

NOTES FROM IPIDAT 2006

GLOSSARY

- IPIDAT = Indian Point International Development and Appropriate Technology
- AT = Appropriate Technology
- PV = photovoltaic
- EWB = engineers without borders
- U2U = university to university program
- SODIS = solar water disinfection
- 🛠️ = action items

EXPECTATIONS

- gather thoughts for curriculum
- forced into heavy thinking
- geek party tricks
- sharing what I've done, get encouragement
- engaging conversations
- possible **collaborations** & next steps for them
- mechanical-type projects
- trading ideas
- funding avenues
- learn a lot from others
- meeting people
- commercialization/entrepreneurs hip aspects of this work
- **rejuvenation**
- low-tech exercises that can be done quickly
- how to carry on projects beyond one semester
- ways to start an AT program at UMass
- improving class
- involving HS students
- excitement
- Bringing AT inventions to the World's Fair in 2008
- getting engineering students developing products for developing regions
- words of wisdom for teaching AT classes, particularly for building


PRESENTATION OF EXISTING MATERIALS & WORK

Peter Haas, AIDG

- runs Appropriate Infrastructure Development Group, founded in 2005
 - entirely volunteer in US; 3 FT, 8 PT, 10 paid Guatemalan engineers
- 3 programs
 - business incubation – starting with one in Guatemala
 - training Guatemalan engineers to develop engineering solutions and sell them to non-profits and the public via no-interest loans
 - no-interest due to regulation nightmares; funds that are returned will be used to start new businesses in other countries
 - education
 - service learning tourism
 - project placement & internship program: help students get their products out into the field
 - outreach program
 - direct charity
 - helps shop with training experience
- Technologies: water, wind, PV, water purification (starting), biogas
- currently funded by private donations, \$50K last year, this year aiming for \$180K

Chris Carr, MIT

- Working on life detection in Mars
 - may provide opportunity for low-cost DNA analysis

 *interested in cell phone applications tailored to developing world to help with revenue generation – would like help knowing what exists, and is needed*

Jessica Thomas, Duke/Cures

Distributed Engineering World Health News pamphlet

- Duke Engineering World Health program
 - increasing healthcare technology in developing countries
 - introducing products
 - identify gaps in technology
 - CUREs business plan competition to commercialize health care technologies
 - course – design for developing world, works in parallel w/ CUREs

Stephanie Dahlquist, MIT

- interested in how to foster businesses & distribute appropriate technology
 - trained as an engineer
- course & research

Amy Banzaert, MIT

- Working on methods for introducing aspects of international service projects into the core curriculum of the mechanical engineering department.

Stephanie Bartos, Carnegie Mellon

- non-majors class that she'd like to pull into sustainability issues
- Also two classes with senior-level, design-intensive projects
 - Occupancy (60,000 SF design)
 - community-based, working in West VA & in a town in Pennsylvania doing distance learning
 - Systems Integration
 - technology-based, for example, Haiti-focused class, Tsunami disaster - drop-in disaster relief; 12 modular clinics that could work remotely; 100,000 SF hospital in Haiti w/ no infrastructure
- how to link these classes using a "ball joint" so that students can not take both but still transfer information, learning
- projects are all prototypes

Bree Carlson, UMass Amherst

- appropriate drinking water techniques for developing countries
 - acidification using lemon & lime juice
 - sari filtration
 - solar disinfection
- president of EWB @ UMass
 - no good courses @ UMass, would like to start a class

Bill Schultz, UMichigan

Distributed Cultural Viewfinder

- teaching Engineering for Community for past three years
 - freshmen - PhD students
 - 2/3 engineers
 - no pre-reqs, so hard to offer technical credit
 - primarily team project course, international & local
- working on desalination on large scale, using waste heat from power plants
- working with Whirlpool to make washing machines using 1/3 water, 1/2 detergent

 *colleague would like feedback on cultural viewfinder, see website*

Inger Schultz, UMichigan

- hear to learn
- starting to look at desalination - basic water chemistry of aquifers

Jeff Kranski, CalTech

- involved w/ Product Design class that's pulling in more AT topics

- one project became a business this year
- would like to improve class further
 - pull in Guatemalan students, art students

Gabe Bauchat Grant, Purdue

Distributed proposal for Enabling Innovation

- orig. in physics
- studying ecological engineering – how to create symbiosis in industries, reusing byproducts
- 3 conferences
 - Byron Fellowship to get people involved & knowledgeable about sustainable living
 - Future Leaders Workshop on effecting change
 - Industrial Ecology student conference

 would like feedback on Enabling Innovation proposal, see handout

Ashish Sahu, UMass

- background on chemical engineering
 - conducting biogas research
- interested in commercialization
 - trying to commercialize wastewater purification

Shawn Frayne, MIT

- Working on developing technologies
 - Charcoal from agricultural waste, focused on sugarcane waste in Haiti; lots of potential for micro-enterprise, improved environmental impact
- Interested in how to make these technologies sustainable, effective, appropriate

Scott Albritton, Purdue

- Work in ed. technology, ed. psych degree
- Want to work in AT field
- Interested in developing a database of existing appropriate technology solutions
 - would include a search capability to find devices based on existing available tools & skill sets & needs
 - would be cellphone accessible
 - intended for people needing technology in developing countries and those developing technologies in academic settings
- side project in extrusion for architecture – domes of any size using just 3 different extrusions

Amos Winter, MIT

Distributed handout on course/goals

- Teaching course on wheelchair design for developing countries

- Working to use mechanical engineering to improve wheelchairs and develop new solutions

Amy Smith, MIT

Distributed: Fall term syllabus, spring term syllabus – or get at <http://web.mit.edu/d-lab>

- D-Lab (development, design, dissemination, dialogue, discovery, delivery)
 - 4-parts
 - In fall, class focuses on development and appropriate technology
 - guest speakers, toolkit of how to (make latrines, test water quality, make charcoal, make peanut shellers, use drip irrigation kits, etc.)
 - working to develop itinerary & projects for January trip
 - Over January break, travel to the field to work with non profit organizations for 3 weeks, (6 countries last year: Ghana, Zambia, Lesotho, Brazil, etc.), and get ideas for projects
 - returning to same places over time, so starting to see real change
 - In spring
 - design class focusing on appropriate technology – device created to solve an issue
 - dissemination class looking at dissemination, implementation, and distribution models for new technology
 - In summer, extended field trips via U2U program
 - continuing projects class for working on continuing projects
 - Many inventions from classes
 - charcoal project, low-cost water testing, SODIS, peanut processing, wheelchair projects

 how do we scale up these projects to reach more people

 good interactive exercises (discussion, debate, role play)

- Trying to start website: What's Where?
 - documents what materials are available in different developing regions
- IDEAS Competition – community-service based innovation competition
 - <http://web.mit.edu/ideas>
- Guest speakers

 how to coordinate & strategize

Donna Cohn, Hampshire College

- background in assistive technology, now also appropriate technology
- Work at Lemelson Assistive Technology Development Center (LATDC);

- Starting to work on appropriate technology, class
- Mix of students
- Want students to learn about appropriate technology by making things, not necessarily innovative
- Focused on pedal-power most recently
- Worked with Ralf Hotchkiss from Whirlwind Wheelchair international
- Good fabrication shop – lots of low tech, nice for appropriate technology
- worked on bicycle ambulance for international setting
 - many students want to focus on local project

Aaron Wieler, Hampshire

- Appropriate technology design class
 - mix of theory and fab and design
 - projects: water treatment, wood cookstove, bicycle transportation, etc.
 - partners: Whirlwind, Kickstart (formerly Approtech), and a cookstove group in Oregon
- Moving to Namibia to work with Bicycle Empowerment Network on ambulance project
 - setting up a shop
 - identify needs

UPDATE ON PAST IPIDAT INITIATIVES

Dissemination class offered @ MIT in spring (see syllabus handout)

- undergrads, grads, 8 projects, many disciplines
- looked at many case studies (used Diffusion of Innovation textbook)
- projects
 - ceramic filters in Ghana
 - solar microgenerators for hot water and electricity in Lesotho
- considered social issues, manufacturing, funding, intellectual property
- for case studies, see web.mit.edu/d-lab/, click on d-lab III

Enabling Innovations Website

- primarily focused on gathering information currently, building a coalition, identifying key partners and organizations
- trying not to reinvent wheels or compete
- investigating funding opportunities
- desktop database mocked up in Access by a student

University 2 University (U2U)

- MIT, Harvard, and U. Zambia students working in a village in Zambia for the past two years
 - sanitation
 - PV system for adult education
 - agriculture
- Collaborations w/ UNZA & village & Harvard going well but need to work on bringing in students who aren't at universities in Cambridge, MA
- Looking to work w/ U. Sao Paolo, U. in Rwanda
- Need a program director

IPIDAT Bibliography

- has continued to be updated
- primarily print resources, some films, a few web links

Course syllabus collection

- would be a cool thing to create – probably a wiki

I NEED ... I KNOW

- Good books:
 - Ecology of Place
 - The Skeptic Environmentalist (somewhat controversial – some good critique, some not)
 - Mastering the Machine: technology, development, & poverty
 - Gaviotas (good general reading)
 - see more on bibliography, post-it-note
- Design challenges for classes
 - Paul Polak ran a session @ MIT
 - designs for a \$100 house
 - Jock Brandis worked with students to brainstorm on peanut shelling
 - with guest speakers, have brainstorming dinners where guest speaker provides some material/product for brainstorming
 - guest speakers add interest and exoticism and years of experience and a specific concept to focus on
- Contests/Awards/Funding
 - Ben & Jerry's
 - World Bank Development Marketplace
 - Echoing Green Fellowship
 - Saatchi & Saatchi
 - Bid Challenge
 - St Andrews
 - California Clean Energy Initiative
 - Ignite Clean Energy
 - EPA P3
 - MIT \$100K
 - TED Prize
 - MIT IDEAS Competition
 - Proctor & Gamble
 - Volunteer & people will fund your volunteer work
 - Ashoka Fellows
 - Tech Museum Innovation Awards (based in San Jose, must be implemented already, not startup funding)
 - Mass Tech Competition
- Film on participatory development
 - Aaron should get from Gabe
- Guatemalan people/orgs who might collaborate with Caltech class
 - AIDG & Peter
 - MayaPedal via Stephanie from MIT

WORKING GROUP BRAINSTORMING

- Design Donna's class on AT – hands-on in a liberal arts environment
- Ways to engage Chem E's in AT
- Water purification technology conversation
- World's Fair pavilion planning
- What's where website
- AT database brainstorm – what makes it really useful?
- 1-2 week projects for advanced undergrads
- Short courses or demos to show basic principles of physics, biology, chemistry – elementary school-aged kids; ideally useful, maybe
 - radios, microscope
- term-long design projects, geared toward AT
- quick & dirty how tos on prototyping
 - legos
 - cardboard & glue
- High school AT outreach
- bridging cultural gap between students and beneficiaries
- specific mini-curricula/teaching modules for
 - water quality, cooking, transportation
 - hands on and theory
- sharing of syllabi, texts, media, and guest speakers (add to bibliography list)
- strategies to teach technical principles in a liberal arts environment & vice versa
- design methodology for non-designers
- disseminating technology on a grand scale
- incubator for tech transfer, for scaling up
- tracking failures and successes and progress of projects
- develop interactive classroom exercises, possibly based on Mastering the Machine
 - see innovation diffusion game
- making decisions given uncertainty, including mathematical models

TECHNOLOGY SHOWCASE

- super money-maker plus irrigation pump (Aaron)
- Paul Polak's low cost drip irrigation kit (Amy S. & Shawn)
- extruded framing/construction (Scott)
- agricultural waste charcoal (Amy B., Amy S., & Shawn)
- rocket stove (Aaron)
- Solar water disinfection bags (Shawn & Amy S.)

PRESENTATION OF WORKING SESSIONS

1-3 Week Projects

- pot in a pot (Nigerian technology) – evaporative cooler; extends lifetime of produce . . . how do you redesign this product (terra cotta pots, sand, & water) to increase surface area / maximize cooling; to increase mobility (bicycle-based?, for longer project), to make a bigger storage device (longer term), how to apply to US market
 - Explain principles and prior art
 - table of materials, start building something that works
 - have data loggers and temp & humidity sensors to test
- water purification unit appropriate for all developing countries
 - two containers ... bottom is terra cotta for evaporative cooling
 - top is ceramic or terra cotta or other filter
 - test very turbid water
 - add alum (after shave) for coagulation
 - how can we speed up the time to filter?
- urine purification
 - use synthetic urine
- ways to make solar concentrators
 - why it's not used as a cooker for developing countries, generally
- how to get value from waste
- **all of these projects can be combined**
 - via alternative technology kitchen

Interactive Projects


- How do we get people thinking about issues in AT; very interactive & engaging activities ... led to 3 groups discussing activities
- Water & (hidden) gender issues role play: get together a group to discuss where to put a water system in a village and what technology to use
 - look over list of important people in village, choose whom to include (head master, PCV, village leader, etc.)
 - take on characters, investigate, and start debate on the next day
 - each character has a description (such as too shy to talk, or very aggressive, or resistant ... but far more detailed)
 - hidden feature – who's not on the list – women and children who collect the water
 - have debate
 - then discuss whether effective
 - follows a demonstration of water treatment technologies to reinforce learning
 - educators may amass lists of best roles to choose/refine

- needs: map of village (resources, who lives where)
- Ways to inject social/political thinking into conservative engineering classes (students and faculty can be conservative)
 - examples from our society where our societal quirks have led to adoption (or not) – iPod
 - one problem on a problem set that's more socially-oriented
 - TA teaching a lecture or recitation
 - call it user analysis (not role play) and add in some sort of analysis, not just talking
 - do the work as homework, then bring into role play
 - create a role play that shows how just university engineering or just local knowledge not enough, combo is best
 - necessity of speaking the same language as the audience
 - focus on the clever technical aspect
- exercise to bring out reasons for participatory development
 - 2 people, each have information about water issues in their village
 - have discussion, then present a summary of the conversation to another person
 - purpose is to test listening skills – when reporting out, third party scores how many points are hit
 - listening game done multiple times per semester, to get people to practice, use appropriate theme
 - could expand to solving problems – requires integrated thinking
 - could change objectives/constraints for each exercise over semester
 - maybe like taboo, some words you can't use (such as sex, when talking about STDs)

AT Database

- needs to be a clean user interface, not a lot of clicks, intuitive, low bandwidth
 - thinkcycle was too complicated
- need to be able to pull off documents to use offline
- needs to facilitate communication exchange
 - document need
 - current technologies
 - user info
 - 1-min. video might be much more engaging
- tag system rather than a file structure system
- what would make this worthwhile to incorporate into classes for profs; worthwhile for people in developing regions
- incorporate what's where vision via search logging
- google toolbar idea – can just search “EWB/ESW/etc” or all of the database




Dissemination & incubators for scale-up

- the essence of the beast is that this is difficult
- individual case studies might be the best way to learn
 - technology developed at UMass – sanitation system for septic tanks, a denitrification device
 - can be scaled up or down
 - gathered market data
 - focused on developed countries, where market is greater; regulatory push is needed for worldwide implementation
 - MIT charcoal project
 - for scaling up, discuss motivations – many people making briquettes, or one industry making many briquettes
 -  would like to develop flow chart to help think about best practices for different types of scaling (via wiki)
- when doing mass marketing, do we lose the A in AT
 - realities of putting people out of business
- how can this be bottom-up, not top-down

World's Fair: ZIPIDAT 2008

- their theme is water & sustainable development
- our theme is invention for developing countries
 - next generation invention is for people in developing countries
- created an outline for a pre-proposal
 - structure of pavilion
 - multiple villages, showing systems approach of how different inventions work together, and that different solutions work in different locations
 - outdoor garden
 - model mini-villages
 - interactive exhibits
 - InvenSH₂O
- becomes a traveling road show afterwards
- convert to Horizons II at Disney

THE FUTURE OF IPIDAT

- ZIPI DAT 2008, mark your calendars for Zaragoza!
 -  need to figure out funding
 -  stephanie can help with process, and design ideas
- technology showcase, leading into bbq, was nice
 - make a composting toilet next time
 - would have been nice to do the computer-based aspect
- I need I know would be more valuable if it was written on the wall, less rushed
 -  should be part of the wiki
- look through minutes from last year as basis for a conversation
- brainstorm on one single case study/village - "what's appropriate about it" ... help with thinking about AT
- more paper
- ½ day to have user end people / university people from other countries add diversity to group

FUTURE STEPS

- place for case studies, role plays, etc.
 - like the D-lab folder - printed or easily printed from online
- collection of syllabi - on wiki
- feedback on board for AT database
 - they'll follow up with Phil, too