Boots on the Ground: Lessons Learned From Early Approaches to Green Workforce Training and Field Placements

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ABSTRACT

Over the last two years, the Strategic Energy Innovations has partnered with colleges, public agencies and utilities to design and pilot two distinct green workforce programs in the San Francisco Bay Area. The first program trained incumbent workers to assess building energy consumption and ultimately, to learn how to install solar panels atop efficient buildings. The second program served low-income, "at risk" older youth, providing soft skills orientation, as well as technical training for careers in energy efficiency. Youth were paired with area utility contractors to perform residential retrofits for six weeks.

Understanding the challenges, barriers, and successes of these pilots will provide important information and best practices for ongoing green workforce development efforts. This session will explore the lessons-learned from green workforce education and training approaches that engaged individuals from diverse cultural, educational, and socio-economic backgrounds. Specifically, the authors will address the delicate balance of training "at risk" individuals in both soft and hard skill development. The authors will present findings (qualitative and quantitative) from early models implemented in the last two years, spotlighting efforts throughout the country; including the challenges encountered and specific modifications that they recommend for improving these approaches. The authors draw from research in the field to build a case for best practices in green workforce training.

Introduction

As a nation on the cusp of a transition from a "brown" to a "green" economy, it is critical we grow our capacity to accommodate a skilled workforce with experience in green building, energy efficiency, and clean energy techniques. These new jobs will take the form of green power technicians and contractors, energy brokers, power marketers, efficiency managers, solar installer technicians, deconstruction workers, energy specialists, biomass collectors, chemical engineers, insulation workers, energy auditors, sustainability coordinators, code inspectors, architects, and beyond. (Lilienthal 2008) Such jobs will require specialized training in the green workforce in addition to basic knowledge of the trades. In a 2008 clean technology report depicting workforce demand and the challenges and opportunities associated with hiring individuals in the clean technology industry, those employers surveyed described they faced the most difficulty "recruiting enough non entry-level employees with adequate skills and experience," in addition to "recruiting enough entry-level employees with the appropriate training and education." ([bw] Research Partnership 2008) The same report describes a study that was conducted which sought to identify general skill deficiencies among recent hires in the clean technology industry. The study illustrated that 25% of employers surveyed noted that the "technical competence specific to the position" was the skill most lacking, 12.5% described a lack of employee creative problem solving skills; 8.8% descried a lack of interpersonal communication skills; and 7.5% responded that employees lacked technical writing skills. The

green industry is on the verge of exploding, and before it does, it is imperative our nation hones the appropriate training infrastructure that can satisfy the overwhelming need for an expert green workforce. This involves coaching those interested in the entering the green workforce in both hard, technical skills, as well as soft skills (professionalism, communication, and creative thinking).

Many unknowns still exist about the type of energy industry we will find ourselves in in several years, however, one thing that is certain is that how we confront and carry out our jobs will change radically from what we currently know and employ. The way in which we will consider cost-effectiveness, resource costs and resource availability will be some of the most apparent changes we will see. To help prepare for these changes, it is key that developers of clean energy, renewable energy and energy efficiency courses and training programs work together to share best-practices and communicate those practices that do not work in an effort advance only those approaches that are successful.

Each year, our nation invests millions of dollars into energy efficiency and clean energy programs with ambitious goals. After working in the energy industry for over 13 years with experience creating a multitude of educational programs that encompass green workforce training and professional coaching, the authors of this paper have concluded that our best opportunity for meeting our nation's energy goals relies on establishing a well-practiced infrastructure that allows for diverse team program development, experiential applications of learning, and curriculum that is targeted at appropriate cognitive levels. Such a framework includes green workforce training curricula that ties in-class technical training, environmental education and professional skills development with hands-on technical experience. Those organizations developing training and curriculum surrounding these green industries will need to take in to consideration the needs of the current, transitioning market, in addition to future market necessities. This requires collaboration with industry partners prior to creation of a training program to identify workforce needs—current as well as future—and create well-defined pathways to meeting those needs. In addition to collaborating with industry partners, a multi-pronged approach to creating a strong workforce involves connecting labor market needs with occupational and training standards, educational providers, and third-party programs that verify competencies (IREC 2010}.

This paper describes two green workforce training programs that were implemented over the last two years by Strategic Energy Innovations with community college and industry partners. Using the Interstate Renewable Energy Council's (IREC's) guidelines for training as a basis for illustrating the processes used to develop and establish these programs, the authors will shed light on the challenges, barriers, and successes encountered through developing, running, and evaluating the programs. In addition, similar green workforce efforts that have been launched in recent years will be highlighted. The green workforce training programs to be discussed are:

- Solar Installation for Incumbent Workers (modified in year two to include entry level workers with no background required in the construction field); and
- Energy efficiency and job readiness training for "at risk" older youth.

In each of its programs, Strategic Energy Innovations embraces a philosophy for education and training that not only provides participants with guidance in the green industry, but also the adequate tools for succeeding in a professional setting. To do this, we provide

participants with career coaching and practice communicating (written and oral) current goals, challenges and future aspirations. Hands-on learning is a fundamental component of any functional curriculum. Strategic Energy Innovations employs a hands-on learning component in all of its curriculum programs, and whenever possible a service-learning constituent to provide participants with in-the-field experience. Internships, fellowships, and capstones function as integral mechanisms that benefit both the student and the local community. For the student taking the internship, such intimate access to employers can lead to long-term green career placement. Communities also benefit through the increased capita of green workforce present. A community with a substantial green workforce helps increase the community's access to energy efficiency and clean energy, lowering overall energy usage and financial expense for the area while increasing the community's resources and capacity to strive in a changing economy (Lilienthal 2008). Furthermore, connecting these parties ensures that the specific training needs for the industry and regional economy is met.

Solar Installation for Incumbent Workers

As best illustrated by Executive Director of Facilities Planning for the Los Angeles Community Colleges District, Larry Eisenberg, "The community college system is a major training ground for the nation's workforce and serves as a career-development incubator for today's jobs and future industries." (Eisenberg, Larry 2008) As the solar industry grows, the ability to source candidates who have experience in the solar industry is diminishing. To close the knowledge gap, new solar installation workers need to be expertly trained through institutions such as community colleges so that participants can acquire high-quality knowledge in a setting that allows for a quick turn around, getting students out working in the field in two years. The course at Skyline College and College of Marin was developed by Skyline College and College of Marin instructors, as well as industry representatives from Solar City and SEI to swiftly and effectively meet the growing solar need in the Bay Area.

The solar installation for incumbent workers program is an introductory course in the study of solar photovoltaic cells, modules and system components. As a regional interdisciplinary curriculum with a heavy training capacity, the program creates a career ladder for incumbent workers, allowing for upward mobility in the industry by providing participants with an obvious competitive advantage. Instruction begins with theoretical foundations of electricity concepts that enable the understanding of solar installations; and continues with a review of photovoltaic equipment, system design and calculations, safety considerations, and installation procedures. A hands-on component is included for students, which involves a comprehensive, exercise of performing a live residential solar installation that is capable of being connected to the power grid.

As previously evidenced, one of the main barriers faced by the solar industry is finding and retaining qualified solar panel installers; there is currently a substantial shortage of these employees. Theoretically, the design and installation process for photovoltaic cells seems an easy process; however, there are several layers of requirements to meet, including installer certification at two levels and various installation stages for the installer to perform. One of the consequences of this severe shortage in qualified installers is that the cost of installing photovoltaic cells becomes quite high, since the manpower to complete the installations is severely limited. Cost reduction will further enhance the growth within the solar industry as well

as create other value-added trade sectors that, in their own regard, further sustain the local economy. Therefore, the availability of skilled, certified installers is one major cost reduction factor.

The Solar Installation course prepares entry-level installers for eligibility to take the North American Board of Certified Energy Practitioners (NABCEP) Photovoltaic Entry Level Certificate of Knowledge exam, recognized as the national standard measure of basic knowledge, comprehension and application of key terms and concepts of photovoltaic system operations. Students obtain in class instruction as well as access to a campus based industry-oriented laboratory to provide the technical experience necessary for job competence. The lab is equipped with inverters, electrical equipment, mounts for photovoltaic cells, etc for hands-on learning experience.

Student Outcomes

All students will be able to:

- Define basic electrical terms and calculate simple circuit values
- Define basic terminology related to solar photovoltaic systems
- Describe markets and applications for photovoltaic systems
- Describe the theory, purpose, and operation of photovoltaic system components
- Calculate photovoltaic system sizing
- Understand photovoltaic system electrical design
- Understand photovoltaic system mechanical design
- Perform calculations related to the design, installation and functioning of photovoltaic systems
- Analyze and troubleshoot system performance
- Identify safety hazards of photovoltaic systems
- Identify safety practices and protective equipment used in photovoltaic system installation and maintenance
- 75% of participants surveyed in 2008 responded that the course was somewhat to very helpful in providing students new skills and knowledge in the industry/marketplace
- 100% of participants surveyed in 2008 responded that the course was somewhat to very helpful in providing students new skills and knowledge in electrical theory and safety
- 100% of participants surveyed in 2008 responded that the course was somewhat to very helpful in providing students new skills and knowledge in solar photovoltaic theory
- 75% of participants surveyed in 2008 responded that the course was somewhat to very helpful in providing students new skills and knowledge in solar installation technology and tools
- 75% of participants surveyed in 2008 responded that the course was somewhat to very helpful in providing students new skills and knowledge in solar installation practices

In Year One the curriculum was tested and fine-tuned, working with an experienced and screened pool of candidates to provide feedback and recommendations for refinement. In Year Two, the program opened its doors to candidates from all backgrounds. Students participating in the curriculum were asked to complete an evaluation report for the entire course. The class,

designed for incumbent workers, consisted of a participant profile that included solar installers, field engineers, operations managers, and a travelling foreman. It was reported by participants that as a result of taking the class, many students had received increased responsibility at their jobs, and are given the opportunity to perform more hands-on, technical work. Half of those surveyed received favorable reviews from their employer after completing the course. Over half of those surveyed have received a raise after taking the course, collecting an increase of anywhere from $1.00-$5.00 per hour, to making $5,000 more a year. Many students are intending to take the NABCEP certification and stated that their confidence in performing electrical techniques has increased in addition to their understanding of the industry as a whole, "[The course has] substantially increased my competency and subsequently my confidence in various aspects of solar installation." One student writes, "In general, I thought that the format, curriculum, teaching methods, and pace were very high in quality and effectiveness. The unanimous consensus seemed to be that everyone's understanding of our work has increased substantially."

Challenges and Response to Challenges

1. *A new industry, a new type of curriculum.* When developing the program, because it was a new curriculum area, there was no established framework for creating a green workforce training curriculum. Developers had to start from scratch when determining the important training areas. To account for this unknown, program developers conducted stakeholder meetings to review and critique program content (curriculum, approach and laboratory work), thus ensuring that the program met all community and industry needs. Furthermore, partnerships were formed with regional industry leaders to guarantee the program utilized an industry standard skill base. For the first year of the program, developers hired an industry consultant to co-teach the course.
2. *Juggling responsibilities.* Because the course targets incumbent workers, it can become increasingly difficult for participants to juggle the ensuing coursework with job responsibilities and the need to care for their families. The Skyline solar installation course and its instructors strive to create an environment that continues to challenge student learning but doesn't create additional stress for participants. To help appease this challenge, course work is scheduled on weekends and instructors provide additional hours of availability for students, in addition to allowing access to the learning center for computer based program training and videos that students can use independently.
3. *Dangerous equipment.* The course provides a comprehensive, hands-on exercise of performing a live residential solar installation that is capable of being connected to the power grid. Such a task can be very dangerous, especially for students who have not yet mastered the art of solar installation. To account for this safety hazard, during the installation phase, the class of 20 is broken down into two groups of 10; students work in teams of three or four with coaching from two qualified instructors. This method allows for each student to obtain concrete experience with the direct oversight of a qualified instructor to coach him or her through the process. Additionally, students were not expected to climb onto rooftops to learn how to install photovoltaic panels; instead panels were sited on removable structures to allow students to learn the intricacies of wiring and mounting.

4. *Diversity of participants.* A challenge exists in working with people from different backgrounds and educations. Some individuals are tech-savvy while others are not. Serving this diverse need can be a difficult. To tackle this, Skyline instructors work with students in small groups to help provide for more direct and pointed coaching. It is recommended that these small groups are diverse themselves, so students can learn from one another and a multitude of talent and experience is represented. Furthermore, because individuals learn at different paces and through different approaches, the course only encourages positive learning. There is no negative point system; instead, students receive points for correct answers, however points are not deducted for incorrect responses when participating.

Best Practices

- Conducts stakeholders meeting to form partnership with regional industry leaders to ensure the program meets community and industry needs and utilizes an industry standard skill base.
- Team teaching with academic instructor and industry leader.
- Employs safety precautions when using dangerous equipment.
- Incorporates an intensive, hands-on learning component to the program to increase real-world experience.

Energy Efficiency and Job Readiness Training for "At Risk" Older Youth: Green Workforce Internship Program

In June 2009, the authors designed and launched a revolutionary youth internship program aimed at helping 15, low-income youth, ages 18-24, gain skills needed to join the burgeoning workforce of green jobs. The program, funded by the Workforce Investment Board of Marin County through American Recovery and Reinvestment Act funds, and by Pacific Gas and Electric Company Charitable Giving, targets individuals in under-served communities who might otherwise not have an opportunity to tap into jobs in the energy efficiency and weatherization industry. Training low-income individuals for this market can help to close the socioeconomic gap prevalent in our cities.

The green workforce internship program specifically targets high school dropouts, persons at risk of dropping out or who are deficient in basic literacy skills, and/or live in high crime/poverty areas. The program aims to inspire participating youth to care about protecting our environment and communities, to help them understand that work in the area of energy-efficiency makes a significant contribution to reducing greenhouse gas emissions, and that this line of work offers opportunities for fulfilling, long-term employment. By boosting one's ability to succeed in the prospective job market, the program provides young participants with opportunities in new and developing fields where demand for jobs is only expected to grow over time. Currently, government policy is such that green contractors are in high demand and employers are looking for individuals who have not only energy efficiency skills but also auditing techniques. It is expected that opportunities in this field will drastically increase due to the strengthening policy support backing this industry.

The program consists of four core features in addition to providing participants with a $2,000 stipend for completing the internship component of the program. After completing a

skills assessment to identify baseline knowledge and weaknesses, participants receive a week-long state of the art introductory training in energy-efficiency and weatherization concepts and techniques, in addition to job readiness skills. The training workshop also includes a trip to Pacific Gas & Electric's Pacific Energy Center for hands-on exposure to energy auditing techniques. Participants are then challenged to put their auditing education into practice by conducting an energy audit on a local public building, before being assigned site-work through summer internships with energy efficiency contractors. Youth continue to obtain job readiness guidance by becoming equipped to communicate their strengths to prospective employers through coaching. And finally, upon completion of the program, participants practice public speaking through writing and presenting their summer accomplishments and personal goals. As a result of the program, students were trained in numerous energy efficient and weatherization activities; these included changing out light fixtures, weather-stripping and V-striping, installing thresholds, utility gaskets, foam patches, calking, shower heads and faucet aerators, insulating attics, hot water pipes and water heaters, and product knowledge.

The internship program has dual objectives. It imparts participants with practical knowledge and skills, directly connecting them to jobs and future opportunities; while concurrently producing a well-trained and specialized workforce to support the increasingly important energy-efficiency/weatherization industry. Of the 15 interns involved in the program, seven were women. Three were fulfilling their internships onsite at bustling contractors' offices, while the remaining 12 worked in the field with professional weatherization specialists, often putting in long days.

Out of the 15 low-income youth participating in the program, ten were offered jobs post internship, and seven of those ten were offered work in the thriving energy efficiency field. In an evaluation upon the program's conclusion, an 18-year-old intern wrote, "Through working with George [the assigned contractor for the intern] I have learned a plethora of new skills I never before thought I would acquire, including how to insulate attics and crawl spaces, insulate ducts using duct mastic, perform air duct testing, examine solar panels, and perform basic plumbing. More important than these skills are the intangible things I have learned after working with George: pride and passion for my work, enthusiasm for energy conservation and, often most frequently, fatigue after a long, hard day of work."

In addition to energy efficiency expertise, participants also possess a new aptitude for computer skills and state/federal incentive programs—of which upon entering the internship program, they had minimal to no knowledge. A 20-year-old mother of two explained that after the program she is now "proficient in MS Office Suite including Word, Excel, PowerPoint, and Outlook." An 18-year-old intern described his role in the marketing and research department at his internship, "I researched out of state rebate programs and incentives for solar; these can range from state rebates, utility rebates, tax credits and exemptions, and production incentives. I also have been researching net metering agreements and interconnection requirements for the northwest, southwest and Hawaii."

Before starting the program, three of the 15 interns were homeless, forced to sleep in shelters or on the streets. Other participants were living in such a state of poverty that they experienced grave difficulty acquiring food, paying bills, and providing for their children and families. The $2,000 stipend provided to participants has helped to mitigate some of these hardships. But what the program more enduringly provided these individuals is a new and highly

demanded skill set to serve in the green workforce and beyond, the ability to converse with professionals and maintain a professional attitude on the job, communication skills, and most importantly, their own self-confidence.

Primary Outcomes of the Program Include

- 15 interns (out of 15) completed the Marin Green Workforce Internship program with Strategic Energy Innovations (SEI)
- 15 were provided pre-employment skills training
- 15 were provided academic enrichment activities
- 15 were placed in paid summer work
- 7 sub-contractors provided supervision and training in exchange for youth interns for the summer
- 10 interns were offered jobs with their sub-contractors
- 5 interns are attending college this fall
- 10 interns were placed in unsubsidized employment after the summer
- 10 interns were referred to the year-round WIA program

Challenges and Response to Challenges

1. *Diversity of participants.* Participants in the energy efficiency program maintained different levels of schooling, this can result in some students finding class stimulating and challenging, while others don't retain the appropriate skills to fully grasp the subject at hand. To tackle this challenge, instructors worked to keep the energy level of the group up by capitalizing on group discussion and sharing of experiences. Those students that were falling behind in the training were provided one-on-one instruction outside of class and instructors were made available for student drop-ins and questions. As an introductory measure to ensure that the education levels of participants were not radically different, a preliminary skills assessment was given to students before entering the program, which tested student's overall math proficiency. Basic knowledge of mathematics is necessary for conducting energy audits and some weatherization techniques. It is noteworthy to call out, however, that one participant did not pass his skills assessment, but was let into the program because of his other exceptional qualities; that individual ended up being one of the exemplary students in the program.
2. *Transportation.* Because this program is offered to low-income individuals, transportation can exist as a barrier to getting to training sessions and internships. Many students did not have personal transportation and would commonly arrive late to work. To overcome this, a van and driver was hired to transport students to and from their training workshops and internships.

Best Practices

- Conduct a preliminary skills assessment test to ensure literacy levels are sufficient
- Work in collaboration with industry leaders to build relevant skills
- Provide an internship and field experience component to make future employment possible

Best Practices for Green Workforce Training Programs

The two programs depicted above should be used as a reference as the reader encounters detailed analysis below, excerpting program elements to understand their relationship to IREC's training guidelines. The analysis of how each program was developed and why it was developed will be illustrated, using the Interstate Renewable Energy Council's (IREC) recommended guidelines. IREC "supports market-oriented services targeted at education, coordination, procurement, the adoption and implementation of uniform guidelines and standards, workforce development, and consumer protection. IREC's mission is to accelerate the sustainable utilization or renewable energy sources and technologies." (IREC 2010) The organization currently serves as the national standard for identified best practices within the educational, training and workforce sector.

Practitioner training courses should provide educational, training, and skill development experiences that lead to industry-defined workplace knowledge, skills, and attitudes.

Solar installation program. In 2007, when the solar installation program was conceived, industry defined skills were just making their way into the training environment. De Anza Community College, West Valley, San Jose and Cabrillo College formed a consortium, the SV Solar IDRC (Silicon Valley Solar Industry-Driven Regional Collaborative) as a strategic regional response to meet the need for a skilled workforce in photovoltaic solar system design and installation. In developing the program, this group utilized the DACUM (Developing a Curriculum) approach to establish training standards and needs. The DACUM was made available to Skyline College to help in the planning of the solar installation program; and represents the combined input of educators, industry leaders and stakeholders in articulating the skills and knowledge needed to succeed as a solar installer in today'—as well as future—industries. The DACUM consortium participated in focus groups and surveys to help establish the factors necessary for a comprehensive solar training program in the Bay Area. (For a very good description of the DACUM method, visit www.ateec.org/learning/instructor/dacum.htm.) From the onset, the solar training program brought together representatives from industry to guide the development of the program. While jobs were not promised upon completion of the program, employers were forthcoming with the specific skills graduates would need to be employable. Perhaps most critical to the success of this program, was the partnership Skyline undertook with Solar City, a full service solar provider for homeowners, businesses, and government organizations located in Skyline's service territory, employing hundreds of workers. Solar City not only helped to develop the curriculum, infusing it with real life scenarios, but they also co-taught the program, and provided essential equipment so that students could be exposed to market based materials and situations.

Energy efficiency program. The low-income energy efficiency program was developed in tandem with the energy-efficiency contractors that would be housing the internships. Contractors were able to provide input on the training workshop, in addition to coaching the students personally during the eight week summer internship itself. Students also received industry-defined training during their fieldtrip to Pacific Gas & Electric's Pacific Energy Center for hands-on exposure to energy auditing techniques.

Training should appropriately address issues of safety, codes, and core competencies of an industry-approved task or job analysis.

Solar installation program. For the solar class, industry leaders co-taught the class to ensure that safety standards were adhered to. As an example, students were not expected to climb onto rooftops to learn how to install photovoltaic panels; instead panels were sited on removable structures to allow students, in small groups of three or four with direct supervision, to learn the intricacies of wiring and mounting without encountering danger. Code regulations were built into the curriculum.

Energy efficiency program. Similarly, with the energy efficiency training, students were required to wear safety glasses and ventilators when working in attics or tight spaces to install or remove insulation. The more complicated task with the energy efficiency program was to convey to students the basic level of professionalism they would need to succeed. In one instance, we found a student laying down in a client's bed to get some rest while he was waiting for his coworker to finish a task. Basic common sense could not be taken for granted.

Training should be taught in an environment with representative equipment, appropriate facilities, tools, and safe practices.

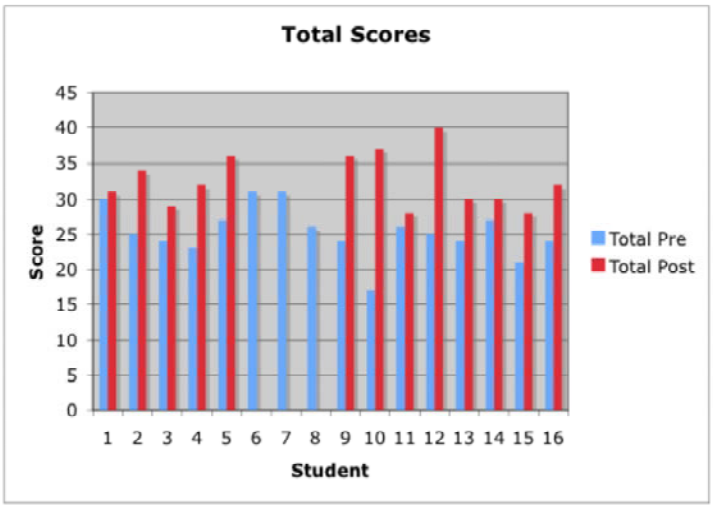
Solar installation program. At Skyline, a lab was set up specifically to train students to install solar, equipped with inverters, PV equipment, and wiring. In addition, Skyline students used the electronics lab to engage in building circuits and working with electrical concepts.

Energy efficiency program. Students were first oriented to the theory of energy efficiency and its relationship to climate change. Portable equipment such as flicker checkers, weather-stripping, faucet aerators, infrared thermometers, watt and light meters, were made available. Students took trips to perform audits at the local college, investigated residential retrofits and partook in a field trip to their local utility, Pacific Gas & Electric's Pacific Energy Center for hands-on exposure to energy auditing techniques. Once they demonstrated familiarity with the content and techniques, students were assigned to internships with businesses in the industry.

Training should offer a formal and planned learning structure where the learner receives confirming or corrective feedback and the learner's progress is monitored.

Solar installation program & energy efficiency program. Curriculum is taken seriously and built with scaffolding in mind, so that first students learn why their work is important, then they learn the fundamental basic scientific concepts, and finally, they learn how to apply those concepts in work situations. In all programs, a pre- and post-test is administered to gauge the level of student learning. Below in Figure 1, is an example of pre- and post- test results from the solar installation course. In addition, in the solar class, students were prepared to take the NABCEP entry-level certification test, and the program was awarded certification as an approved provider.

Figure 1. Pre and Post Test Results of Student Learning in the Solar Installation Class



Training should be taught under the administration of a legally registered entity that has proven administrative and managerial quality control.

Solar installation program. The solar programs are integrated into curriculum within the community college offerings, in the Science and Technology Division at Skyline College and the Department of Career Workforce at College of Marin. *"This program is part College of Marin's commitment to provide community members in the field the opportunity to take a step up the career ladder in this greatly expanding career field in green technology," said Dean of Workforce Development and College-Community Partnerships Nanda Schorske. (press release June 24, 2008)*

Energy efficiency program. Strategic Energy Innovations offered the soft skills training and introductory technical training up front to participants, and upon completion of that segment of the program, participant were placed with licensed contractors.

Training should be offered by an entity that has received third-party verification through conventional accreditation or government or trade approval, or the ISPQ or similar quality assessment auditing process.

Solar installation program. Skyline College and College of Marin received the NABCEP certification as an approved provider to offer the entry-level course material to students.

Energy efficiency program. The hands-on component of the energy efficiency training course was offered by licensed contractors and in most cases, low-income energy efficiency providers sub-contracting with the local utility.

Additional Noteworthy Solar Programs across the Nation

Hudson Valley Community College. Hudson Valley has a provided a nationally acclaimed solar PV training program for about four years, and in the recent past, has started providing geothermal technology training to students as well. The programs success lies within its three-

pronged approach to curriculum delivery. The program combines in-class instruction (based largely on electrical curriculum) with extensive laboratory work, and on-site training. The community college has also partnered with New York State Energy Research and Development Authority (NYSERDA) to expand their programs across the state. (Sarubbi, Joseph T. 2009)

In addition, compiling over 200 presentations about green workforce education, IREC has arrived at the following recommendations, which are summarized below:

- Curriculum needs to include real world preparation for an occupation. Planners of renewable energy courses and training programs need to determine the required and desired knowledge, skills and attitudes by surveying local businesses, industry, and government representatives. Multiple experts in the field are the best sources for recognizing and describing job tasks. Required certifications and licenses should be identified and a list of tools and equipment that students should be proficient with should be compiled.
- If not already available, conduct a labor market assessment to match training curriculum with local labor demand for specific occupations.
- Emphasis should be on developing high quality courses. Instructional systems design has been successfully used in the renewable energy field. Utilize a team-based approach for developing curricula. Assess the use of classroom, technical shop, online, computer-based and internship delivery systems.
- Make sure that pre-requisites have been established for each course or program and that student performance is evaluated by written exams or other assessment methods. For training programs that cannot enforce prerequisites, a description of "highly suggested experience" should be part of the course description.

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