

INCORPORATING STANDARDS EDUCATION INTO COURSES ON ENVIRONMENTAL MANAGEMENT AND SUSTAINABILITY

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Our Background

- Research and teaching in environmental management and sustainability since early 1990's
- Extensive work in field of Life Cycle Assessment (LCA)
- In Department of Engineering and Public Policy, but see students lacking general knowledge about policies, rules, standards

Life Cycle Assessment:

Quantitative Approaches
for Decisions That Matter



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www.lcatextbook.com

Free textbook online

~60 “registered” instructors
~8,000 downloads

1 full chapter on standards,
Specifically the ISO 14040
LCA Guidelines

Project goal

- Improving knowledge of, and use of, ISO 14000 Environmental Management Standard, with a focus on ISO 14040 LCA standard
 - ▣ Secondary – how can we improve the book, and the standards chapter
- Multi-institution
- Multi-perspective

Participating institutions

- ❑ Carnegie Mellon U.
- ❑ Arizona State U.
- ❑ Michigan State U.
- ❑ Rochester Institute of Technology
- ❑ U. California – Berkeley
- ❑ U. California – Los Angeles
- ❑ U. Georgia
- ❑ U. Missouri
- ❑ U. New Hampshire
- ❑ U. Pittsburgh
- ❑ Western State Colorado University

Perspectives

Students

What are you learning about standards for LCA?

What resources are needed to address standards for LCA in your course?

Practitioners

What do you need to know about standards for LCA?

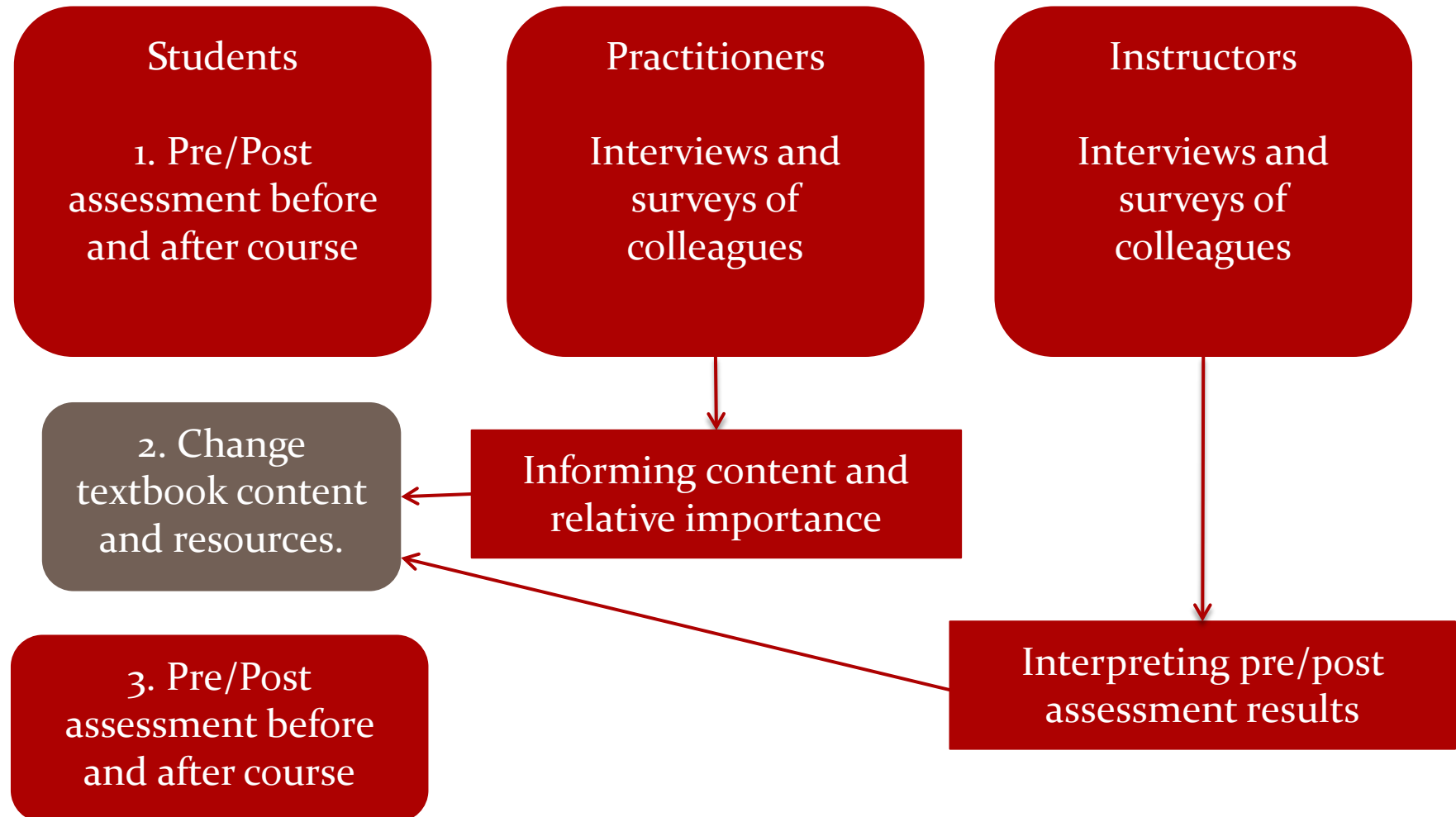
How does the standard impact your work?

Instructors

How are you including standards for LCA in your course?

What resources are needed to address standards for LCA in your course?

Methods



Student Pre/Post Assessment

- ❑ Which of the following activities were done to produce the LCA Standard (choose all that apply)?
- ❑ In what order does the LCA Standard suggests dealing with a hypothetical multifunctional system involving a refinery system?
- ❑ When did (if) you read the chapter on LCA standards?

Student assessment status

- Spring 2016 pre/post assessment, but generally low response rate.
 - ▣ Results show some learning gains about standards.
- Fall 2016 pre-assessment complete. Post-assessment to circulate in a few weeks.

Practitioner interviews

- Ongoing.
- What parts of the standard are most critical to your tasks?
- What professional development in standards have you completed?
- Review of recent work product for standards language.

Instructor interviews

- Ongoing.
- What emphasis do you place on chapter 4, ISO Standard 14040? Do you reference standards in other sections of the course?
- What are your attitudes to the standard?
- Syllabus review, assessment review

Timeline



- ❑ Fall 2015 assessment development and IRB approval
- ❑ Spring 2016 student pre/post 1
- ❑ Fall 2016 student pre/post 2, practitioner interviews, instructor interviews
- ❑ Fall 2016/Jan 2017 textbook content and resources updates
- ❑ Spring 2017 student pre/post 3, communication

Outcomes

Within Project

- Number of courses – 8
- Number of students - 300 – 500?
- Textbook chapters and associated materials – 1
- Pre/Post survey available for others to use, adapt

Extended and After Project

- Number of courses – 20 annually
- Number of students – 2K-3K annually
- General awareness for us to include standards content in other courses, materials
 - ▣ ASCE Professional Devt.

Communication

- Project shared with registered instructors
- Presentation at ACLCA 2016 Conference in Sept.
- Final results:
 - Overall results with participating instructors
 - Textbook updates with all registered instructors
 - Paper on project process and results in ASEE, JIE, as appropriate.

Lessons Learned

- IRB approval always takes longer than you think it will.
- Lower response rate (especially matched responses pre to post) than expected.
 - ▣ Could offer incentives but don't want to skew results.
- Timeframe worked for us (CMU LCA course is in Spring), but didn't correspond to when most LCA courses are taught (Fall semesters).
- Collaboration with LCA colleagues (practitioners and instructors) has been enthusiastic and informative.
- NIST colleagues contributed as well to ideas for how to improve the content of the textbook.

Project Management Challenges

- ❑ Original time frame dependent course timing and on reasonable response rate from students, which we didn't get. Including CMU students.
- ❑ So, extending for an additional semester (Spring 2017) to get feedback we need. Will likely run pre/post again in Fall 2017 as well.
- ❑ Budgeting and staffing sufficient.



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