

Bridging Theory and Applications:
Implementing Modeling Activities and Project Assignments
in Differential Equations II Course

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Differential Equations II:

- solving higher order equations: undetermined coefficients, variation of parameters
- solving linear systems
- nonlinear systems, phase plane analysis,
- Laplace transform
- Fourier series
- Intro to PDEs

Mostly math majors, some engineering, chemistry and physics

Assessment (previous years)

- Homework
- 3 midterm exams
- writing assignment
- final exam

Teaching bunch of techniques and giving exams- Boring!

Bridging theory and Applications??

- Why?
- How?

- First day modeling activities
- Final projects and write ups

First day modeling activities

- M & M
- M & M slightly changed, Potato Cooling



- Different assumptions?
- What if there was immigration?

- Insight into what DEs are and exposure for modeling a “real world scenario”
- Students were excited and engaged
- “This is so much fun!” and “it makes sense” at the same time
- Students were motivated and excited for the semester
- During the semester..

- Projects instead of final exams
- Groups of 3
- Assessment: 20 min group presentation and group report 3-5 pages
- peer evaluations
- Preparation
- Topics adapted from SIMIODE Resources:
 - Humans Vs Zombies
 - AlgaePopulation Self-Replenishment
 - VanderPol Oscillator

How did it go?

- success stories
 - they did research on what other applications do the model have
 - one group ended up coding a game for humans vs zombies considering the college
 - COMAP
- lessons learned
 - new experience for the students
 - groups?

- enhanced student understanding
- increased engagement
- improved both subject knowledge and critical thinking skills
- They saw the bigger picture!!
- Fun!
- less and meaningful grading!

- Fun to see real world examples of what we learned
- Saw how concepts were related to engineering (most of my students are in a dual degree program)
- We were left alone, we had to figure it out, it was the worst thing that happened to me...
- A great experience where we had to figure things out, (just like how the real world works)

Improvements/variations

- next time- Definitely!
- will add different first day activities
- include some modeling during the semester
- maybe build a portfolio with 2 or 3 mini projects over the semester (instead of exams)
- be transparent

Thank you!