

Learning in the real-world how to develop solutions for sustainability problems

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Implementation in Inter- and Transdisciplinary Research, Practice and Teaching | Td-net conference 2010 | Geneva, Sep 15-17, 2010

Leonard's Story



A Vision for Real-World Learning

“Imagine what might happen if students were regularly assigned actual sustainability problems that were brought to higher education by cities, businesses, nonprofit organizations, and other institutions. If classroom exercises produced workable contributions to solutions, students would understand they can have a positive impact on the world through their academic learning.”

“Most of our higher education institutions include somewhere in their mission statements goals for preparing students to help create a better society, yet this ideal is often not fully implemented.”

POLICY FORUM

SUSTAINABILITY

Education for a Sustainable Future

Debra Rowe

Sustainability is a lens through which increasing numbers of individual colleges and universities, as well as national organizations, are collectively examining and acting upon our shared world systems (1, 2). In the United States, a national trend has begun, but much more needs to be done.

College and University Actions
Sustainability is being integrated into US institutions' mission and planning, curricula, research, student life, operations and purchasing, and community partnerships. Students and staff at hundreds of campuses are engaged in sustainability committees and actions, including the following: learning to focus on acquiring sustainability knowledge and application; developing sustainability-oriented film festivals, speakers, and other campus events; socially and environmentally responsible criteria for purchasing and endowments; infusion of sustainability into the general education core requirements, courses, disciplines, whole colleges, and specialized degrees; and regional and global approaches to sustainability in collaboration with business, government, nongovernmental organizations (NGOs), and independent through high school (6-12) education.

Core requirements at many universities and colleges (e.g., Portland State University, Miami Dade Community College, University of Minnesota) include the components of sustainability education, even if the word sustainability is not specifically used. Degrees in sustainability have proved up at dozens of institutions (see (3) for a listing). In the Campus Climate Challenge, students on over 400 campuses are working with administrators and staff to measure and reduce greenhouse gas emissions (4) and are voluntarily raising student fees and changing energy policies to move to renewable sources.

US business, architecture, and engineering schools are in the forefront of sustainability education. Architecture and engineering schools have criteria for accreditation that require students to be able to understand and implement sustainable design. Non-profit organizations such as Engineers for a Sustainable World and Engineers without Borders have developed. The World Resources Institute and the Aspen Institute have worked with business schools to develop case studies and business curricula that include sustainability principles and practices (5). Increasingly, interdisciplinary learning experiences focus on our sustainability challenges.

The purchasing power alone of colleges and universities, as they demand more environmentally and socially responsible products and processes, can help move sustainability from its present niche markets to become the standard in product and process design. This can be expressed through commitments to sustainable behaviors and policies in institutional mission and planning; more energy-efficient and greener buildings and operations; substantial purchases and installations of renewable energies and commitments to carbon emissions reductions and neutrality; sustainability audits and reporting; and sustainable living campaigns in the residential halls. For example, over 300 presidents have signed commitments and taken actions to move toward carbon neutrality and to eliminate greenhouse gas emissions. Michigan State University, NYU (New York University), University of California at Berkeley, the Pennsylvania State University, and others have conducted sustainability audits and reports. Sustainability-oriented residential living practitioners are in place at Bowdoin, Carnegie Mellon, Dartmouth, Harvard, Tufts, University of Vermont, and Yale. Rutgers and the National Association for Educational Procurement have focused on developing resources for the purchasing side of sustainability (6, 7). Stanford University has developed both environmental and social sciences for their endowments.

A statement drafted by the Business Sector Team of the U.S. Partnership for Higher Education to make sustainability education a requirement for all undergraduates. Participating members come from both small and large corporations—from media conglomerates to energy companies such as Duke Energy and consumer products such as Duracell. “All students need to learn, through an interdisciplinary approach, not only the specifics of our sustainability challenges and the possible solutions, but also the interpersonal skills, the systems thinking skills, and the change agent skills to effectively help to create a more sustainable future. We are looking for these sustainability-related students as future business people, as employees, as consumers, innovators, government leaders and inventors” (8).

Activities of National Organizations
After the United Nations declared a Decade of Education for Sustainable Development (2005-14), a grassroots effort from higher education developed in the United States in the absence of a federal government response: The National Council for Science and the Environment hosted its annual conference in 2003 on Education for a Sustainable and Secure Future. One of that meeting, the U.S. Partnership for Education for Sustainable Development (9) was created to catalyze a U.S. response for this decade and beyond. This national network of over 300 organizations has sector teams in Faith, Business, Communities,



Sustainability is being integrated into higher education institutions' mission and planning, curricula, research, student life, and operations.

Downloaded from www.sciencemag.org

President of the U.S. Partnership for Education for Sustainable Development, Washington, DC 20037, USA. E-mail: drowe@qualtek.edu

www.sciencemag.org SCIENCE VOL 317 20 JULY 2007 323

Rowe, 2007, *Science*, 292, 641-642

Sustainability Programs

Curricula

- Discipline + sustainability (“Add-on”)
- Genuine sustainability degree programs

Project initiatives

- On campus (ANU Green, Sustain, UBC, Play-a-greater-part)
- On campus and in the community (seed-sustainability, ETH Zurich)

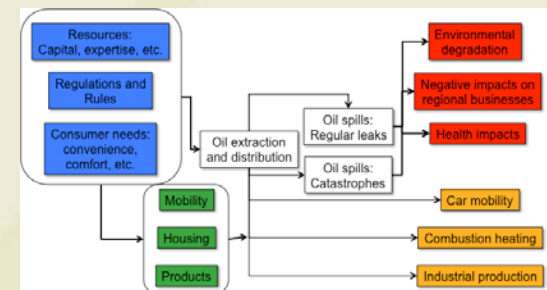
Real-World Learning and Sustainability

Complexity of sustainability problems

Problem-solving and transformative change

Competencies in sustainability

Exposure and reflection



Variety of formats for real-world learning

Table 1. Overview of key differences among dominant models of real-world learning formats

	Project-based Learning	Service Learning	Internship
OUTCOMES: What students learn/benefit	Collaborative problem-solving capacity	Education and teaching capacity	Professional working experience; career development
PRACTICES: What students do	<i>Collaborating with partners to develop solution approach</i>	<i>Educating people</i>	<i>Assisting or working on a professional project</i>
INTERACTION with stakeholder	Two-way knowledge generation (co-production)	One-way knowledge transfer (students to community)	One-way knowledge transfer (employer to student and student to employer)
INTEGRATION of theory and practice	Explicit, supervised by faculty and stakeholder	Implicit, not supervised by faculty	Implicit, not supervised by faculty
IMPACTS on world	Systemic innovation	Support of social innovation and change	Modular innovation

Brundiers , Wiek & Redman (2010) Real-world learning opportunities in sustainability – from classroom into the real-world.
International Journal for Sustainability in Higher Education

Services at the School of Sustainability

Class-based

- Preparatory -- part of a course
- Hybrid courses

Project-based

- Capstone projects
- Solution workshops

Differences

Small

Instructor

Practice or academic

Low

Scope

Responsibility

Focus of collaboration

Intensity of interaction

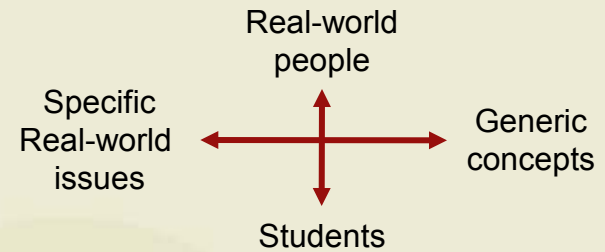
Large

Student

Transacademic

High

Class-based activities



Bringing the world in

- Documentaries
- News paper article
- Stakeholder analysis

Visiting the world

- Participatory observation
- Attendance of meetings open to the public
- Fieldtrips & prepared Q&A

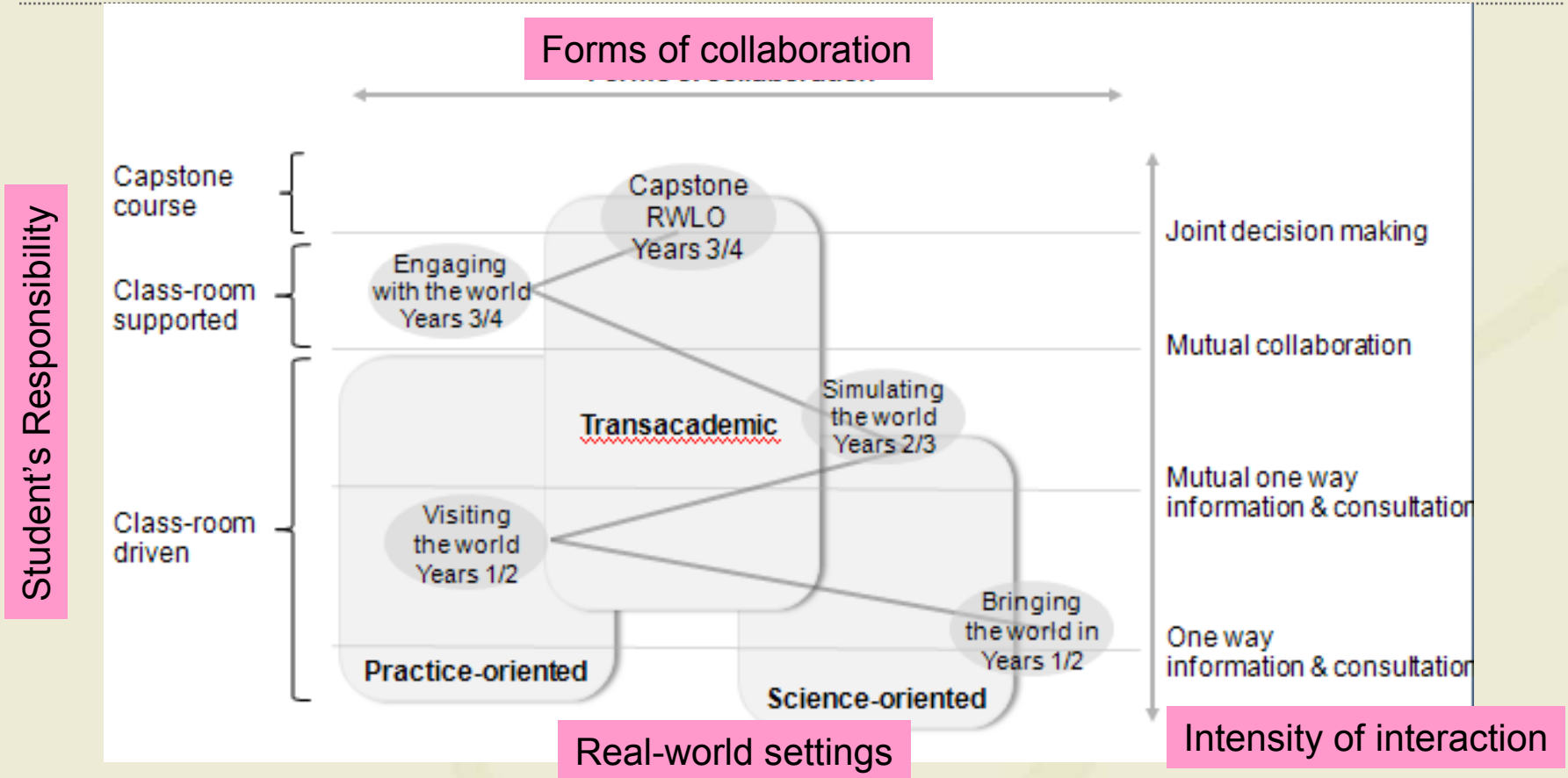
Simulating the world

- Group discussions (TV-talk show, panel, debates)
- Simulated negotiations
- Role plays

Engaging the world

- Moderated guest speakers
- Presentations to experts
- Panel discussions

Class-based: A functional-progressive model



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Policy and Governance in Sustainable Systems

Type: Hybrid, 65 undergraduate students

Partner: Arizona Department of Water Resources

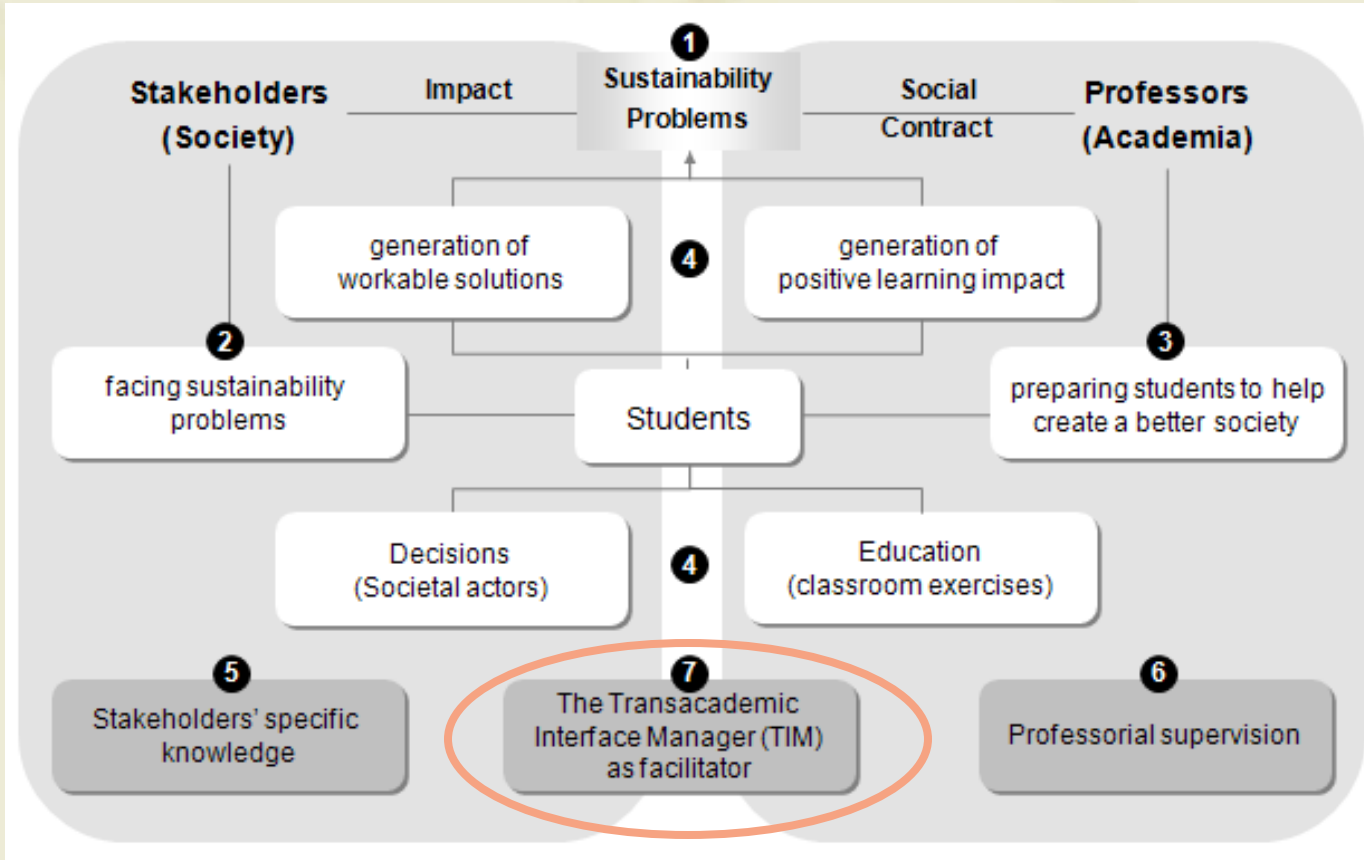
Goal: Improve drought monitoring in a sustainability perspective

Activities: 4 sessions for joint problem-definition & deliberation of solution approaches, extended peer-review of 65 reports

Outcomes: short-/long-term actions; td-award; internships

My role as TIM: jointly define project; facilitate collaboration; coach students; debriefing/evaluation

Project-based: Transacademic collaboration



Brundiers & Wiek (in press) Educating Students in Real-world Sustainability Research: Vision and Implementation. *Innovative Higher Education*

Guide for transacademic sustainability projects

Requirement / Feature	Criteria	Guiding questions to help assessing each criterion
(1) Actual sustainability problems	<ul style="list-style-type: none"> a. Long-term dynamics b. Cross-domain and cross-scale complexity c. Cause-effect structure d. Specificity e. Urgency f. Harmfulness 	<ul style="list-style-type: none"> a. Does the problem impact future generations? b. Does the problem feature tensions between social, economic, environmental domains as well as inter-linkages across global, national, local levels? c. Does the problem have multiple causes and impacts? d. Is the problem spatially and temporally embedded (place-based)? e. Is the problem pressing because it is quickly getting worse, even irreversible? f. Does the problem result in harm that threatens socio-ecological viability and integrity?
(2) Stakeholders facing the sustainability problems	<ul style="list-style-type: none"> a. Initiation b. Problem ownership 	<ul style="list-style-type: none"> a. Do stakeholders approach researchers to address the problem? b. Does a process of collaboration and negotiation lead to joint ownership?
(3) Preparing students to help create a better society	<ul style="list-style-type: none"> a. Corresponding specific and generic sustainability knowledge b. Link knowledge to action c. Problem-solving techniques d. Interpersonal skills 	<ul style="list-style-type: none"> a. Does the project allow for acquiring knowledge that is valid beyond the specific problem situation? b. Does the project allow for acquiring knowledge that links various forms of knowledge and ultimately leads to substantiated and tested recommendations for change? c. Does the project allow for exploring problem-solving tools and techniques? d. Does the project allow for acquiring communicative and collaborative skills?
(4) Generation of workable solutions and positive learning impact	<ul style="list-style-type: none"> a. Salient, extended peer reviewed products b. Generic transformative "impacts" 	<ul style="list-style-type: none"> a. Does the project result in theses and other products that include strategies, plans, or recommendations for action agreed upon by all relevant stakeholders? b. Does the project induce changes in knowledge, attitude, decision-making, or behavior towards sustainability?
(5) Stakeholders' specific knowledge	Two-way interaction	Does the project involve stakeholders during all research phases in a way that goes beyond extraction and exchange of information? Do stakeholders and scholars jointly negotiate, revise, and synthesize knowledge, and take decisions?
(6) Professorial supervision	Academic supervision	Do the professors advise students' academic thinking (e.g., structure, coherence, consistency), convey basic academic practices (e.g., research design, literature review, research techniques, scientific writing, presentations), and supervise their academic performance (e.g., jointly identifying objectives, providing feedback)?
(7) The Transacademic Interface Manager (TIM) as facilitator	Transacademic interface management	Does a TIM provide the services of translation of scientific knowledge and integration of scientific with practical knowledge, coaching, and project management that is satisfying for all parties involved?

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Future scenarios of agriculture and water in AZ

Type: Workshop, 12 graduate students

Goal: Future scenarios for agriculture -> governance recommendations

Partner: 25: farmers, policy, planners, water managers, NGO's, scientists

Activities: fieldtrips, listening sessions, interviews, active deliberations

Outcomes: public debates (!!); report; dissertation themes

My role as TIM: preparation, concept for engagement, observation/reflection

First evaluations indicate

Caution: limited basis -> need evaluative framework

Preliminary finding: match exists!

“Matching” requires deliberate choices

- form of real-world learning ↔ the desired outcomes
- experience ↔ structured reflection
- self-directed approach by students
- build capacity for transacademic engagement

Institutional support system

- **Actor specific coping-strategies**
 - Institutional embedding
 - Tenure review, staff support (TIM)
 - Coordination across courses and intro-course
 - Involve community partners -> collaborate design!!
- **Actor specific info about services**

Key messages

Real-world learning experiences for sustainability research and problem-solving

- are **important**
- are **feasible** (templates and experiences exist)
- Are available in a **variety of formats**
- Require **institutional embedding** and support systems

References

Brundiers, K., & A. Wiek (2010) Educating Students in Real-world Sustainability Research: Vision and Implementation. *Innovative Higher Education*

Brundiers, K., Wiek, A., & C. L. Redman (2010) Real-world learning opportunities in sustainability – from classroom into the real-world. *International Journal for Sustainability in Higher Education*

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