Guiding and Grading Mathematical Art

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Course Details

• Queens College
  – Urban Commuter Campus
  – Diverse Student Population
Course Details

• Queens College
  – Urban Commuter Campus
  – Diverse Student Population

• Math with Mathematica
  – First course in computing
  – Varied math, programming levels
  – Satisfies writing requirement
Teaching Philosophy

- Give students the tools to succeed
  - Stand-alone tutorials
  - Comprehension Questions
Teaching Philosophy

• Give students the tools to succeed
  – Stand-alone tutorials
  – Comprehension Questions
  – How to: Documentation Center
  – One-on-one help

Introduction to Lists

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Teaching Philosophy

• Give students the tools to succeed
  – Stand-alone tutorials
  – Comprehension Questions
  – How to: Documentation Center
  – One-on-one help

• Make learning active
  – Goal oriented: Projects
  – Inspires creativity
  – Each gains unique knowledge
Projects

1. Tutorial for a math class (4 weeks)

2. Piece of Mathematical Art (4 + 1.5 weeks)

3. Design an Interactive Interface (5 weeks)
Projects

1. Tutorial for a math class (4 weeks)
   – Learn specialized commands
   – Basic Mathematica concepts
   – Instills collaborative spirit

2. Piece of Mathematical Art (4 + 1.5 weeks)

3. Design an Interactive Interface (5 weeks)

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Mathematical Art Project

• Goals
  – 3D Printing Process
  – 3D Design in Mathematica
Mathematical Art Project

• Goals
  – 3D Printing Process
  – 3D Design in Mathematica
  – Creativity in Mathematics
  – Interdisciplinarity
Mathematical Art Project

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• Deliverables
  – Artwork
  – Mathematica notebook
  – Four-page writeup
Guiding: Framework

- Mathematical basis
- Techniques: 3D modeling, functional
Guiding: Framework

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- Artistic considerations taken into account
  - Visit by Matt Greco, QC Art Department
Guiding: Framework

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  - Visit by Matt Greco, QC Art Department
- Commensurate with math, programming levels
Guiding: Framework

• Mathematical basis
• Techniques: 3D modeling, functional
• Artistic considerations taken into account
  – Visit by Matt Greco, QC Art Department
• Commensurate with math, programming levels
• Critiqued, refined, revised multiple times
• Timeline to stay on track
Guiding: Tutorials

• 2D Graphics (reminder of 2D coords)
• 3D Graphics (thinking in 3D coords)
• 3D Design (making printable, ~STL)
• MeshRegions (more advanced capabilities)
Guiding: Tutorials

- 2D Graphics  (reminder of 2D coords)
- 3D Graphics  (thinking in 3D coords)
- 3D Design    (making printable, ~STL)
- MeshRegions  (more advanced capabilities)

New!  Minimal Working Examples

- 4 weeks to prototype, 1 week for revision
How to grade this?
How to grade this?

Different answers for different people!
Grading Scheme

Artwork (30%)
- Intrigue
- Mathiness
- Computational Techniques

Organization (25%)

Writeup (45%)

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Grading Scheme

Artwork (30%)
- Intrigue
- Mathiness
- Computational Techniques

Writeup (45%)
- Artistic Qualities
- Math, Programming Discussion
- Revision Process

Organization (25%)
Grading Scheme

Artwork (30%)
- Intrigue
- Mathiness
- Computational Techniques

Writeup (45%)
- Artistic Qualities
- Math, Programming Discussion
- Revision Process

Organization (25%)
- Timeliness
- Name and Description

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Grading (is also Guiding)

• Transparency
• Give weight to what I value.
  – Skill Development
Grading (is also Guiding)

• Transparency
• Give weight to what I value.
  – Skill Development
  – Intentionality
  – Creative Process
Grading (is also Guiding)

- Transparency
- Give weight to what I value.
  - Skill Development
  - Intentionality
  - Creative Process
  - Revision Process
  - Thoughtfulness
Grading (is also Guiding)

• Transparency
• Give weight to what I value.
  – Skill Development
  – Intentionality
  – Creative Process
  – Revision Process
  – Thoughtfulness
  – Aesthetics
Grading (is also Guiding)

- Transparency
- Give weight to what I value.
  - Skill Development
  - Intentionality
  - Creative Process
  - Revision Process
  - Thoughtfulness
  - Aesthetics
  - Student responsibility
Success!

Trip to Shapeways
April 29, 2015

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Student Comments

• “This project allowed me to let my imagination soar while still learning about math concepts and modeling.”
• “The art project was challenging but still managed to be fun ... extremely satisfied when the object came to life.”
• “I learned how to think in three dimensions.”
• “Having a physical copy of the project was one of the greatest things ever.”
• “I like the creative freedom that we given to complete this project.”
• “The trip was very informative and was also very fun to attend. Thanks again Professor.”
Difficulties

• 3D Design in Mathematica is finicky
Difficulties

- 3D Design in Mathematica is finicky
- 3D Printing is finicky
  - Printability
  - Build in lots of time!
Difficulties

• 3D Design in Mathematica is finicky

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Future

• Standards-based Grading Scheme

• More tutorials about three-dimensional mathematics
Thank YOU!

- Shapeways and Lauren Slowik!
- My students, who amaze and inspire EVERY TIME!

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