Using the WPI Projects Program to Promote Faculty / Student Research Partnerships

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March 25, 1999
Presentation Overview

• Background

• Sponsored Projects
  – Off-Campus
  – On-Campus
  – Recruiting Students
  – Industry Contacts

• Running a Successful MQP
  – Grading
  – Balancing Challenge and Support

• Reward Structure for Project Advising

• Summary
Personal Background

• 1979-1983 A.B. Engineering Sciences Dartmouth College
• 1983-1986 Design Engineer, Analogic Corp.
• 1990-1994 Graduate School (Univ. Rochester, Boston U.)
• 1994-1999 Asst. Professor, WPI
Off-Campus Projects

• Best Project Quality
  – Focus entirely on MQP
  – No campus distractions
  – No temptation to more structured course work

• Motivated, Caring, On-site Advisor Is ESSENTIAL!
  – With good on-site advisor:
    • Good quality project is EASY
  – Without good on-site advisor:
    • Good quality project is IMPOSSIBLE
Off-Campus Projects

Motivated, caring, on-site advisor is ESSENTIAL!

• Forget Universities
  – No one else thinks of "projects" the way we do
  – No one else cares about spending time to help undergrads
  – Misanthropes aplenty

• Industry
  – Enjoy having new, fresh young faces around
  – Ideal advisor:
    Someone who wishes he/she was a professor
  – Understand scope, goals of MQP
  – Willing to commit resources
    (time, equipment more important than money)
On-campus Sponsored Projects

Better Project Quality

- "Real World" project credibility
- Better project definition
  - Expect more from first term!
- "Customer" = easier to motivate students
  - Professor not the bad guy
- Compete with sponsor's competitors
  - Students live with real cost / budget constraint
Sponsored Projects

• Off-Campus: Ireland MQP (with Vaz)
  – 10 weeks: August 10 to end of A term
  – Sponsor pays $6K (raised from $5K)

• On-Campus: N. E. Center for Analog / Mixed Signal IC Design [NECAMSID] (Terri Fiez, CDADIC, WSU)
  – 5 companies pay $30K/year each
  – Collaborative "Package Deal":
    • Total of 4 MQPs, 4 MS, 16 students in lab
  – Combine graduate research, undergraduate education (sort of)
Show Me The Money

• $5,000 is too cheap for MQP
  – Hot job market = graduates in demand!
    • Major field dependent, of course
  – Don’t be afraid to ask for a lot of money
    • OK if they say no
  – Sponsor's attitude:
    • Little money committed = low priority

• Sponsors are really interested in students
  – Access, experience, interest in company's field
  – Curriculum, research less important
  – Cheap compared to recruiting / headhunter cost
  – Give the people what they want
Recruiting Students

• Two words: FREE FOOD
  – MQP / Grad student recruiting event early C term
• Two more words: FREE CLOTHING
  – Analog Lab T-shirts
• Another two words: OPEN HOUSE
  – October, April
  – Invite all undergrads in dept (especially juniors!) to lab
  – See ongoing projects; cool place to work
• Teach undergraduate courses in your area with enthusiasm
  – Act like someone they will want to work with
• Most important: Student word-of-mouth, positive peer "buzz"
  – Positive Feedback
  – Ireland applicants: 7, 11, 20 (for 3 slots)
  – On-campus: 15, 30 (for 12 slots)
Industry Contacts

Quantity Rules

• To get 1 good idea, you need 10 bad ideas

• To make 1 sale, you need to live through 10 rejections

• To get 1 project sponsored ...

• If a potential contact isn’t producing, spend time elsewhere!
Industry Contacts: Where to get them?

Anywhere and everywhere!

• Former students! (tough for new faculty)
• Former employers/employees (tough for traditional PhD path)
• Your PhD advisor's contacts (tough for some advisors)
• Help from colleagues in your department (tough in small dept, hate-filled academia)
• People who see you at conferences (tough: 99% of academic conferences bogus for industry. Choose wisely)
• People who see your publications (tough for industry: ultra-narrow publish-or-perish niches)
• People who see you at local professional society talks
• Put your buzzword-laden CV on the web
Analog Devices, Ireland Contact Trail

1991:  Anton Mavretic (BU advisor)
1992:  Francisco Dos Santos (ADI; former student of Mavretic)
       Paul Brokaw (Analog Design Deity)
       Larry DeVito (Down the hall from Brokaw)
1993:  Peter Real (Dinner at ISSCC San Francisco)
1995:  John Reidy (Marketing Manager, ADI, Limerick)
1996:  First Project in Ireland (McNeill, Vaz co-advise)

Rajan Kumar, Dawn Ostenberg, Neil O'Rourke:
Winners, Outstanding MQP Award ECE Dept
Sigma Xi MQP Award (Institute-Wide)
Mixed Signal Design Center Contacts

• Analog Devices
  – Julie Barbeau (Former WPI student)

• EG&G Reticon
  – Chris Raanes (Former AOA underling, now Pres. & G.M.)

• Unitrode
  – Rich Valley (Eng. Manager; through BU advisor)

• Teradyne
  – Bill Bowhers (Former BU student)

• Allegro
  – Pete Lanyon (Called me; worldwide fame and prestige)
Grading

- Never give an A the first term!
- No Fear: Give different grades to team members if warranted
- 1 paragraph e-mail to each student explaining grade, path to improvement next term
- Make it as much like a course as possible
  - Hand out criteria, procedures at first meeting
- Week-to-Week (Nicoletti)
  - At the end of each weekly meeting, identify 15 hours of work for each team member
  - At beginning of meeting, compare work done to last weeks goal; assign grade
  - No surprises at end of term
- End of Project (Vaz)
  - Confidential form on process issues, relative contribution level of partners
Balance Challenge / Support

- 1st week: Minor hint
- 2nd week: Major hint (make it obvious)
- 3rd week: Tell them what to do

Important to tell sponsors MQP is primarily an educational experience to teach design

- NOT to "get something done"
  - Pay big $$$ for research to get deliverables: tell sullen grad student what to do
- Hard to let them flail when sponsor expects deliverables!
Reward Structure for Project Advising
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• Status: Good Project Advising Is Its Own Reward

  Project Advising at WPI is on the threshold of collapse:
  • Senior faculty (present at creation of Plan and committed to its vision) retiring;
  • Most new faculty have little experience with design, MQP-type projects - only know PhD research model

• Project Advising:
  – Invisible in loading models
  – Marginally recognized / rewarded
  – Valued even less in Doctoral 1 University Culture
  • You choose: 0.2 PhD / year or advise an MQP/IQP?
What I've Learned From Mistakes / Failures

• Don't be afraid to say no (Just Don't Do It)

• Make it clear what MQP can, can't do
  – Not product development or true research

• On-site advisor is KEY for off-campus projects

• Don't do too many MQPs at once! ($iren $ong)

• Retractable goals / scope

• Always start planning to finish in C term
What I've Learned From Successes

• Believe in your students

• Expect Success: Set high expectations

• $oak the Rich