Problem Solving as Motivation: Just In Time Teaching

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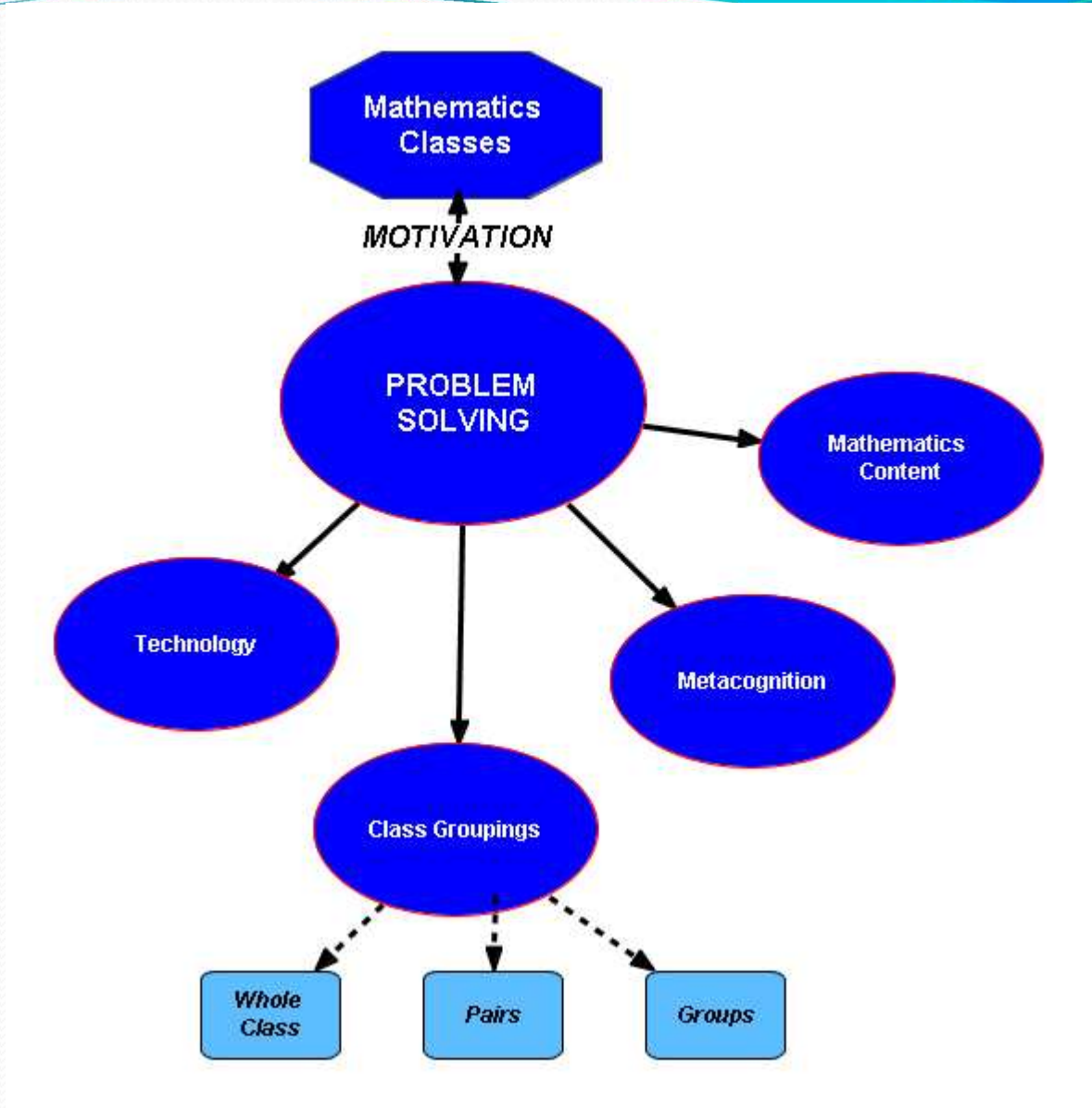
Mathematics Classes
MOTIVATION
PROBLEM SOLVING
Mathematics Content
Technology
Metacognition
Class Groupings
Whole Class
Pairs
Groups

Class Problem(CP)

- Began every class
- Immediate reason to use the math
- Designed to go beyond students' current knowledge

MOTIVATION

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

Topic of Study	Problem Focii
Venn diagrams	Earthquake epicentres; consumer attributes
Intersection of lines	Breakeven analysis; pursuit problems
Integers	Temperature, especially extremes; climate (geography)
Logarithms	Richter scales; pH; magnitudes of stars
Linear relations	Simple interest; comparing printing costs; density (science)
Bar graphs	Climate; population (geography)
Circle graphs	Net worth; budgeting
Exponential growth	Population; compound interest
Quadratic functions	Profit maximization; optimization

Topic of Study	Problem Focii
Hyperbolas	LORAN navigation system; comets
Ellipses	Planetary orbits; satellite transfer ellipses
Perimeter, area, volume	Fence it, paint it, fill it up; design a garden, room, amusement park
Similar triangles	Inaccessible distances; shadows
Triangle trigonometry	Inaccessible heights; clinometers
Displacement, velocity, acceleration	Physics problems; experiments
Periodic functions	Radio waves; biorhythms; Ferris wheels
Geometric sequences and series	Compound interest; annuities; chessboard problems
Arithmetic sequences and series	Simple interest; linear relations
Matrix operations	Power ratings of sports teams; Markov chains; communication networks; cryptography
Matrix equations	Leontiev production models; Kirchoff's laws; election predictions; consumer behaviour
Equations	Formulas such as D=ST; D=M/V; V=IR; SP=(1+P%)CP
Systems of equations	Mixtures; puzzles; DST; money; percents

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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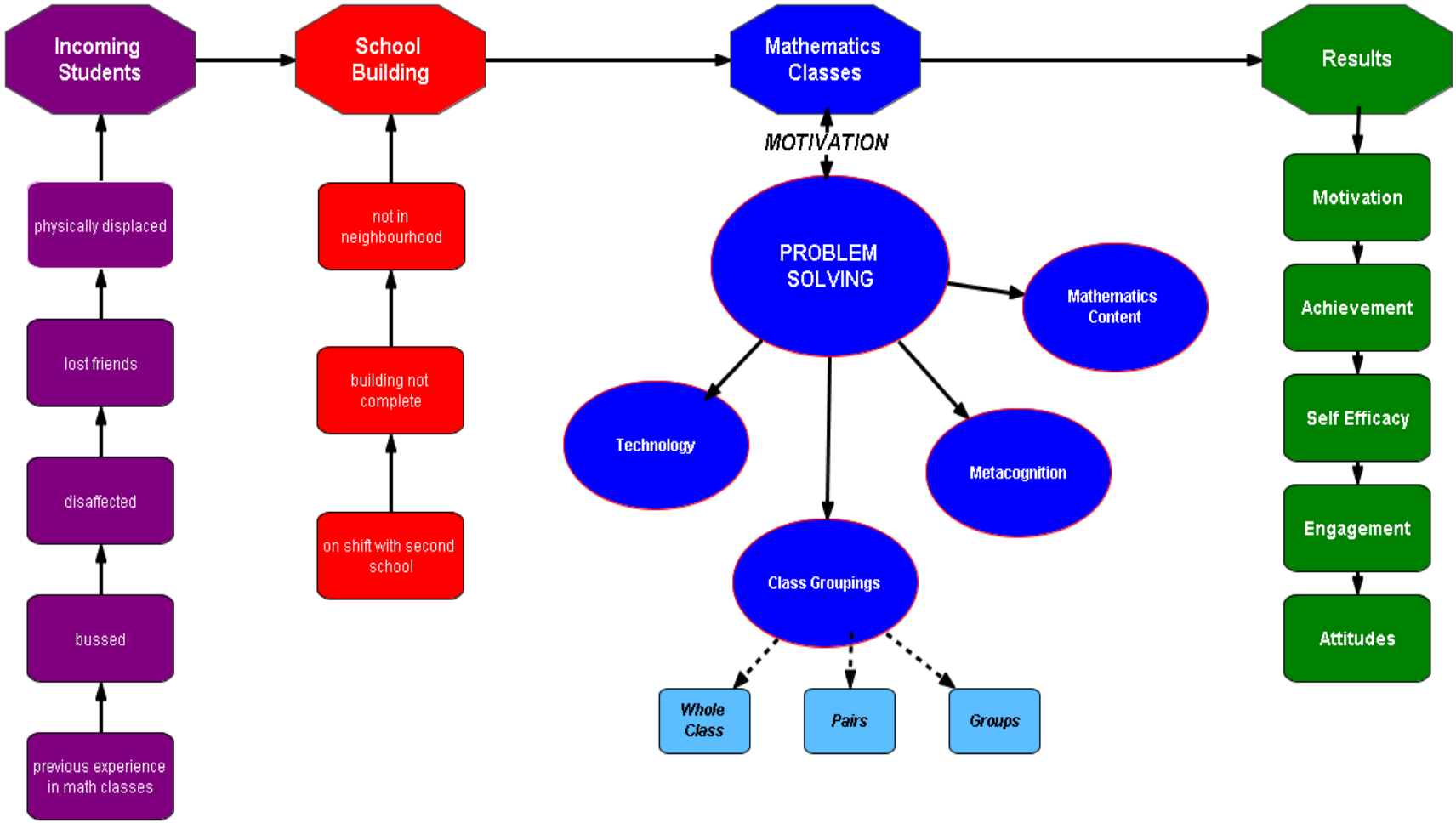

PROBLEM SOLVING AS MOTIVATION

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)

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Thank you