Problem Solving as Motivation: Just In Time Teaching

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Class Problem (CP)

- Began every class
- Immediate reason to use the math
- Designed to go beyond students’ current knowledge
What is REAL?

- Students can use it immediately
  - Part time job
  - Budgeting
- Students can use it in the near term in another subject
  - Science
  - Geography
  - Technical shops
  - Family Studies
What is REAL? (continued)

- Someone close to the student could or does use it
  - Family member
  - Relative
  - Adult acquaintance
- Examples exist in the real world of someone using it
- The math flowed from an investigation, experiment, or model in which the students were involved
### Some Examples of Class Problems

<table>
<thead>
<tr>
<th>Topic of Study</th>
<th>Problem Focii</th>
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<tbody>
<tr>
<td>Venn diagrams</td>
<td>Earthquake epicentres; consumer attributes</td>
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<tr>
<td>Intersection of lines</td>
<td>Breakeven analysis; pursuit problems</td>
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<td>Integers</td>
<td>Temperature, especially extremes; climate (geography)</td>
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<td>Logarithms</td>
<td>Richter scales; pH; magnitudes of stars</td>
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<td>Linear relations</td>
<td>Simple interest; comparing printing costs; density (science)</td>
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<td>Bar graphs</td>
<td>Climate; population (geography)</td>
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<td>Circle graphs</td>
<td>Net worth; budgeting</td>
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<td>Exponential growth</td>
<td>Population; compound interest</td>
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<td>Quadratic functions</td>
<td>Profit maximization; optimization</td>
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<td>Topic of Study</td>
<td>Problem Focii</td>
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<td>Hyperbolas</td>
<td>LORAN navigation system; comets</td>
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<td>Ellipses</td>
<td>Planetary orbits; satellite transfer ellipses</td>
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<td>Perimeter, area, volume</td>
<td>Fence it, paint it, fill it up; design a garden, room, amusement park</td>
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<td>Similar triangles</td>
<td>Inaccessible distances; shadows</td>
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<tr>
<td>Triangle trigonometry</td>
<td>Inaccessible heights; clinometers</td>
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<tr>
<td>Displacement, velocity, acceleration</td>
<td>Physics problems; experiments</td>
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<td>Periodic functions</td>
<td>Radio waves; biorhythms; Ferris wheels</td>
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<tr>
<td>Geometric sequences and series</td>
<td>Compound interest; annuities; chessboard problems</td>
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<tr>
<td>Arithmetic sequences and series</td>
<td>Simple interest; linear relations</td>
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<tr>
<td>Matrix operations</td>
<td>Power ratings of sports teams; Markov chains;</td>
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<td>communication networks; cryptography</td>
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<td>Matrix equations</td>
<td>Leontiev production models; Kirchoff's laws; election predictions; consumer behaviour</td>
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<tr>
<td>Equations</td>
<td>Formulas such as D=ST; D=M/V; V=IR; SP=(1+P%)CP</td>
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<td>Systems of equations</td>
<td>Mixtures; puzzles; DST; money; percents</td>
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Just In Time Teaching (JIT)

- On-demand mini-lessons
- Provide the math content needed to solve or progress towards a solution of the class problem (CP)
- Whole class or small groups
- Practice and consolidation
- Repeat as necessary
Example of a Class Problem

The school yearbook will be priced at $30 per copy. After investigating several printing companies, the cheapest bid for production of the yearbook was $600 as a setup charge, plus $18 per copy for printing. What is the minimum number of yearbooks that must be sold to at least break even?

Expected math content: intersection of lines
JIT Mini-lessons

- Algebraic formulation of equations
- Graphing linear relations
- Solving systems of equations by multiple methods
- Special cases (parallel, coincident)
- Extension to quadratic relations (profit)
- Other similar situations (cell phone plans, company production and sales)
Extensions

- Role play (e.g. corporate CEO)
- Communication (e.g. letters to suppliers)
- *What If?* Scenarios
- Business plans
Your Turn

- With a partner, create a CP on the topic of your choice
- Don’t forget to keep it REAL
- Complete the template, identifying the expected math content, and the probable JIT mini-lessons
- (20 minutes)
- Post your template
- Gallery walk with your partner
- Identify commonalities in the CPs
- (20 minutes)
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PROBLEM SOLVING AS MOTIVATION
Issues

- Some topics not very “real” (e.g. algebra)
- Large time commitment by teachers
- Requires high teacher self-efficacy
- Teacher flexibility
- Other dimensions (e.g. metacognition)
- Traditional assessment and evaluation
- Difficult to maintain focus over time
In Memoriam: Joseph Stein

Born: May 1, 1930
Died: February 6, 2014

Visionary, Leader, Aeronautical Engineer, Father
In a completely rational world, the best of us would be teachers, and the rest of us would have to settle for something else.

Lee Iacocca (former CEO, Chrysler Corporation)
Thank you

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