Some Thoughts on Education

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Some thoughts on education

- Students* work primarily on things they recognize as important to their careers

* “students” = undergraduate students
Some thoughts on education

• Students work primarily on things they recognize as important to their careers
  • They don’t recognize much of what we teach as important to their careers: especially math and fundamentals
  • They do recognize that grades are important to their careers
Some thoughts on education

• Students work primarily on things they recognize as important to their careers
• Many students work well on open-ended projects that capture their imaginations
Some thoughts on education

• Students work primarily on things they recognize as important to their careers

• Many students work well on open-ended projects that capture their imaginations
  • Difficult to work out in a course that has a lot of diverse topics to cover
Material covered in the final exam for Part 2:

**Heat Transfer**
- Shell-balance method for setting up the differential equation and boundary conditions for simple heat-transfer problems; solution of resulting equation for simple problems
- Final equations for steady-state heat conduction through multiple planar or cylindrical layers
- Multivariate and Unsteady Conduction
  - Assumptions
  - Derivation of pde
  - Tabulated 1D Solutions
  - Extending Tabulated 1D Solutions
    - surfaces where \( q = 0 \)
    - orthogonal conduction ("product method")
    - time-varying boundary conditions: superposition
- Analysis of Complex Heat-Transfer Problems
  - Approach
  - Making best estimate of answer
  - Estimating nature of deviations of true answer from estimate
- Heat-Transfer Coefficients for Tube Flow
  - combining heat transfer within a tube with conduction through the tube walls

**Mass Transfer**
- Unsteady and Multivariate Diffusion
  - Analogy to heat transfer and application of methods of unsteady conduction
  - "Complex" mass-transfer problems
- Mass-Transfer Coefficients for Tube Flow
Some thoughts on education

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• Many students work well on open-ended projects that capture their imaginations
  • Difficult to work out in a course that has a lot of diverse topics to cover
  • Requires course or curriculum long enough that students can learn basics, then apply them in project
Some thoughts on education

- Students work primarily on things they recognize as important to their careers.
- Many students work well on open-ended projects that capture their imaginations.
- Students procrastinate as much as they think they can do safely.
Some thoughts on education

• Students work primarily on things they recognize as important to their careers
• Many students work well on open-ended projects that capture their imaginations
• *Like everybody else,* students procrastinate as much as they think they can do safely
Some thoughts on education

- Students work primarily on things they recognize as important to their careers.
- Many students work well on open-ended projects that capture their imaginations.
- Students procrastinate as much as they think they can do safely.
- Many (most?) students don’t know how to study efficiently.
Some thoughts on education

• Students work primarily on things they recognize as important to their careers
• Many students work well on open-ended projects that capture their imaginations
• Students procrastinate as much as they think they can do safely
• Many students don’t know how to study efficiently
  • They drill on old exams, prepare to “fight the last war.”
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• Many students work well on open-ended projects that capture their imaginations
• Students procrastinate as much as they think they can do safely
• Many (most?) students don’t know how to study efficiently
• Students respond to a teacher who is enthusiastic for the subject and can communicate it on their level
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- Teaching style has to fit with the personality of the instructor
Some thoughts on Petroleum Engineering curriculum

• Above all, a university education should train students in the basics, especially subjects not likely to be picked up later
Some thoughts on Petroleum Engineering curriculum

- Above all, a university education should train students in the basics, especially subjects not likely to be picked up later
  - Math
  - Physics, mechanics
  - Chemistry
  - Geology, geophysics
  - Basic engineering concepts: e.g., balances
Some thoughts on Petroleum Engineering curriculum

- Above all, a university education should train students in the basics, especially subjects not likely to be picked up later.
- Cover as much of the applications and current methods as time allows.
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- Cover as much of the applications and current methods as time allows
- Students are most motivated by “real world” applications
- Some employers want graduates fully ready to work, without additional training
- Universities must balance demands for work-ready graduates and graduates with flexibility to handle changing situations and technologies