Pondering Pencil Puzzles

Christopher R. H. Hanusa
Queens College Mathematics

Teaching and Learning Showcase
May 6, 2016
Pencil Puzzles?

• Most well known: Sudoku
• Diversity of types!
• Pure logic – no “math”
  • Nikoli
  • Conceptis Puzzles
  • Puzzle Picnic
The Course

- MATH 555: Games and Puzzles
  - Mon/Wed 75 min
  - 11 undergraduates

- Textbook?
  - Magazines
  - Puzzlecraft
Course Goals

• Learn problem solving techniques
• Design own puzzles
• Develop mathematical curiosity
• Become a puzzle connoisseur

A chance to **EXPERIENCE** and **BE CREATIVE WITH** mathematics
Certified Organic

• Course content determined organically with input from students

• How would I assign a grade?
  • Exams?!?
  • Solving prowess?
  • Puzzle creation? ✓
  • Essays? ✓
  • Wikis?
  • Final project? ✓
How to teach puzzles?

1. Introduce the rules

2. Solve some puzzles of varying difficulty

3. Discuss solving strategies
   - In-class scribe
   - Real-time puzzle solving

4. Try to create puzzles
   - At home / In groups
5. Solve, critique others’ puzzles

6. Philosophical discussions
   - What makes a puzzle hard?
   - Tension between difficulty and uniqueness.
   - How much information is in a clue?
   - Theory: decision tree

7. Homework Assignment

8. Presentation
Creative Puzzling Assignment

• Create one or more puzzles
  • Push the boundaries

• Write a short essay (Deep thought!)
  • What conscious decisions went into its construction?
  • What makes the puzzle easier (harder) to create? solve?
  • Explain the tension between uniqueness and difficulty.

Inspired by Circular Teaching Squad discussion
• Join us! Watch for announcements on Socrates
• What are the rules of this game?

• Create a hybrid puzzle.
  • For two puzzles you’ve learned
  • Merge rules and clues

• Voice record yourself completing the puzzle.
Field Trip!

• An Escape Room
  • Sunday in Flushing

• Locked in a room!
  • Escape within an hour!

• Solve a sequence of puzzles
  • Find hidden objects
  • Code breaking
  • Temporal, physical clues
  • (hints provided)
Final Project

• Create an “Escape the Room”
  • Group theme
  • Individual puzzles + writeup
  • Group portfolio: Walkthrough

• Final exam day:
  • SOLVE the other group’s room

• Student-designed assignment
  • Students taking ownership

Christopher R. H. Hanusa    Queens College, CUNY
Creativity played a big role in this course which forced me to get out of my usual structured mindset.

Looking into the why of a puzzle was something I never thought about prior to the course. I feel like a better puzzle solver now!

A very open class that will bend your mind a bit.

It's not often in math you're asked to really dive into why you're doing something.

Math 555 has definitely shaped how I approach my other classes. I found myself looking at other mathematical problems from an alternative perspective.
• You can create a puzzle in a group!
• Very useful: Pictures before & after getting stuck
• Change in solving philosophy
  • Solve the puzzle with an eye toward creation
• I gave up control and I feel fine!
  • Came out of class with a different homework assignment than when I went in.
• Supervising 35 projects in a semester is tiring.
THANK YOU!

qc.edu/~chanusa

> Course Archive
Course Content

> Talks
Slides Available

- QC Mathematics Dept
- Sarah Mason (Wake Forest)
- My students, who amaze and inspire, EVERY TIME!

Christopher R. H. Hanusa  Queens College, CUNY

Teaching and Learning Showcase  May 6, 2016