# 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

TU Delft

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- 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

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# 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=o
  - 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

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  - 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

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  - They drill on old exams, prepare to "fight the last war."

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- Teaching style has to fit with the personality of the instructor

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  - Math
  - Physics, mechanics
  - Chemistry
  - Geology, geophysics
  - Basic engineering concepts:  e.g., balances

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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