, if every PDP participant incorporates these small changes on a day-to-day basis they will each contribute to creating a more inclusive environment in their classes and workplaces.

- Employing moves learned in PDP workshops to maintain **equitable collaboration**, for example by paying attention to whose ideas are considered in a group, and intervening if it is unbalanced.
- Designing an activity with multiple ways to investigate an important concept, and providing **multiple ways for students to demonstrate their understanding and competency**.
- Students are given explicit instruction and feedback on practicing the norms of STEM, helping them to gain a **positive STEM identity** and sense of belonging in STEM
- **Expecting all students to succeed**, communicating this expectation to students, and designing multiple entry and exit points to help all students succeed.
- Making sure the goals, and expectations are made explicit throughout the activity so that students' prior experiences do not create inequitable advantages or disadvantages.

Reports & Literature

Identity and Career Choice

A study of nearly 4000 college students from 34 colleges/universities has contributed to the increasing evidence of the role of identity in career choice, and the important role of inquiry lab experiences in increasing participation in science careers. Students' "physics identity," or how much they saw themselves as the type of person who does physics, strongly predicted their choice of whether to pursue a physics career. Physics identity was, in turn, positively predicted by particular characteristics of students' high school physics classes. The kinds of experiences that supported the development of a physics identity (and likelihood of choosing a physics career) included just the kinds of learning experiences that the PDP focuses on: a focus on conceptual understanding, lab activities that address students' beliefs about the world, and engaging students in asking questions and engaging in discussion. Notably, however, having female scientist guest speakers had no effect on students' (girls or boys) sense of identity as physicists. This study provides further support for the idea that students' thinking and choices are complex, and that "showing girls pictures of female scientists or even live examples is not enough for them to want to participate in science for themselves."

See: Hazari, Z. et. al. (2010) Journal of Research in Science Teaching. 47:8, pp. 978-1003.

Graduate Level Workforce Development: Needs and Challenges

Two recent reports highlight the need for changes in U.S. graduate education. A study by the Council of Graduate Schools and Educational Testing Services, "Pathways Through Graduate School and Into Careers" examined the transition between graduate degrees and careers. The study found that graduate degree holders often lack valuable professional skills, and recommend that stronger ties are made between graduate school experiences and workforce needs. The report also includes data on employment by sector and field of study for recent graduates, with more than half of all science, engineering, and health degree holders going into non-academic positions (much more than half for engineering). The second report related to this topic, from the President's Council of Advisors for Science and Technology (PCAST), is aimed at strengthening the U.S. research enterprise. The report includes a number of important policy recommendations, including the need for improvements in graduate education: "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.Ds are ill prepared, include **project management, leadership, communication, the ability to work in teams, the expertise to address complex interdisciplinary problems, and the ability to teach**."

See: Council on Graduate Schools, "Pathways Through Graduate School and Into Careers," at www.pathwaysreport.org/; and November 30, 2012, PCAST Report, "Transformation and Opportunity: The Future of the U.S. Research Enterprise" at http://www.whitehouse.gov/administration/eop/ostp/pcast/.

Collaboration & Innovation

Supporting International Collaboration Through the PDP

Canada – China – Nigeria – Denmark – Indonesia

ISEE and the PDP have recently expanded to include new international partnerships, reflecting the global nature of many science and engineering collaborations. We recognize the importance of formally training PDP participants to engage in international collaborations, and we have over a decade of experience in training our participants to draw from each others' backgrounds and experiences to effectively collaborate on designing and teaching inquiry lab activities. This is applicable in international collaborations, where contributors may bring different skillsets, approaches, and perspectives to a project, due to individual or cultural experiences. Furthermore, participation in the PDP often forges new scientific and engineering collaborations. A more diverse, international PDP community can spark new projects as participants exchange ideas about science, engineering, and education.

CANADA

One of our recent partnerships is with the ***Dunlap Institute*** at the University of Toronto in ***Canada***. This year is the second year that Dunlap has funded the participation of a group of astronomy graduate students and postdoctoral researchers in the PDP. In both 2012 and 2013, Dunlap PDP participants designed a "PREP" (Preparation for Research Experiences Program, similar in structure to the Akamai Short Course), to prepare undergraduate researchers to be successful in their summer research projects. This year's team (***Tuan Do, Etsuko Mieda,*** and ***Jeffrey Fung***) centered the PREP at Toronto on a new inquiry activity to help their students gain a more thorough understanding of measurement errors.

NIGERIA

A second PDP team (***Linda Strubbe, Kelly Lepo, Heidi White*** and ***Jielai Zhang***) from our collaboration in Toronto is designing a short course focused on measuring distances in astronomy that they will teach in Abuja, ***Nigeria*** at the ***Special Astronomy Summer School 2013***. This team is supported by Dunlap, ISEE and the ***Canadian Institute for Theoretical Astrophysics*** (CITA).

CHINA

In June, ISEE Director Lisa Hunter traveled to **China**, along with Sandra Dawson from the Thirty Meter Telescope (TMT). They visited the ***National Astronomical Observatory of China***, ***Beijing Normal University***, and the ***Kavli Institute for Astronomy and Astrophysics at Peking University***, to discuss future opportunities for collaboration, including graduate student and postdoc exchanges that would include participation in the PDP.

INDONESIA

A new collaboration with ***Universitas Indonesia*** will begin soon through a grant from The National Academies through the U.S. Agency for International Development (USAID) program. The project lead, ***Kamarza Mulia*** (Professor, Department of Chemical Engineering), has worked for many years on Problem Based Learning (PBL) and will be collaborating with ISEE to improve inquiry process skills through PBL.

DENMARK

ISEE is part of the new "US-***Denmark*** Cooperative Research and Education in Intermittency-Friendly Community-Scale Renewable Energy for Micro-Grids" project funded by the NSF Partnerships for International Research and Education (PIRE), through the ***Center for Sustainable Energy and Power Systems*** (CenSEPS) at UC Santa Cruz. The project will fund 20 PDP participants to design activities related to renewable energy in an international context.

Broadening Career Horizons of PDP Participants

The 2013 PDP included career development session aimed at broadening PDP participants' professional opportunities and growth. The session on March 26 opened with comments from Monterey Peninsula College's President, Walter Tribley. Participating organizations included:

Monterey Peninsula College (MPC): Andres Durstenfeld (Instructor, Department of Biology), Kevin Raskoff (Instructor, Chair, Department of Biology), and Walter Tribley (President). *Topics: careers at MPC, how teaching at the community colleges differs from teaching at the university, the importance of teaching experience, job application and interview tips, the challenges of continuing research while at a teaching institution.*

University of California, Santa Cruz Center for Sustainable Energy and Power Systems (CenSEPS): Michael Isaacson (Professor, Engineering), Ronnie Lipschutz (Professor, Politics). *Topics: sustainability and renewable energy; opportunities for graduate students in the U.S.-Denmark Summer School on Renewable Energy.*

Naval Postgraduate School (NPS): Jim Newman (Professor, Space Systems), Maddie Studholme (Graduate Student). *Topics: use of very small satellites in education and research; developing flight hardware for very small satellites; careers at NPS; transition from graduate school to industry.*

Lawrence Livermore National Laboratory (LLNL): Scot Olivier (Deputy Program Director for Science). *Topics: scientific research opportunities at LLNL, covering a range of areas emphasized in the current LLNL strategic plan; and career opportunities at National Laboratories.*

Monterey Bay Aquarium Research Institute (MBARI): Shannon Johnson (Research Technician). *Topics: graduate level technician positions; scientific and career topics related to MBARI.*

W. M. Keck Observatory: Luca Rizzi (Support Astronomer). *Topics: observatory career paths, staying involved in education in a non-academic position, astronomical instrumentation, and topics related to scientific interests.*

University of Houston: Jason Porter (Associate Professor, College of Optometry) *Topics: balancing research and teaching, and other academic career development topics.*

PDP Community

Professional Skills Gained by PDP Participants

The major focus of the PDP is on teaching – how to teach effectively and inclusively. However, PDP participants gain many other professional skills that are valued in the STEM workforce and are often not gained through graduate school (see "Literature & Reports" in this issue). The PDP is continually adding support to help participants gain professional skills in the same way that they gain teaching skills through the program: with a practical experience directly applying what they have learned, and then time for reflection.

All PDP participants work on a small team to design and then teach an inquiry activity (or unit). Teams are often **interdisciplinary**, and are led by an alumni participant, and each member of the team is responsible for a major task area (e.g. documentation or managing logistics at the teaching site). Team leaders read about and discuss aspects of **leadership** prior to leading their team, and through scenarios consider the various ways they can handle challenging situations. Their role as a leader is "scaffolded" during workshops, and then they are expected to lead on their own. Designing and teaching a new unit, with an expectation that it meets many PDP requirements and will be a productive professional development experience for everybody on the team, takes leadership as well as **project management skills**. A short workshop is also provided on project management to help participants think about timelines, effort, and how they will structure and **run meetings**. Throughout the PDP, participants are **communicating** in many ways, and are facilitated as they engage actively and respectfully in many different discussions and formats. Just prior to teaching, PDP participants learn about **facilitating group work** (e.g. strategies for handling a dominant group member; or a quiet one), and then try it out when they teach. In all of the above activities, we emphasize issues of **equity and ways to leverage diverse backgrounds**.

The PDP is continuing to develop more ways to support the development of professional skills. Currently, we are working on tools and workshops to train participants in **leading discussions**. We are also expanding our support in the area of **cross-cultural collaboration** to support international PDP teams (see "Collaborations & Innovations" in this issue). We're always seeking input from the PDP community on what is needed and how we provide it, and invite new ideas!

Credit: Christopher Bailey

Class of 2013

The 2013 Professional Development Program opened with the Inquiry Institute, held in Monterey, CA, March 25-28. Participants from ***UC Santa Cruz***, ***University of Hawaii at Manoa***, ***Hawaii Community College***, ***Kauai Community College***, ***Carnegie Observatories****,***UC Los Angeles****, ***UC Santa Barbara****, ***University of Colorado at Boulder***, ***University of Houston****, ***University of Toronto***, and ***W.M. Keck Observatory*** gathered together to receive training in teaching and learning through workshop intensives focusing on inquiry, diversity & equity, and assessment. The PDP included *new partners this year with funding from the National Science Foundation (DUE#1226140).

Advancements of PDP Alumni

New jobs, promotions & awards

Austin Barnes
Math & Science Teacher
Peace Corps, Kenya

Paola Castro
Software Engineer
Survey Monkey, Palo Alto

Kathy Cooksey
Assistant Professor
Physics & Astronomy
University of Hawai'i, Hilo

Kristel Dorighi
IRACDA Postdoctoral Fellow
Stanford University

Mike Jacox
Postdoctoral Researcher
Ocean Sciences
UC Santa Cruz

Jessica Lu
Assistant Professor
Institute for Astronomy, Manoa
University of Hawaii

Anne Medling
Postdoctoral Fellow
Research School of Astronomy and Astrophysics, Australian National University
Canberra, Australia

Ryan Montgomery
Assessment Specialist
Lawrence Hall of Science, Berkeley

Craig Nance
Assistant Director
Mount Graham International Observatory
Arizona

Derek Padilla
Physics Faculty
Santa Rosa Junior College

Nicole Putnam
Assistant Professor
Midwestern University
Arizona College of Optometry

Brooks Thomas
Research Fellow
Theoretical Particle Physics Group
Carleton University, Ottawa, Ontario

Partnerships

Preparing Interns to be Effective in the Workplace

Internships can be an important ingredient in a college student's pursuit of a STEM career. However, the transition from being a student at a college or university to being in the STEM workplace is often a significant leap. In the workplace, personnel need to grapple with ill-defined problems and are not given step-by-step recipes for solving problems that students often become accustomed to in traditional STEM laboratory courses. They need to take initiative, work in teams, figure out what resources are required, navigate within the cultural norms of their workplace, and reason through how to implement their skills in new contexts. Each year PDP participants teach in the "Akamai Short Course," a unique component of an internship program offered through the ***Akamai Workforce Initiative,*** which is led by University of Hawaii (UH) at Manoa ***Institute for Astronomy (IfA)*** *with funding from NSF (AST#0836053), Air Force Office of Scientific Research (FA9550-10-1-0044), UH, and the Thirty Meter Telescope.* The short course is specifically designed to prepare students for their coming internship at an observatory or industry site in Hawaii. The course was offered for credit through ***UH Hilo*** with ***David Harrington*** (IfA) as Lead Instructor. The two activities taught by PDP teams in 2013 were:

Computer Programming

In this activity, developed by ***Brooks Thomas*** (Physics, UH Manoa), ***Sarah Beganskas*** (Earth & Planetary Sciences, UC Santa Cruz), and ***Ian Cunnyngham*** (IfA), interns have an opportunity to hone their programming skills before embarking on their summer projects.

Analog to Digital Imaging

This activity was developed by ***Heather Kaluna*** (IfA), ***Georgeanne Friend*** (Kauai Community College), ***Reza Rahimnejad***, and ***Ehsan Yavari*** (both from UH Manoa College of Engineering), focusing on sampling rates in relation to specific science goals.

Partnership with NSO's Advanced Technology Solar Telescope (ATST)

McMath Pierce Solar Telescope, Kitt Peak
Credit: NSO/AURA/NSF

With funding from the ***National Solar Observatory (NSO)*** and the ***Akamai Workforce Initiative (AWI),*** ISEE offers a weekend technical course targeted at alumni of the Akamai Internship Program. ISEE Director Lisa Hunter, ***Jeff Kuhn (UH IfA)*** and ***Steve Keil (NSO)*** initiated and have co-led this unique workforce development activity since its inception in 2010. The course takes place over two days and includes skill development, networking, and an opportunity for NSO to recruit from the local talent pool created by Akamai. Activities this year will include mock interviews, resume feedback, presentations on potential NSO projects open to participants, and networking with Maui and Hawaii Island employers. Akamai alumnus, James Linden from Hawaii, was ***hired by ATST as an engineer***, as a direct result of the 2010 course, demonstrating the value of activities like this in engaging large projects like ATST with local talent. Six other Akamai alumni have been hired on short-term NSO projects.

A major component of the course is an inquiry activity in which participants will learn about sampling rates and refine their skill at defining engineering problems based on science goals, with an aim toward designing an instrument such as a spectrograph or bolometer, for a hypothetical satellite that will take data on solar phenomena. This activity is in development by ***Christopher Moore*** (U. Colorado, Boulder), ***Andy Pham*** (UH Manoa College of Engineering), and ***Luca Rizzi*** (Keck Observatory), and will be offered at the Institute for Astronomy's Advanced Technology Research Center on Maui in November 2013.

Partnership with Thirty Meter Telescope (TMT) Pilots New Mentoring Workshop

Courtesy TMT Observatory Corporation

With funding from the TMT and the AWI (NSF, AST#0836053), ISEE initiated a new effort aimed at expanding and improving mentoring in Hawaii. With AWI, ISEE has been increasing its focus on the tremendous potential for training the next generation that exists outside of, and complementary to, formal education: scientists, engineers, and technicians already in the workplace. After working with Hawaii technical personnel for more than a decade, it is clear that many are interested in training local young people, but want support and training to be most effective. In May, ***Jerome Shaw*** *(Education, UCSC),* ***Andrew Norton*** *(Engineering and Laboratory for Adaptive Optics, UCSC),* and ***Lisa Hunter*** *(ISEE Director),* with assistance from ***Anne Metevier*** *(PDP Lead Instructor, ISEE),* piloted several new activities to help mentors work more effectively with student interns.

The May workshop, building on ten years of experience and nearly 300 student projects, focused on ways to make student projects productive for both the student (as an educational experience) *and* the host organization (getting something accomplished). These two goals are often difficult to balance, but with thoughtful planning mentors are much more likely to succeed. Perspectives from participants:

> "The mentoring workshop provided me the time, awareness, and environment to construct and fully develop a deliberate and meaningful project."
>
> "Nearly all of the techniques used in this workshop are critical elements to becoming a better supervisor and ensuring professional career development of the employee."

Participants included individuals from: ***UH Institute for Astronomy (***C. Aspin, M. Cotter, J. Kuhn), ***Subaru*** (L. Ramos, K. Schubert), ***Smithsonian Submillimeter Array*** (J. Kuroda), ***OceanIt*** (M. Bush, A. Knox), ***Hnu Photonics*** (R. Pultar), ***Natural Energy Laboratory of Hawaii Authority (***K. Olson), ***Keck Observatory*** (J. Baldwin).

ISEE Updates

Team PDP

The PDP is a collaborative effort and its success is dependent on the valuable contributions of many. This year's team is composed of the following people:

2013 Core Developers and Instructors:

The team that works throughout the year designing or revising curriculum and that teach in nearly all workshops:

Anne Metevier (Lead Instructor), UCSC Consultant & Sonoma State University
Scott Seagroves, UC Santa Cruz and College of St. Scholastica
Barry Kluger-Bell, UCSC Consultant
Lisa Hunter (PDP Director), UC Santa Cruz & University of Hawaii
Tiffani Quan, UC San Francisco
Andrew Norton, UC Santa Cruz

2013 Instructors:

Katherine Kretke, Southwest Research Institute, Boulder
Oscar Azucena, UC Santa Cruz
Michael Nassir, University of Hawaii at Manoa
Jason Porter, University of Houston
David Harrington, University of Hawaii at Manoa
Nicholas McConnell, University of Hawaii at Manoa
Candice Brown Pacheco, UCSC Consultant

2013 Event Manager:

Beth Walker, UC Santa Cruz

Professional Development Program (PDP)

Teaching science as inquiry, engineering as design, in an equitable environment

The ISEE 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 student participants. PDP participants receive training on how to teach effectively and inclusively, as preparation for academic or industry careers, and as a complement to their already extensive research training. They receive initial training through workshops, and then work on a team to design and teach an inquiry activity, continuing to develop their skills through mini-workshops and expert consultation. The practical teaching experience takes place in "teaching labs" — PDP-affiliated educational programs or courses. PDP participants often work on interdisciplinary teams and gain skills in communication, leadership, and project management. They may return for one or more years, with increasing leadership roles. The PDP was developed through the NSF Center for Adaptive Optics and is now led by ISEE. Currently, the PDP is open to graduate students, postdoctoral researchers, and professionals from ISEE partner institutions.

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