Clean Energy Workforce Conference

New Approaches

Responding to the changing needs of the U.S. workforce
Edward Olson is...
Principle Investigator and Program Director for Integrated Systems Technology.
Ed has spent more than two decades working on integrated systems and has led national teams in the training and evaluation of technicians. He currently leads the academic team for this project’s curricular design and development.
NSF-ATE Program –
Growing a New Generation of Energy Technicians and Professionals
This projected three year effort will focus on the core competencies required to support the continued growth of our energy industries.
This presentation will share the conversations that our national team partners have started as the first year of this project focuses on the design and development of a set of competency statements and the cognitive structure needed to support those competencies.
A new model for curriculum development will be demonstrated that supports four cognitive levels across a range of core energy topics – Electrical – Mechanical – Fluid Power - Safety – Industrial Tools – Wind Energy.
This project is supported by the NSF-ATE program and will continue into years two and three with the integration of science, technology, engineering and math (STEM) competencies to create a convergent set of learning activities for new technicians. The project’s outcomes include a cross-walked matrix of industry approved core competencies, course syllabi, curriculum materials, professional development activities, articulation agreements, enrollment, retention and placement data as well as outreach and dissemination efforts. These activities will be facilitated by a team of national Co-Chairs and based around existing programs in renewable energy at colleges across the country.
New Approaches

What are we doing?
Why are we doing it?
How the heck are we gonna get it done?
OUR GOALS

Academic Rigor & Relevance
- Develop curricula that are industry-endorsed and student-focused
- Enhance curriculum design and learning materials

Career Pathways
- Develop student pathways into advanced degrees
- Develop educational pathways into advanced degrees

Recruitment, Retention & Placement
- Increase underrepresented student participation
- Develop student outreach activities

Outreach & Dissemination
- Collect feedback for design refinement through site visits, workshops, institutes, and presentations
- Develop student outreach activities

Deliverables
- Course syllabus
- Curriculum materials
- Technical reports
- Student surveys

Our Partners

NSF
IREC
Laramie County Community College

This material is based upon work supported by the National Science Foundation under Grant #1510873.
Academic Rigor & Relevance

Verify core abilities and foundational competencies

Develop curricular design and learning materials

“Teams will set the stage for ongoing activities as we document essential knowledge and skills.”
Career Pathways

Develop enrollment options for secondary students

Develop educational pathways into advanced degrees

“We want to broaden the entry options into these careers and define extended learning opportunities.”
Recruitment, Retention & Placement

Increase under-represented student participation
(traditional age students, women, transitioning veterans, and minorities)

“We want to show that these opportunities are available to wider audiences.”
Outreach & Dissemination

Collect feedback for design model through peer review

Develop student outreach activities

“Partnerships will be our key to developing products that best serve the greatest number of aspiring technicians.”
Median annual wages, selected wind-energy-related occupations, May 2009

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Median Annual Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional</td>
<td></td>
</tr>
<tr>
<td>Aerospace engineer</td>
<td>$94,780</td>
</tr>
<tr>
<td>Electrical engineer</td>
<td>$83,110</td>
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<tr>
<td>Civil engineer</td>
<td>$76,590</td>
</tr>
<tr>
<td>Atmospheric scientist</td>
<td>$64,710</td>
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<tr>
<td>Biological scientist</td>
<td>$58,500</td>
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<tr>
<td>Logistical</td>
<td>$67,350</td>
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<tr>
<td>Construction</td>
<td></td>
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<tr>
<td>Construction laborer</td>
<td>$29,150</td>
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<tr>
<td>Electrician</td>
<td>$47,180</td>
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<tr>
<td>Construction equipment operator</td>
<td>$39,770</td>
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<tr>
<td>Machinist</td>
<td>$37,650</td>
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<tr>
<td>Production</td>
<td></td>
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<tr>
<td>Computer-controlled machine tool operator</td>
<td>$34,460</td>
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<tr>
<td>Assembler</td>
<td>$36,820</td>
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<tr>
<td>Quality control inspector</td>
<td>$24,950</td>
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<tr>
<td>Transportation</td>
<td></td>
</tr>
<tr>
<td>Truck driver, heavy and tractor-trailer</td>
<td>$37,730</td>
</tr>
<tr>
<td>Crane and tower operator</td>
<td>$44,140</td>
</tr>
</tbody>
</table>

Source: U.S. Bureau of Labor Statistics
Summary Report for:
49-9099.02 - Wind Turbine Service Technicians

Inspect, diagnose, adjust, or repair wind turbines. Perform maintenance on wind turbine equipment including resolving electrical, mechanical, and hydraulic malfunctions.

This title represents an occupation for which data collection is currently underway.

Tasks:
- Inspect or repair fiberglass turbine blades.
- Troubleshoot or repair mechanical, hydraulic, or electrical malfunctions related to variable pitch systems, variable speed control systems, converter systems, or related components.
- Climb wind turbine towers to inspect, maintain, or repair equipment.
- Diagnose problems involving wind turbine generators or control systems.
- Perform routine maintenance on wind turbine equipment, underground transmission systems, wind fields substations, or fiber optic sensing and control systems.
- Start or restart wind turbine generator systems to ensure proper operations.
- Test electrical components of wind systems with devices such as voltage testers, multimeters, oscilloscopes, infrared testers, or fiber optic equipment.
- Test structures, controls, or mechanical, hydraulic, or electrical systems, according to test plans or in coordination with engineers.
- Assist in assembly of individual wind generators or construction of wind farms.
- Collect turbine data for testing or research and analysis.
Levels of Learning

4 – Application/Use
3 – Analysis
2 – Understanding
1 – Retrieval

Based on Marzano & Kendall’s work in
The New Taxonomy of Educational Objectives (2nd Ed.)
Competence

com·pe·tence  (kmp-tns) n.
1.  a. The state or quality of being adequately or well qualified; ability.
   b. A specific range of skill, knowledge, or ability.

2.  Law The quality or condition of being legally qualified to perform an act.
DC Electricity

Decide if a material is a good conductor or insulator.

Predict how electrical circuit characteristics will be affected by changes to individual component characteristics.
Integration

“By the broadest definition, any attempt to remove an academic subject area from its respective silo can be considered curriculum integration.”
Convergent

convergent [kənˈvɜːdʒənt] adj
1. moving towards or meeting at some common point
2. tending towards the same result; merging
We need a competent clean energy workforce to sustain our nation’s increasing energy demands...