How to Manage your Co-op Assignment…and your career

“Life is not at all like a Prelim”

Keith Holtermann ChE ‘85
Air Products and Chemicals, Inc.
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holterk@airproducts.com
Who is this guy?

- 1983/4 Cornell Co-op (at Air Products)
- 1985 BSChE Cornell
- 1991 MS ChE (Lehigh)
- Engineering related jobs 25+ years
- Now: Global Continuous Improvement Manager for >$2 Billion Business
  - Cornell was more stressful
  - Except Co-op summer
- Have interviewed, managed or advised hundreds of interns/co-ops
- Ask questions any time…
- Forgive my upcoming generalizations…
Agenda

- When to start?
- Who will you interact with?
- What happens?
- Do’s and Don’ts
- Problem Solving
- Managing your Boss
- Managing your Career
When to start/end/time off:

Competing Interests

- 16 weeks vacation for 16 years to **2 weeks** vacation for **Five Years!**

_vs:

- Learn as much and make as much as you can
  - If you have a good reason start and end dates (and time off) are usually (cautiously) negotiable – even if they say it’s not
    - School, **Major** personal events,
  - Most supervisors don’t care when you start
    - Human Resources may care (or seem to)
    - If they do care, they’ll likely forget about it eventually
Who will you interact with?

- **Human Resources (be careful)**
  - Not engineers, Purpose: fill positions effectively and efficiently
  - Some can be very helpful, most can create an issue if pushed

- **Recruiters (maybe)**
  - Good recruiters will make time for you. Use them to test anything you’re unsure of (like negotiating)

- **Supervisor** – for now treat them like Human Resources (more later)

- **Co-workers** (later in preso)
What happens when you start?

- **Logistics**
  - Paperwork
  - Health/drug tests
  - Scrambling to find a place to live

- They may not be ready for you

- You will likely read or even do nothing for **days**

- Problem solving in the real world is not like a prelim
Do’s and Don’ts

■ **Do**
  
  ● Show up on time w/ enthusiasm
  
  ● Appear to be trying hard all the time
    ■ Work longer than required
  
  ● Learn as much as you can
    ■ So you can do a good job anywhere
  
  ● Network with co-workers
    ■ Industry is a small world - globally
    ■ Alums, company events (e.g., softball, break room, department roast)
  
  ● Meet people w/ no specific agenda
    ■ “Informational Interviews”
  
  ● Get a Mentor
    ■ Company programs are good
    ■ Real connections are better (Co
Do’s and Don’ts

■ Do

■ Ask questions (more later on how)
■ Have your work be just a bit better than required (but not perfect) (more later)
■ Proofread your Emails
  ■ And make them more one level more formal than you receive
■ Ask for feedback
■ Ask for as much work as possible
  ■ And always say yes to more
■ Manage your career … Now
  ■ (more on this later)
Do’s and Don’ts

■ Don’t

● Expect to set the world on fire
● Expect too much responsibility
● Blow off anybody
● Be the only one in jeans, using iPod etc.
  ■ Act one level higher than you are/follow the culture
  ■ Same for socializing
  ■ Sending personal emails
  ■ Pandora, Facebook, etc.
● Spend everything you make
● Expect work to be like school (it’s actually easier… sort of)
Solve Bernoulli’s equation for the figure below:

1. What pressure must the pump develop? (8 pts)
2. What is the power of the pump? (2 pts)

\[ \frac{P_a}{\rho} + \frac{gZ_a}{g_c} + \alpha V_a^2/2g_c + \eta W_p = \]
\[ \frac{P_b}{\rho} + \frac{gZ_b}{g_c} + \alpha V_b^2/2g_c + h_f \]

\( Z = 50 \text{ m; } h_f = 29.9 \text{ J/kg; } \eta=60\% \)

\( V_a = V_b = 3 \text{ ft/sec} \)

pumping water

McCabe and Smith 3rd Edition
Problem Solving in the Real World An Example:

Boss: “This pump doesn’t work. Fix it.”
Problem definition in the real world: get it straight at the start

- Which pump?
- Are we sure it’s a problem?
- What doesn’t work?
- Timing requirements
- Precision/accuracy required
  - No partial credit if it has to work
  - Often ok to fix it “too well”
- Value of result
  - $5 or $5 million?
- Where would your Boss start?
The problem isn’t defined still

- Be a Doctor
- Use everyday logic
  - Ex: the noisier one is usually broken
- Develop several problem definitions
  - Brainstorm what could be wrong
- Look upstream and downstream from the “problem”
- Gather data and look for patterns and differences
- Find out old problems look for repeats
- Work backwards
- Check the possible problem definitions with Boss and others
- Start to solve the most likely problem (“hunt and peck” based on fundamentals)
Gather information (Cheat)

- **Determine how you think you’d solve the problem**
  - Unit analysis/Books/Fundamentals
  - Boss’s starting point/Company standards/tools
  - Google it

- **Copying (cheating) is required**
  - Most problems have been solved before
  - Copy an old solution directly -> praise

- **Find a source**
  - Borrow your neighbor’s homework or notes
    - What is in the file? What do they remember?
    - Drawings, specifications, purchase orders…

- **Be a Detective**
  - Don’t trust anyone… Check the story

- **Look for confirming evidence…**
  - Be a journalist – two source rule

- **Does the info make sense to you?**
- **Check info again when problem is solved.**

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**Bernoulli’s Equation:**

\[
\frac{P_a}{\rho} + gZ_a/g_c + \alpha V_a^2/2g_c + \eta W_p = \frac{P_b}{\rho} + gZ_b/g_c + \alpha V_b^2/2g_c + h_f
\]

**The Real Bernoulli’s Eqn:**

\[
h_p = \Delta P \times \text{GPM} \quad 1716
\]
Something’s Always Missing

- **Make an assumption**
  - Guess
  - Ask someone else to guess
  - Try info from similar problem

- **Bracket the problem**
  - Try highest, lowest, average possible values

- **Gather data**
  - Check company files or industry articles
  - Plant operating data: automated historians
  - Lab data

A *cheap approximate answer quickly is better than a perfect answer that never comes*
Solve the problem

- Do it by hand first (yes, w/ a pencil)
  - Does the answer make sense?
    - 5 mile long equipment in 100ft long plant?
    - 0.01 hp motor next to a 100 hp motor?
- Do it in a spreadsheet
- Save the file
- Change some numbers and see what happens
  - Graph it and/or make a table
  - Try zero, midpoint and 100% and see if the trend is correct
  - Was your detective work correct?
- Get away from it then check again
- By the time you’re done, you’ve solved the problem many times over
  - Understanding increases each time
- Show your boss
  - First the answer, then assumptions then method (all of them)
  - Might not get past your answer
Managing Your Boss

■ **Typical Co-op Bosses:**
  - Young Upwardly Mobile Professional - best
  - Experienced Curmudgeon – ok
  - Swamped Manager – uh oh

■ **Save up questions and be formal**
  - No matter how easy going they seem
  - Find out how they want to work before assuming

■ **Get a backup boss**

■ **Be prepared:**
  - to be hopelessly wrong
  - for instant evaluation
  - for lack of interest
  - to do it over and over and over…

■ **If you get more work, that’s a good thing**
Managing Your Career

- **Start now**
  - Manage your second assignment and your permanent assignment
  - Make it easy for them to give you the job you want (first you need to know what you want (informational interviews))

- **Pick the job you like**

- **Pick a company with operations in some areas you’ll like**
  - And some you don’t

- **Salary differences don’t last**
  - Company culture does
Thank You!
More Questions?

holterk@airproducts.com
School:

- Problem is defined
- Equations/ Drawings available
- One unknown per equation
- All information must be present
- Measurements are perfect
- Solve each type of problem once
- 14 weeks of memory required
- Value understood
- Timing clear

Real World:

- Problem definition is the problem
- The world is available
- One assumption per unknown
- Some information always missing
- Measurements have accuracy limitations
- Generally repeat problem types (sometimes tedious)
- Often years of memory required
- Value not defined
- Timing variable
Summary Problem Solving

- **Clear Problem Definition is the biggest hurdle**
  - Problem statement
  - Timing requirements
  - Precision/accuracy required
  - Value of result
  - Is it really a problem?
  - Starting point
- Find the equation(s)
- Find the missing info (cheat)
- Check the info (detective/journalist)
- Lists of questions are better (w/ no pride)
- Solve the problem
- Check your own answer…wait…check again
- Get review (get homework corrected)
- Solve it forever, put in a control plan