PATHWAYS TO COLLEGE & CAREER READINESS
CareerClusters

Infusing Green and Sustainability Standards in the Career Clusters™ Knowledge and Skill Statements

Project Results

June 19, 2012

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Overview

- Project Background
- Why Sustainability
- Overview of Standards Development Process
- Explanation of Standards Format
- Review of Standards by Cluster
- Accessing Standards and Resources
- Discussion of Standards Use
- Next Steps

Project Background

- Project Genesis
  - Funded by U.S. Department of Education
  - Address need to incorporate green standards into existing K&S developed for National Career Clusters
- Collaborative Effort
  - National Career Technical Education Foundation
  - Vivayic
  - U.S. Department of Education
  - MPR Associates, Inc.

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Project Background (cont.)

- Two-Year Timeline
  - Year 1: Standards Development
  - Year 2: Validation and Dissemination

- Broad Stakeholder Involvement
  - Subject Matter Experts
    - Debra Rowe, Senior Fellow in Education for Sustainability
    - Susan Gentile, Graduate Professor, Antioch University

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Project Background (cont.)

- Technical Working Groups
  - Experts from the Field
  - Six Cluster areas
    - Agriculture, Food, and Natural Resources
    - Architecture and Construction
    - Information Technology
    - Manufacturing
    - Science, Technology, Engineering, and Mathematics
    - Transportation, Distribution, and Logistics

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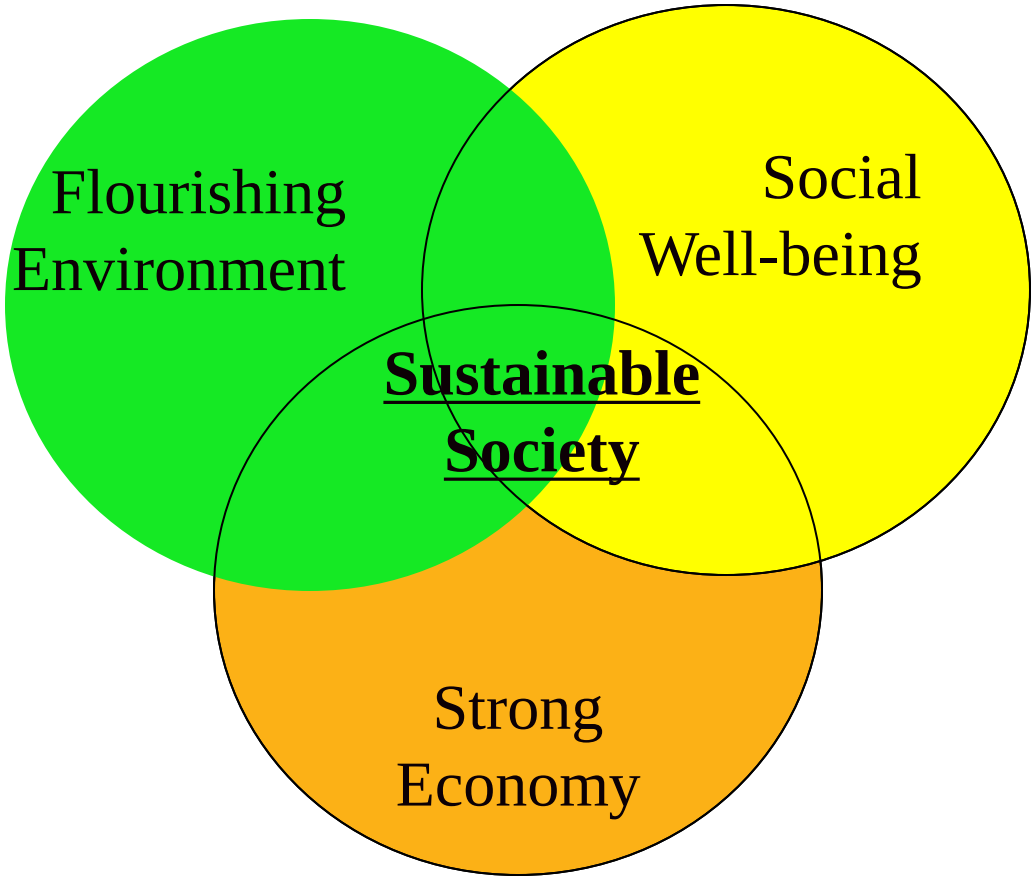
Why Sustainability?

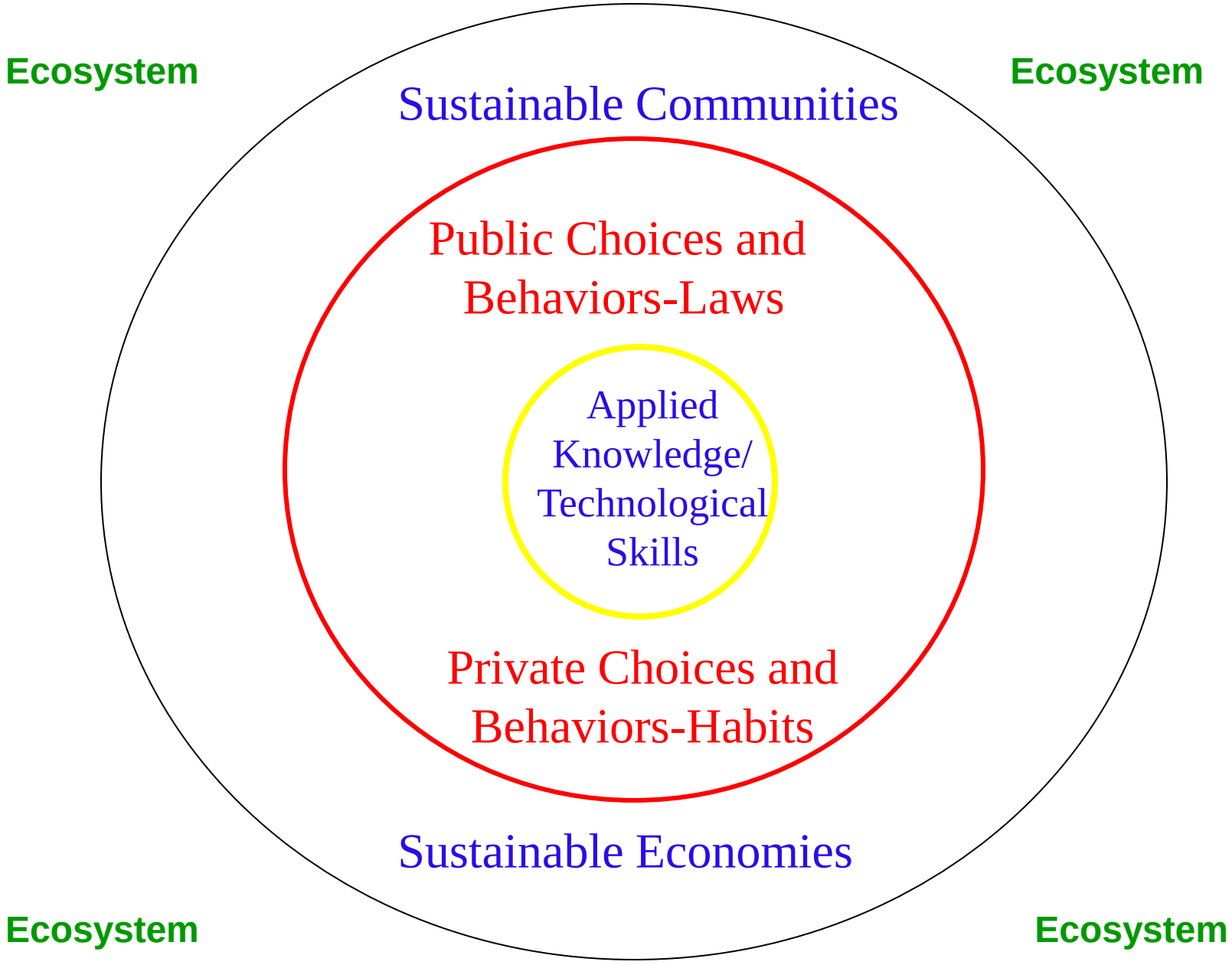
Education for a Sustainable Society

"…enables people to develop the knowledge, values and skills to participate in decisions…that will improve the quality of life now without damaging the planet for the future."

UNESCO World Summit on
Education for Sustainable Development



Triple Bottom Line of Sustainability
"Economics as if People Mattered"


Ecosystem
Ecosystem
Sustainable Communities
Public Choices and Behaviors-Laws
Applied Knowledge/ Technological Skills
Private Choices and Behaviors-Habits
Sustainable Economies
Ecosystem
Ecosystem

Some green/sustainability jobs: the obvious

Traditionally, community college, career and technical education, and even the National Science Foundation focus on technicians:

- Energy auditor technician
- Wind energy technician
- Insulation and weatherization technician
- Photovoltaics (solar electricity) installer
- Thermal solar installer (hot water and space heating and pool heating)

“Upstream” green/sustainability jobs: jobs needed before technicians get hired

- Energy policy analysts and legislators
- Employees in state and local energy related offices
- Energy efficiency and renewable energy products financiers, manufacturers, distributors, and salespeople
- HVAC and other contractors with green**,** energy efficiency and renewables expertise/product line
- Energy Service Company (ESCO) employees
- Corporate social responsibility officer
- Sustainability oriented purchasing agent and business VP
- Energy manager
- Facilities director
- Green builder/designer

Some green/sustainability jobs: the less obvious

- Resource conservation/efficiency manager
- Measurement and verification technician
- Material scientist
- Environmental engineer technician
- Biomass plant designer, manager, technician
- Utility plant operatives
- HVAC/ building automation technician controls specialist
- Refuse and recycling worker
- Sustainable agriculture specialist
- Groundwater heat pump contractor/installer
- Wave power system designer/installer
- Forestry & wildlife worker

Key Government Initiatives

- U.S. Dept of Ed - Sustainability Summit
- Green Ribbon Schools
- Including Green/Sustainability into Career Pathways for State Directors of Career and Tech Ed – this project
- Funds from multiple federal agencies in energy/environment/climate change – NOAA, EPA, NSF, FIPSE…
- Sustainability in STEM (Science, Technology, Engineering and Math)

National Trends in Higher Education

Committed to the advancement of sustainability throughout higher education

DANS – the Disciplinary Associations Network for Sustainability www.aashe.org/dans - click on Resources

- American Psychological Association
- Sociology
- Religion
- Philosophy
- Math
- Broadcasting
- Architecture
- Engineering (civil, mechanical, eng. ed.)
- Business - AACSB
- Marketing - AMA
- Economics
- Chemistry
- Biology
- AAAS
- Computer Research
- Humanities
- Women's Studies
- Political Science
- Anthropology
- STEM for a Sustainable Future

Student Learning Outcomes

ACPA President's Sustainability Taskforce, 2006

1. Each student will be able to define sustainability.
2. Each student will be able to explain how sustainability relates to their lives and their values, and how their actions impact issues of sustainability.
3. Each student will be able to utilize their knowledge of sustainability to change their daily habits and consumer mentality.
4. Each student will be able to explain how systems are interrelated.

Student Learning Outcomes (cont.)

ACPA President's Sustainability Taskforce, 2006

5. Each student will learn change agent skills.
6. Each student will learn how to apply concepts of sustainability to their school and community by engaging in the challenges and solutions of sustainability on their campus.
7. Each student will learn how to apply concepts of green/sustainability globally by engaging in the challenges and the solutions of sustainability in a world context.

Outcomes parallel international declarations and other countries'

Svanström, Lozano-G, Rowe (2008) "Learning outcomes for sustainable development in higher education", International Journal of Sustainability in Higher Education; Volume: 9 Issue: 3; 2008

Vision: *Sustainable development integrated into education and learning in the United States*

- Non-partisan, multi-sector partnership of over 360 registered organizations
- The Partnership's current Sector Teams are:
  - Communities
  - Business
  - Faith Based Organizations
  - **Higher Education**
  - **K-12 and Teacher Education**
  - Youth

SEED - Sustainability Education & Economic Development - Windows Internet Explorer

http://www.theseedcenter.org/default.aspx

Google

Search web...

Norton

Cards & Logins

http://www.detroitwaldorf.o...

SEED - Sustainability Edu...

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SEED

Sustainability Education & Economic Development

SUBMIT RESOURCES

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Resource Center

- Solar
- Wind
- Green Building
- Energy Efficiency
- Sustainability Education

Additional Sectors COMING

Colleges In Action

The SEED Center is a **leadership initiative**, **resource center**, and

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Sign-in/Registe

Email

Password

Register >>

Newsletter Sig

Sign-up >>

Connect with u

A more comprehensive way of looking at education for a sustainable future

1. Everyone interacts with the planet and the ecosystems we depend upon for life.
2. Everyone has an important role to play in helping to create a sustainable future.
3. Some of the most crucial jobs haven't been created yet, so we have to understand the potential sustainable economy to predict it and contribute to its strength.
4. Not just green jobs, sustainability thinking.
5. Systems thinking, creating effective change.
6. High schools have a unique and important role that requires new curricula and pedagogy.
7. Technicians are needed and much more than that.

Sustainability THINKING and ACTION

1. All technology programs need to incorporate triple bottom line, sustainability principles, skills and applications into curricula, including construction, HVAC, automotive, culinary, retail, manufacturing, electrical and plumbing, health, all clusters, and the general education courses, too.

2. All students in all degrees need to be literate about our sustainability challenges and be able to engage in problem solving as consumers, employees, community members, and investors.

3. Lifelong learning for public – use the media. Students teaching the community.

Core knowledge and skills for all

- Literate about our sustainability challenges – (www.myfootprint.org, www.earth-policy.org, including the triple bottom line conceptual frame)
- Engagement in real world problem solving
- Skills and attitudes to be systemic thinkers (local-national-global) and effective change agents
- Interpersonal skills
- Civic Engagement in policies for a green and sustainable future – e.g. national teach-in and Powershift, presentations to city council

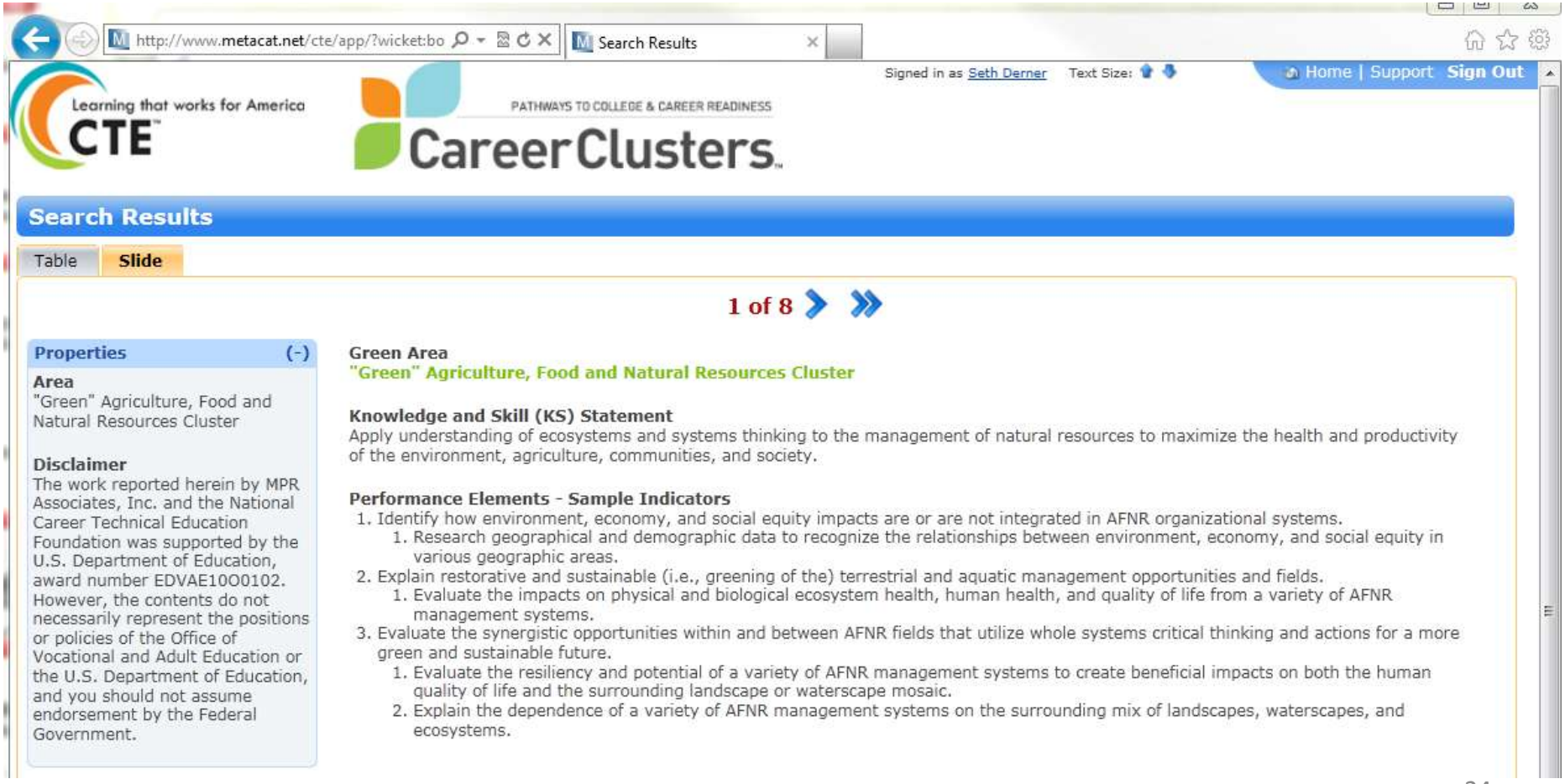
Educating For Sustainability

Integrating environment, economy, and equity
through systems thinking
in all disciplines at all levels for all students

“We hold Earth’s future in our hands. What will we decide?”
Pierre Teilhard de Chardin

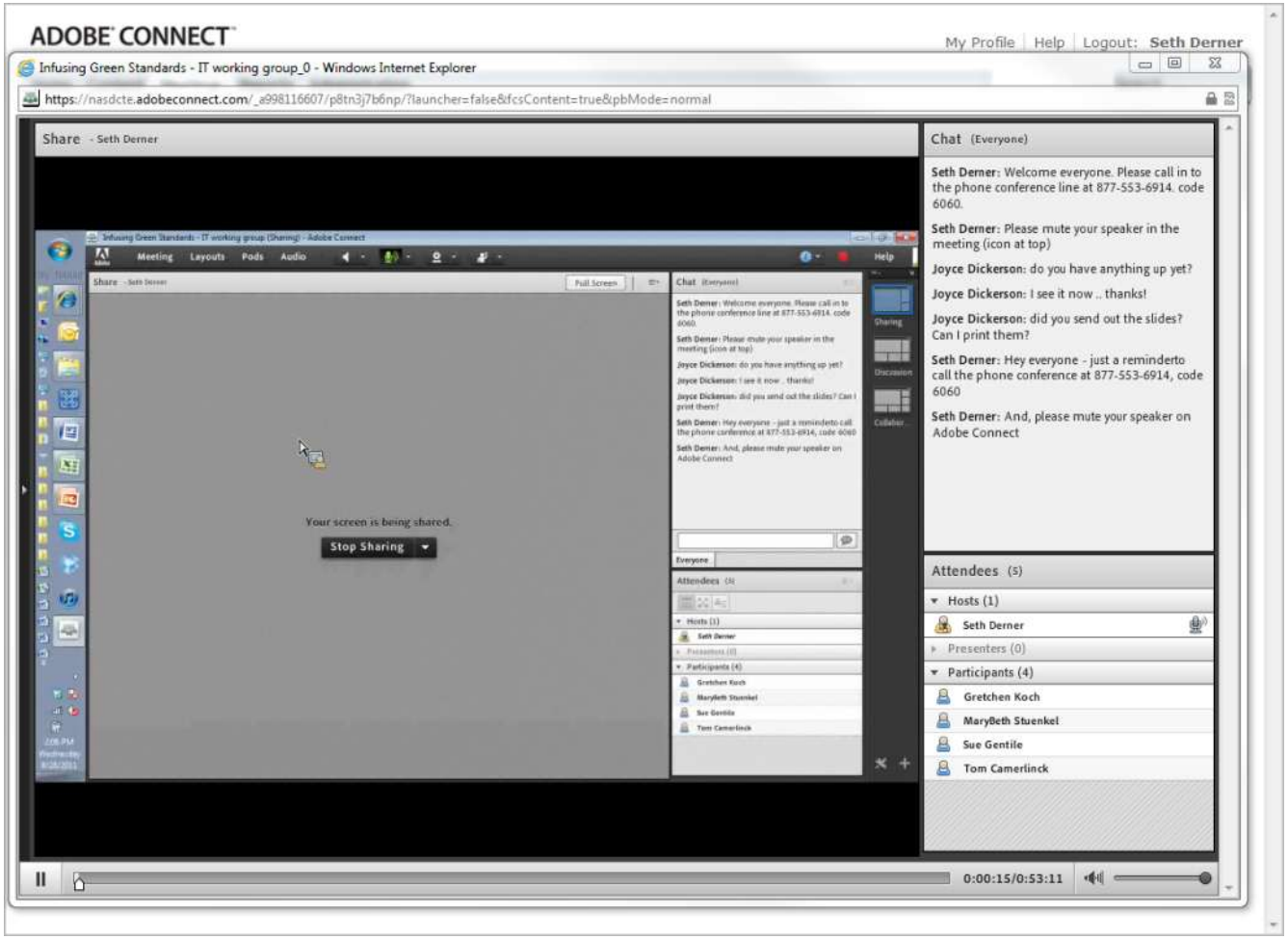
Overview of the Standards Development Process

A “green” process -- Use of online, standards development portal



Overview of the Standards Development Process

A “green” process - use of virtual meeting technologies



Overview of the Standards Development Process

1. Initial training for TWG members
2. Individual study, discovery and contributions via online portal
3. TWG discussion and evaluation of initial offering
4. Revisions by SMEs and project coordinator
5. Additional revisions by TWG individuals via portal
6. Additional TWG meeting to discuss and evaluate

Overview of the Standards Development Process

7. Revisions by SMEs and project coordinator
8. Final review by TWG individuals
9. Copy editing
10. Validation and review via national, online process
11. Review by Career Cluster™ National Advisor Committees (if applicable)
12. Additional edits, if any made and reviewed by TWG
13. Final layout and design for access via portal and website

Explanation of the Standards Format

- Use the existing Career Cluster™ Knowledge and Skill Statements as the model
  - Knowledge and Skill Statement (Standard)
    - Performance Element – definition of performance
      - Sample Indicators – examples of tasks or products

GREEN/SUSTAINABILITY STANDARDS

TRANSPORTATION, DISTRIBUTION, AND LOGISTICS CLUSTER—TRANSPORTATION SYSTEMS/INFRASTRUCTURE PLANNING, MANAGEMENT, AND REGULATION PATHWAY

	KNOWLEDGE AND SKILL STATEMENT	PERFORMANCE ELEMENT	SAMPLE INDICATORS
1	Understand the relationship among systems, equipment, and human behaviors related to environmental and human health.	1. Use systems thinking to address a problem or issue with transportation systems and infrastructure. 2. Identify effective strategies to influence human behavior in ways that lead to greater transportation efficiency.	1a. Explain the relationship of people, systems, goods, vehicles, and the environment in a given situation. 1b. Find examples of changes to transportation systems and infrastructure where there is evidence of systems thinking. 2a. List human behaviors that impact transportation systems and infrastructure. 2b. Describe strategies that have influenced behavior and led to greater transportation efficiency.

Explanation of the Standards Format

Keys to Remember

- Industry expectations still emerging
- First generation standards
  - Grain size
  - Terminology
  - Appropriate scope and depth
- Includes skills for specific green careers and the green skills needed for existing careers as expectations change.

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REVIEW OF STANDARDS – BY CAREER CLUSTER™

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Green/Sustainability Standards: All Career Clusters™

1. Define the following key terms and explain their relationship to one another:
   - Green
   - Green job
   - Sustainability
   - Sustainable development
2. Define the following core concepts of sustainability and green efforts/initiatives and explain how these concepts can contribute to the ability to solve societal, environmental and business problems while creating a more sustainable future.
   - Triple Bottom Line for business
   - Cradle-to-cradle resource use
   - Materials life-cycle analysis

Green/Sustainability Standards: All Career Clusters™

3. Define and use the following enabling concepts of sustainability and green efforts/initiatives
   - Precautionary principle
   - Ecosystem services
   - Ecological footprint
   - Tragedy of the Commons
   - Systems thinking
   - Unintended Consequences
   - Quality of life indicators
4. Utilize problem-solving skills to address a real world opportunity to help create healthier ecosystems and communities while protecting or increasing organizational health.

Green/Sustainability Standards:
Agriculture, Food & Natural Resources

1. Apply understanding of ecosystems and systems thinking to the management of natural resources to maximize the health and productivity of the environment, agriculture, communities, and society.
2. Analyze community practice or policy development related to sustainability in AFNR.
3. Communicate the impact of “green” and sustainability principles on agriculture, food and natural resource systems.
4. Recognize the social, health, environmental, and economic costs and benefits of renewable energy production (e.g., solar, wind, and biofuels) in comparison to non-renewable energies (e.g., coal, oil, and natural gas).

Green/Sustainability Standards:
Agriculture, Food & Natural Resources

5. Analyze energy usage, renewable energy options, and renewable materials options to promote sustainable practices across AFNR.
6. Use green technologies and sustainability practices to maintain safe and healthful working environments that sustain the natural environment and promote well being in the AFNR workplaces
7. Demonstrate an understanding of green and sustainability trends that are impacting processes and markets in AFNR.

Green/Sustainability Standards:
Agriculture, Food & Natural Resources

8. Apply adaptive ecosystem management to a common pool resource (e.g., an irrigation system or fishing grounds) problem which addresses ecological (data, models, concepts, understanding, and scientific responsibilities), socioeconomic (values, interests, information, assets, private sector responsibilities), and institutional (law, policies, authority, assets, public sector responsibilities) contexts.

Green/Sustainability Standards:
Architecture & Construction

1. Understand the overarching significance of the building industry—design, construction and operation/ maintenance—in humankind's global "footprint" on the environment (e.g., impact on air, food, water, biodiversity, medicine, energy and other ecosystem services).
2. Use integrated design process to accomplish green and sustainable outcomes in architecture and construction applications.
3. Examine the impacts on environmental and societal conditions over the life cycle of a building including frequently overlooked externalities (e.g., pollution, health impacts on humans involved in material procurement, humans using the building, and environmental degradation).

Green/Sustainability Standards:
Architecture & Construction

4. Evaluate the benefits and costs of green and sustainable applications in design, construction, and maintenance of the built environment.
5. Employ materials and components that are required to make the built environment more sustainable.
6. Understand options to reduce energy loads and use “green” energy sources for building applications.
7. Appreciate the regional aspects of green and sustainable building design and construction.

Green/Sustainability Standards:
Architecture & Construction

8. Communicate the value of green and sustainable practices in architecture and construction to co-workers and clients.
9. Understand the standards, regulations, and codes intended to create a more green and sustainable built environment.

Green/Sustainability Standards:
Information Technology

1. Assess, explain, and measure how IT can be used to advance and/or enable green and sustainability measures.
2. Consider impact on human health and the environment related to IT manufacturing and disposal.
3. Consider the entire life cycle of computing components and their impact on the environment.
4. Employ behavioral change models to change the culture of the organization to integrate sustainability with IT.
5. Evaluate data center energy use, and use power usage effectiveness (PUE) and other measurements that define the environmental impacts of a data center.

Green/Sustainability Standards:
Information Technology

6. Evaluate energy sourcing (including renewable and nonrenewable sources) required for IT infrastructure.
7. Explain and measure the impact IT decisions have on the environment, social conditions, and financial viability of an organization.
8. Explain green and sustainable IT policies and standards that relate to reducing permanently damaging environmental, social, and financial/economic impacts.
9. Understand and employ strategies to reduce the negative impacts of IT infrastructure on an organization's energy use.
10. Understand the impacts of an organization’s storage needs (e.g., virtual, archived, offline, online, physical) on green/sustainability efforts.

Green/Sustainability Standards:
Manufacturing

1. Communicate the benefits of applying green and sustainability principles to manufacturing.
2. Understand the state of green and sustainability efforts in U.S. manufacturing as compared with those in other countries.
3. Demonstrate how to make the business case for green and sustainability decisions throughout manufacturing.
4. Demonstrate problem solving using sustainability skills.

Green/Sustainability Standards:
Manufacturing

5. Understand and demonstrate how environmental, economic, and social sustainability are interrelated with regard to manufacturing.
6. Understand and explain existing and emerging standards, metrics, and best practices for green and sustainable manufacturing.

The following industry and curriculum resources were used as reference materials in support of completing the work of this project. Manufacturing Skills Standards Council (MSSC), May 2011, Production Standards, www.msscusa.org. Manufacturing Skills Standards Council (MSSC), October 2011, Green Production Standards, www.msscusa.org. Additional resources, assessments, certifications, and other professional development tools may exist to support engagement and implementation from the original sources.

Green/Sustainability Standards:
Science, Technology, Engineering & Math

1. Understand and explain the concept of sustainability as it applies to STEM career fields.
2. Apply STEM concepts to determine both detrimental and beneficial ("green" and sustainable) behaviors, and identify/create solutions to environmental threats (e.g., chemical toxicity in the environment, water and air quality degradation, climate change, and carbon emissions) and human welfare issues (e.g., poverty reduction, access to clean water and air and healthy food, quality of life indicators).

Green/Sustainability Standards:
Science, Technology, Engineering & Math

3. Apply communication strategies that incorporate principles of sustainability, as they relate to STEM, in oral, written, or visual formats to impact community practice and/or policy development.
4. Practice thoughtful consideration of green and sustainability issues related to STEM.
5. Apply principles of green/sustainability to professional activities.

Green/Sustainability Standards:
Transportation, Distribution & Logistics

1. Understand the role of human behavior in planning and managing green and sustainability efforts in U.S. transportation, distribution, and logistics.
2. Explain the economic costs and benefits for green and sustainability initiatives in transportation, distribution, and logistics.
3. Understand the role of technology in advancements that promote sustainability in transportation, distribution, and logistics.
4. Understand the social and environmental impacts of business model choices in transportation, distribution, and logistics.

Accessing Standards and Resources

Two methods to access the Green Standards

- PDF form – for easy review and distribution
  - Found at www.careertech.org > Career Clusters > Knowledge and Skill Statements > Green Standards
- Searchable, sortable and downloadable form
  - Found at www.metacat.net/cte
    - Must create free registration to use portal
    - Can export to Excel files

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Accessing Standards and Resources

Notes

- Green Standards to be presented with newly revised Knowledge and Skill Statements as supplemental compendium
- States with online standards databases may be able to have CTE standards portal directly populate state database
- NCTEF will assume responsibility for maintaining and updating Green Standards

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Accessing Standards and Resources

Resources

- SMEs and TWGs identified valuable resources to assist in understanding and teaching Green Standards.
- These resources cataloged by the SEED Center – they will maintain and add to resources over time

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Discussion of Standards Use

Guiding Questions:

- Primary opportunities for using the standards?
- Additional resources and tools?
- Integration and infusion opportunities?
- Alignment with emerging state and association efforts?

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Thank you!