Problem Solving in Intro courses

Andy Rundquist

Learning Outcomes

- Explain the difference between problem solving and doing exercises
- Explain the value of exercises and list ways to get students to do them
- Craft Learning Outcomes that specifically articulate problem solving
- Describe assignment arcs that include scaffolding for Problem Solving

Apprentice model

- Most proven technique to pass on knowledge
- Scaffolding
  - Watch
  - Do with supervision
  - Exercises
  - Submit finished work for review
  - Stand alone

Problem Solving

- “If you know how to do it, you’re not ‘Problem Solving’”
  -Ken Heller, U of MN
- General purpose tools vs Algorithms
- Exercises vs Problem Solving

Analogies

- Sports
  - Weight lifting vs playing the game
  - Drills vs playing the game
  - Isolating a particular play vs playing the game
- Theater
  - Memorizing lines vs performing
- Music
  - Scales vs whole piece
- Others?

Physics vs math

- Sometimes the exercises are for math
- Algebra/Calculus/vectors can stop physics understanding
- Research around conceptual

Circuit example (math)