How *Mathematica* improves my teaching

Christopher R. H. Hanusa
Queens College, CUNY

Technology in Mathematics Instruction Conference
June 8, 2010
Talk Overview

- Teaching students *Mathematica*
  - Teaching *Mathematica* in class
    - Mathematical Modeling
    - Mathematics with Mathematica
- Using *Mathematica* to improve clarity
  - Examples from Graph Theory
  - Examples from Mathematical Modeling

Christopher R. H. Hanusa  Queens College, CUNY

How *Mathematica* improves my teaching
Mathematical Modeling at Queens College

- **Audience:** Future high school math teachers

- **Topics Covered:**
  - Modeling Process
  - Function Fitting
  - Linear Regression
  - Transition Matrices
  - Simulation, Queuing Models
  - Linear Optimization

- **Final Group Project**
  - Own choice of subject
  - Apply modeling principles from class
  - 15–20 page paper and 15 minute presentation

- **Mathematica Goal:** Basic knowledge; for use in project.
Mathematics with *Mathematica* at Queens College

- **Audience:** Sophomore–Senior math majors
- **Topics Covered:**
  - Programming in *Mathematica*
  - Graphics in *Mathematica*
  - Recreational mathematics incl. 2-player games
- **Individual Projects**
  - Own choice of subject
  - Apply techniques from class
  - Commented *Mathematica* code and 10 minute presentation
- **Mathematica Goal:** Advanced knowledge with a focus in programming.
Introducing *Mathematica*

- Not a math class!
- Start with the basics
- Motivate its use
  - Integrate something difficult
  - Show interesting graphics
  - Showcase animations created through the `Manipulate` command
- Highlight habits of independent learners
Habits of independent learners

- Comfortable checking help (Documentation Center)
- Comfortable with code
  - Parsing the code
  - Understanding what commands do
  - Modifying or creating from a template
- Comfortable asking questions of other students
Summary of what I’ve learned

▶ Install software promptly
▶ Teach qualities of independent learners
▶ Create clear step-by-step tutorials
▶ Spend time demonstrating the material
▶ Incorporate projects to motivate the learning
Talk Overview

- Teaching students *Mathematica*
  - Teaching *Mathematica* in class
    - Mathematical Modeling
    - Mathematics with Mathematica
- Using *Mathematica* to improve clarity
  - Examples from Graph Theory
  - Examples from Mathematical Modeling

Christopher R. H. Hanusa  Queens College, CUNY
How *Mathematica* improves my teaching
Graph Theory at Queens College

- **Audience:** High school math teachers & advanced majors
- **Example Topics:**
  - Ford–Fulkerson Algorithm (Maximum Flow / Minimum Cut)
  - Kempe Chains Argument (Five-Color Theorem)
  - The Turning Trick (Graph Decompositions)

Go now!
Summary of using *Mathematica* to improve clarity

- *Mathematica* helps me to generate graphics which are:
  - Precise
  - Colorful
  - Dynamic
Thank you

Christopher R. H. Hanusa
chanusa@qc.cuny.edu

Course syllabi and slides available online:
http://qc.edu/~chanusa/