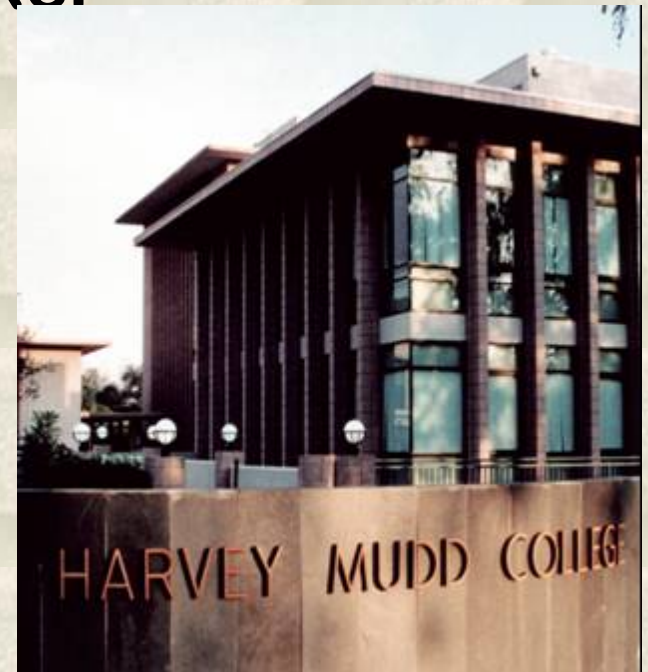


The Clinic and Global Clinic Programs at Harvey Mudd College

Colloquium on International Engineering
Education, Nov 7, 2008

Prof. Shenda Baker



Clinic Program at HMC

Overview

HARVEY MUDD COLLEGE



Harvey Mudd College

- Highly selective liberal arts college of science and engineering
- Student/faculty ratio is 9:1
- Enrollment ranges between 700 to 740
- Among top undergraduate programs in science and engineering
- One of the top 15 liberal arts colleges
- Competition: Stanford, MIT, Caltech



Strategic Vision: HMC 2020

- The new vision revolves around six themes:
 - Innovation, Leadership, and Impact, Especially in Engineering, Science and Mathematics
 - **Focus on Experiential and Interdisciplinary Learning**
 - Unsurpassed Excellence and Diversity at All Levels
 - Nurturing and Developing the Whole Person
 - **Global Engagement and Informed Contributions to Society**
 - Improvement of Infrastructure and Resources to Support HMC's Commitment to Excellence and Building Community

The Clinic in Brief

- *Hallmark of HMC Engineering education-expanded to other departments recently*
- Sponsor proposes real problem
- The responsible Clinic Director appoints a *team* of 3-5 students, student *project manager*, and *faculty advisor*
- The sponsor appoints a *liaison*
- The students prepare a *work statement* (subject to liaison agreement) to produce scheduled deliverables
- Fee

Clinic Characteristics

- **A teaching clinic, providing professional services**
- **Students participate under faculty direction**
- **Liaisons provide company direction**
- **Seminar presentations identify principles and procedures**
- **Project management emphasized**
- **Engineering, physics, computer science, mathematics or combination**

Project Selection

- **Must be important to Sponsor**
- **Emphasizes design and experimental skills**
- **Sponsor pays for project and receives all IP**
- **Allows for team interaction**
- **Work scope 1,200-1,500 person hours**
- **Fixed end date**
- **Concrete measurable goals**

Typical Clinic Project Timeline

(only academic year)

- **Spring-Summer: Project commitment, general description**
- **Early September: Project start, Orientation Day**
 - Team structuring, research (Marathon Weekend), draft Statement of Work (work plan)
- **Early October: Closure on SOW with team**
 - Research and design reviews, first presentations
- **Mid-December: Mid-year reporting**
 - Development
- **Early to Mid-May: Projects Day presentations, poster, final report and deliverables**

Harvey Mudd Clinic, 1963-2008

40+ years, 300+ sponsors, 1200 projects

Accel Technologies, Inc.

Auditude.com

Applied Biosystems, Inc.

Areva T&D, Inc.

The Aerospace
Corporation

Bank of America

Beckman Instruments

BioSTAR Group

Boeing

CPI, Inc.

DirecTV

Disney Feature Animation

ESRI

Fair Isaac & Co.

Green Media Toolshed,
Inc.

GTE

HP

HRL Laboratories

IBM

I/O Software, Inc.

Jet Propulsion
Laboratory

Jet Propulsion
Laboratory

Kofax Image Products

Laserfiche, Inc

Legato Systems, Inc.

Magulandia Studio

Marine Biology Lab.

Medtronic MiniMed

Microsoft Corporation

N2H2, Inc.

NC4, Inc.

NeonGecko

Northrop Grumman

Nuera Communications

Octel Communications
Corp.

Optivus Technology, Inc.

Paracel, Inc.

QB Inc.

Qualcomm, Inc.

Raytheon

Rockwell Science Center

Sandia National
Laboratories

Teradyne Inc.

United Device, Inc.

WebTV Networks, Inc.

Worldport, Inc.

Yahoo!

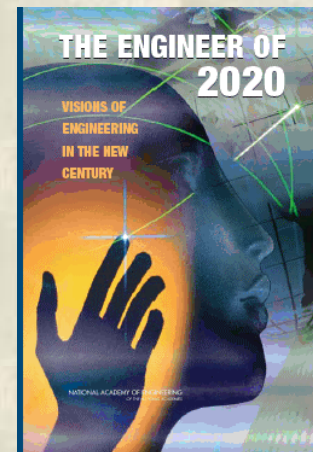
Global Clinic Program Overview

HARVEY MUDD COLLEGE



“Many advanced engineering designs are accomplished using virtual global teams – highly integrated engineering teams comprised of researchers located around the world. These teams often function across multiple time zones, multiple cultures, and sometimes multiple languages”

**“The Engineer of 2020
Visions of Engineering in the New Century”
Report of the National Academy of Engineering
National Academies Press
Washington DC
September 2004**



Clinic Goes Global in 2006

Statement of Purpose

- The Global Clinic Program supports teams of Harvey Mudd students to collaborate with international student teams from partner science and engineering programs to solve real world, technical problems in a global context
- Particular interest in SE Asia, India and China



Goals

- Foster a deeper understanding in our graduates of the **business, science and engineering culture** of another country
- Offer international sponsor companies and foundations a **partnership role in the education** of the next generation global engineering and science graduates
- Benefit students and society by **promoting international cooperation and partnership** among young engineers and scientists

Global Clinic Project Team

- **Collaborative student team from Harvey Mudd College (3 seniors) and international partner school (3 seniors)**
- **Faculty advisor from each school**
- **Company liaison**
- **Full year duration (summer plus academic year June – May)**

Global Clinic Characteristics

- Real problem for an internationally represented client
- International team-based projects
 - Students, liaisons, faculty
- Has required summer and academic year programs
- Highest caliber students from many disciplines
- Fee structure depends on type

Global Project Selection

- **Must be important to Sponsor**
 - Industrial Sponsor must have sites in both companies
 - Foundation sponsor must be willing to accept and support students from two institutions
- **Emphasizes design, theoretical and/or experimental skills**
 - Preferably divisible into 2 stand alone parts
 - Preferable to have global requirements
- **Requires team interaction**
- **Work is minimum 6 people, 10hrs/week with odd hours**
- **Fixed end date**
- **Concrete measurable design specifications and goals**

Typical Global Clinic Project Timeline

- **December of Prior Year: Project commitments**
- **Spring: Student recruiting, summer program planning**
- **Summer: Two month summer program, draft Statement of Work (work plan)**
- **Early September: Orientation Day, Closure on SOW with team**
- **Mid-December: Mid-year reporting**
 - **Development**
- **Early to Mid-May: Projects Day presentations, poster, final report and deliverables**

Summer Session (~Two months)

- **June at HMC**
 - Engineering Design Theory
 - Engineering Design Workshop
 - Project Management Class
 - Globalization and Technical communications
 - Project discussion
- **July at Partner School**
 - In-depth project discussions
 - Cultural and/or language
 - Meetings with sponsors
 - Others as pertains to project and global challenges
- **Need to have a well defined project and responsibilities before the academic year**

Academic Year (Nine Months)

- **Continued collaboration (at a distance) between team members through to completion of project**
- **Weekly contact of team members via email and teleconference**
- **Weekly multi-conferences with company liaisons**
- **Midyear progress report and design review in December**
- **Final report and deliverables presented at company sponsor site in May**

Global Clinic Models

- **Traditional:** Global Industrial Sponsor pays a fee that covers all costs associated with the program
- Partner Academic Institution and HMC provide faculty liason and support for three students from each site
- Sponsor provides liason(s) to entire team

2006/7 Global Clinic Program

Hewlett Packard Project

Develop a computational fluid dynamic model of the process of imprinting a liquid layer with a stamping dye for application in printed circuit manufacture

HMC partners with

University of Puerto Rico
Rico Mayaguez



2006/7 Global Clinic Program

Amgen Project

Development of a cell culture process and comparative testing of alternative downstream separation methods for scale up to pilot plant operation

HMC partners with

University of Puerto Rico
Rico Mayaguez



2007/2008 Global Clinic Project

- National University of Singapore and HMC
- Designing and Validating a low-cost, real-time Polymerase Chain Reaction Instrument for Educational Use



QuickTime™ and a
decompressor
are needed to see this picture.

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Global Clinic Models

- **Foundation or Private Sponsor:** A global foundation with interests in solving local problems with technological solutions sponsors a project
- Partner Academic Institution and HMC provide faculty liaison and for three students from each site
- The sponsoring Foundation supports a significant component of the Clinic, each institution will provide equivalent financial efforts towards the summer and/or academic programs
- IE: Lien Foundation supports direct interaction of students with the program, NTU/HMC pay for each's summer program and academic year costs
- Requires substantial commitment from the institution

2008/2009 Global Clinic Project

- Nanyang Technological University and HMC
- Lien Institute for the Environment (LIFE)
Foundation: Develop and implement a method to remove arsenic from the water in municipalities in Cambodia using local resources to WHO standards and develop methods to test the arsenic content



2008/2009 Global Clinic Project

- On the Mekong in Cambodia



Global Clinic Models

- **Single Site Outreach:** Faculty member or institution identifies global partner with a technological challenge
- A team of 5-6 students from one institution spends 1 month at that site and 1 month at the HMC Global Clinic summer program
- Sponsor provides liason(s) to entire team which may be funded by a foundation, an individual or through institutional funding
- Academic institution provides a faculty liason

Performance

- **Students perform all aspects of the work**
 - One student acts as team leader
- **Faculty advisor**
 - Advises and monitors team progress
 - Maintains oversight with liaison
 - Evaluates team performance
- **Sponsor's liason**
 - Provides domain expertise
 - Monitors progress per work statement
 - Weekly teleconference with team
 - Evaluates project deliverables
- **Sponsor pays for project and owns all IP**

New Skills

- **Educating students in a multicultural program emphasizing professional practice in global project teams**
 - **Language/intercultural communication skills**
 - **“Virtual” design teams, project management skills**
 - **Networking skills: Students-Students, Students-Faculty Advisors, Students – Liaisons, Faculty Advisors – Liaisons, Faculty Advisor-Faculty Advisor**

Lessons Learned

- **Summer team building is essential**
- **Summer coursework is essential**
- **Not a language program**
- **Students must be well matched in training and level**
- **Each relationship is different, flexibility in program is key**

Thank you and questions!!



Coordination of program (1)

- **Sponsor company takes responsibility for:**
 - **Furnishing project description to Global Clinic Program Director**
 - **Selecting company liaison to act as client to project team, with availability for weekly or biweekly conference call with team during the duration of the project**
 - **Payment of project fee**

Coordination of program (2)

- **Each school takes responsibility for:**
 - **Selecting student team and faculty advisor**
 - **Hosting the visiting student team at their campus for one summer month**
 - **Assessing their own students during the academic year for course credit**

Coordination of program (3)

- **Global Clinic Program Director takes responsibility for:**
 - **Overall management of program**
 - **Recruitment of new projects for program**
 - **Development of secure funding base for program**
 - **Oversight of operational and budgetary requirements of program**