

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

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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.**
- **1986-1990 Design Engineer / Engineering Manager,
Adaptive Optics Associates (AOA)**
- **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**