

Cultivating graduate students in the liberal arts environment

Lesley Ward
Harvey Mudd College

Engaging Young Mathematicians:
An NSF workshop on majors and the transition to graduate work
Washington, D.C.

13 August 2005

Overview

- ① Harvey Mudd College
- ② Principles
 - Principles
 - Esprit de corps
 - Flow of information
- ③ Resources needed
- ④ HMC Math Dept plans

Harvey Mudd College

- liberal arts college of engineering, science, and mathematics
- curriculum: 1/3 humanities and social sciences, 1/3 common core, 1/3 major
- 9 majors: all technical, 3 interdisciplinary
- ~710 students (undergraduate only)
- students very strong
- math majors: 10 in 1993, 27 in 2003
- Math Dept: 12 faculty, $2\frac{1}{2}$ support staff
- teaching load: essentially 3 and 2 (semester system)

Principles

- esprit de corps among students
- flow of information to students
- culture of student research
- equip students with professional skills
- incorporate students in many research/professional activities
- depth + breadth in structure of major
- capstone year of research (Clinic or thesis)
- students need: support; peer group; respect; some choices; to learn the unwritten rules; someone to take an interest

Esprit de corps

- social events for math majors (Sept barbecue; Dec party; May dinner for seniors + families). (Food!)
- Math Club (help with conference; host visiting speakers)
- annual dept Newsletter
- Interface (interdisciplinary journal edited by students)
- math video evenings, softball games
- weekly Putnam practice (60-70 students)
- MCM, ICM competitions

Flow of information

- math dept website
- Math Info Night (April) for prospective majors
- Math Grad Night (October): how to apply to grad school
- extensive individual discussions
- Study Abroad info meetings (one per semester)
- Senior Thesis website, structure
- Clinic student handbook

Culture of research

- Mathematics Clinic
- Mathematics senior thesis
- summer research
- emphasis on communication skills
- students present at conferences
- joint publications with students
- teach skills: writing, speaking, \LaTeX , websites, MathSciNet, teamwork

Resources needed from institution

- three class days (May 2–4) for Presentation Days: student presentations on research (thesis, Clinic, other)
- faculty time: Clinic Director, thesis coordinator, Putnam seminar all part of dept teaching load
- faculty time: commitment to publishing research with students; advising; extensive interactions with students
- develop and reward good teaching
- fund student travel to conferences (8 to Joint Meetings 2005)
- fund continual updates of computing facilities

Cultivate and reward good teaching

Tactfully and without pressure. Make materials available to faculty. Give time to absorb, discuss, and implement/innovate.

- make good teaching part of the institution's criteria for promotion, tenure, and faculty performance
- peer teaching observation + discussion (free lunch)
(<http://teaching.berkeley.edu/compendium/>)
- W.J. McKeachie and M.D. Svinicki, *Teaching Tips*
- John Bean, *Engaging ideas: The professor's guide to integrating writing, critical thinking, and active learning in the classroom*
- Edward Tufte's books, (<http://www.edwardtufte.com/tufte/>)

HMC Math Dept plans

- keep all the plates spinning
- faculty support/development/encouragement.
Overloaded. Need to reduce pressure.
Time for course development, own research, ...
Can NSF help?
- strengthen Stats/OR curriculum (new hire)
- develop student Math Club
- possibly form AWM student chapter
- tweaks: matching students with thesis advisors