Fostering Standards Literacy in General Education at an R1 Institution

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North Kedzie Hall

Frank S. Kedzie
1915-1921
Center for Integrative Studies in General Science (CISGS)

- Non-STEM Majors
- 12,000 students annually
- ISB and ISP Lecture requirement (6 cr.)
- ISB or ISP Lab requirement (2 cr.) ***

- Scientific Literacy !!!
MSU Undergraduate Learning Goals (ULGs)

- Analytical Thinking
- Cultural Understanding
- Effective Citizenship
- Effective Communication
- Integrated Reasoning
NIST Project Learning Outcomes

- Explain what a *technical standard* is

- Explain how standards are developed based on a combination of science, technologies, societal history, political lobbying, etc.

- Explain the organizational means by which standards are created, implemented and regulated in both governmental and commercial settings

- Explain and predict the implications (economic, social, political, etc.) of implementation of certain standards
Standards Curriculum Development and Interventions

- Embedded in the Context of Science Lab Courses
  - ISB and ISP
  - Graduate Teaching Assistants
- Reading Assignments
- Independent Research
- Case Studies
- Lab and / or Field Investigations
- Role-Playing / Stakeholder Debates
ISB 208L – Integrative Studies in Biology Lab

- Three Major Units
  - Food
  - Water
  - Energy

- USDA Food Defect Action Levels (DALs)
- Allowable limits for *Insects* in food
The industry standard for hops is that there can not average more than 2,500 aphids per 10 grams of hops (pre-harvest).

Students evaluate organic hops to evaluate whether they meet industry standards.
At least 11 different standards need to be met before a dietary supplement can be made available to the public. And, 16 different governing bodies oversee these standards to make sure they are met.
ISP 203L – Geology of the Human Environment

➢ Place Based Lab
➢ Goal: Expose students to standards; including how and why they are developed, using real world examples of local impact
➢ Stormwater (*EPA Standards*)
➢ Riparian Buffer Strips (*MDEQ Standards*)
➢ NaCl (road salt) concentrations in Water Bodies and *Soils* 

ISP 203L Students in the Red Cedar River
Literature suggests a need to re-evaluate EPA’s chronic chloride standard. (Corsi et al. 2015)

Students conduct controlled investigations to determine appropriate chloride standard for soils.
Students experiment on the effects of various chloride concentrations on germination rate and radicle growth of Buttercrunch lettuce seeds.
Stakeholder Debates

- Role-playing (stakeholders) allows students evaluate existing, or develop new standards.
- Emphasize the role of science.
- Highlight challenges associated with developing standards.
  - Economic
  - Social
  - Political
Standards Literacy Assessment

- Assessment Instrument Development
- Iterative Process
- Instrument Revision
- Coding Development
Assessment Instrument(s)

- **Qualitative Data**
  
  “What role(s) do science, technology, or engineering play in the development of Standards? Use a specific example to illustrate.”

- **Quantitative Data**
  
  “I feel very confident with explaining what role(s) science, technology, or engineering play in the development of Standards:”

[Selection options:  □ Strongly disagree  □ Somewhat disagree  □ Undecided  □ Somewhat agree  □ Strongly agree]
Assessment Data Collection

➢ Preliminary Data Collection and Instrument Revision
  ➢ Fall ‘15 and Spring ’16
  ➢ Pre- and Post- (n=500+)

➢ Academic Orientation Program (AOP)
  ➢ Summer ‘16
  ➢ n = 253

➢ Course Embedded Pre- and Post- Testing
  ➢ Fall ‘16
  ➢ Pre- and Post- (n = 1000+)
Future Directions

- Sustainability
- Cohort Experience
Broader Impacts and Additional Opportunities

- Non-traditional Student Populations
  - IAT Certificate Students
    - On-campus Certificate Students (18 – 24 month programs)
    - Off Campus Certificate Students (18 – 24 month partnership programs with community colleges)
  - VESTA NSF National Center of Excellence Students (online wine and grape education)
Broader Impacts and Additional Opportunities

- **Non-credit Training Program Participants**
  - Current training program for Food Production, Processing and Distribution in Detroit, Michigan
    - Veterans
    - Returning Citizens

- **Observations**
  - These populations seem to have an enhanced understanding of standards in their lives compared to entering freshman students.

- **Opportunities**
  - Does this translate into a benefit for employers and therefore provides an incentive to hire from these populations?
Questions?