

Knowledge Mobilization with Service Learning and Open Source Appropriate Technology

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Queen's
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Outline

- Need for KM even in 'Applied' Science
- Service Learning in Engineering
- OSAT
- Examples
- Grant writing



Cooperation. Dr. Cumberbatch, Cooper Union in Northern Ghana and SUN in India



Need for KM in 'Applied' Science

- Most problems in Sustainable Development solved in a science/engineering sense but
 - 10.8 million children <5 yrs old die/ year from preventable causes ~ 30,000/day
- Deaths due to poverty
 - ~ 1.2 billion people living <\$1/day
 - ~ 2.8 billion people living < \$2/day
- The “Developed” World economy completely dependent on FF, 50% cut with off-the-shelf tech., absurdly slow uptake





Service Learning in Engineering

- Service learning is a teaching method, which combines community service with academic instruction as it focuses on critical, reflective thinking and civic responsibility.
 - SL positive for students, faculty, educational institutions and involved community partners
 - Students more motivated, work harder, learn more and experience lasting benefits
- ...but often viewed as “forced community service” or vapid “how do you feel” journaling



In Engineering and Science SL must be 'hard'

- SL as 'outreach' for research and tie directly to curriculum
 - MECH460/461 Capstone/Research
 - Specific problem set for advanced classes
- Find appropriate partner/ work only on part of project/ virtual SL*
- Solve same problems normally tackled in courses but applied to real life
- Publish in





Open Source Appropriate Technology

- OSAT- technologies that are designed in the same fashion as free / open-source software.
- Open source is a development method for AT that harnesses the power of distributed continuous peer review and transparency of process.
- Result in better quality, higher reliability, and more flexibility than conventional design/patenting of technologies.



Virtual Service Learning: Appropedia.org



- Site for collaborative solutions in sustainability, poverty reduction and international development through the use of AT and the sharing of project information
- Wiki
- Growing rapidly – over 16,000 articles, 1000s of users, millions of page views. Enables Virtual Service Learning and open lab notebooks



Appropedia for Virtual SL, Lab Notebook

- Appropedia used for free as a course information system for several courses to
 - i) coordinate an online course and distributed service learning projects,
 - ii) a means of topic review for specialized technical courses, and
 - iii) a means of interdisciplinary integration.
 - iv) AT Labs for Science and Engineering

- In research as Open Lab Notebook

- at least protocols, lit reviews, and applied results (overcome closed publishing)



1. For Online Course

● Physics of Energy and the Environment online



- i) share information with fellow students that may have never met,
- ii) collaborate on documents, LED FAQ
- iii) coordinate a sustainability-focused service learning outreach campaign.
 - 4.3 year payback, 20% ROI, saved municipalities in PA thousands/year
- iv) review physics with application to technologies for sustainable development



2. Topic Review for Specialized Course

Materials Processing and Nanotech

1. appropriate use of nanotech/mp of their choice that has a positive sustainable development impact
2. assist students review physics & materials engineering covered in the semester and explore one area of new nanotechnology in depth

Huge Motivation Aid – OLPC

- high efficiency solar cells, fuel cells, or producing nanoparticles for purifying water received thousands of views.



3. Interdisciplinary Integration

- Modern Languages and the topics in applied sustainability provided an opportunity for students to increase their language proficiency while learning about concepts related to sustainable development
 - Small group IS German
 - German Conversation and Composition – offered simult. At 3 Unis via interactive TV
 - Translation and unit on enviro. Sustainability
 - expanding to Ekopedia/Appropedia collab.

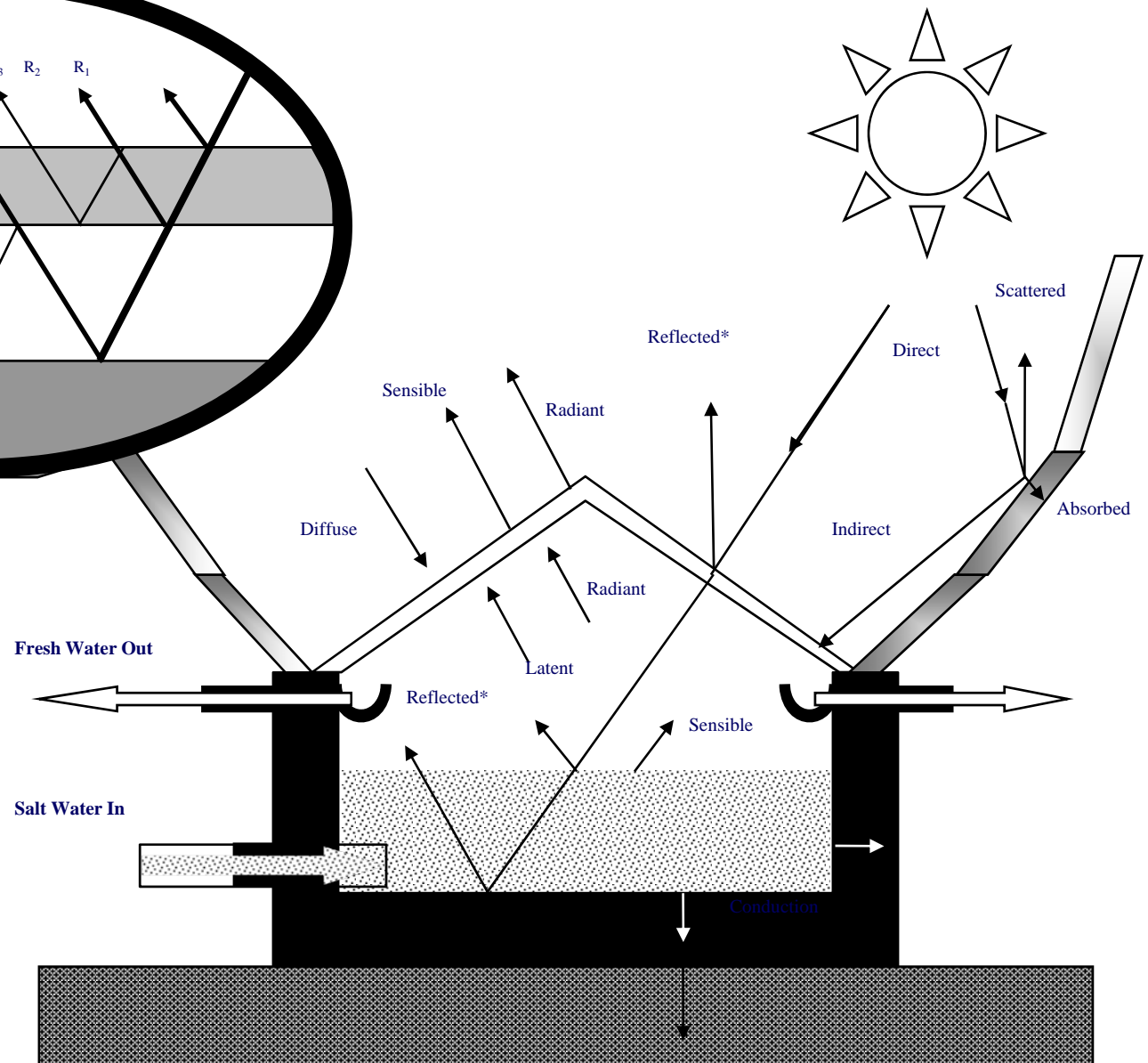
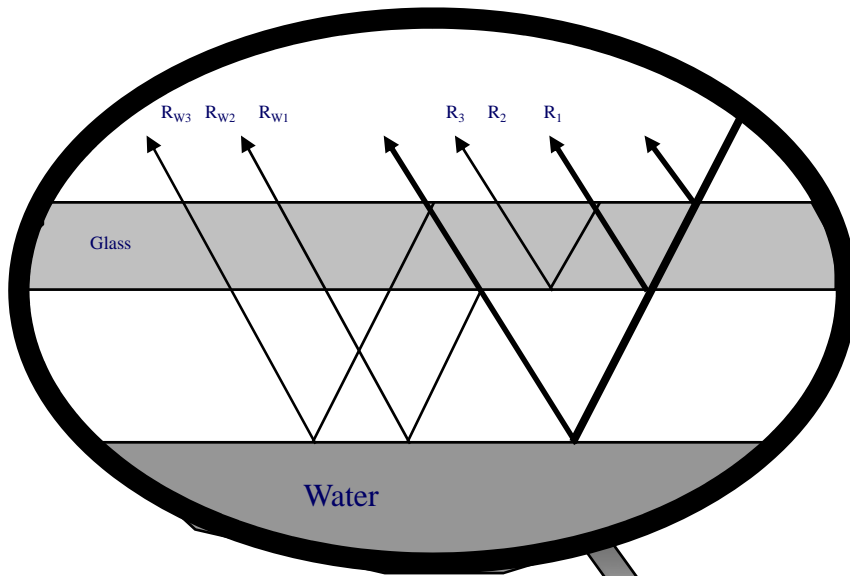


4. Laboratories

- Semi-open structured labs – MECH396 Dye sensitized titanium-dioxide solar photovoltaic cell
- Design your own based on AT principles



Example 1: Solar Still - Desalination



Example 2: Horizontal Axis Tarp Windmill – LED Lighting



Other Examples:
stoves/ovens,
compost bins, solar
water purifiers,
solar cookers,
biological waste
treatment,
rainwater
catchments, metal
kilns, passive solar
devices, wind mills,
micro-hydro,
aquaculture,
methane digesters,
brick making,
"chicken tractors",
basic water
pumps, etc.



Example:

OSAT/SL as KM in Grants

- Webster, J., Jenkin, T., and Pearce, J.M.
“Implementing Environmental Responsibility in Organizations through Information Technologies and Systems”, Strategic Research Grants - Canadian Environmental Issues, SSHRC, \$231,190
- Decentralized Co-generation Hybrid System: Microturbine and Solar Photovoltaic, National Fuel, \$163,996

