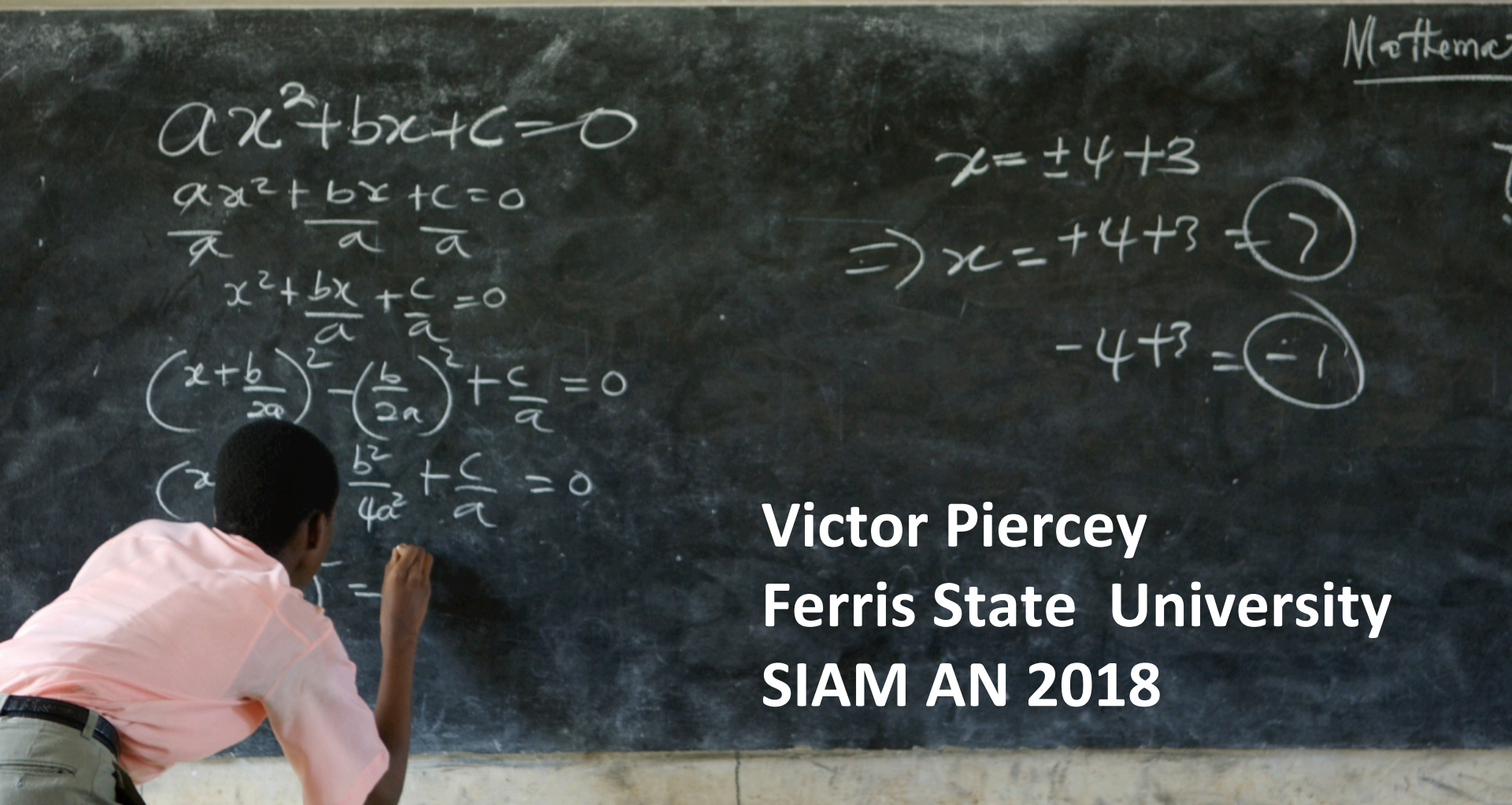
IBL in Financial Mathematics for Actuarial Science Students



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SIAM AN 2018

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Ferris State:
Relatively Open Admissions

Math Programs:

- **Applied Mathematics**
- **Actuarial Science**

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Act. Sci. at FSU:

- 2 out of 3 VEEs
- Exam P and FM
- 3-credit exam preps

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Math 450:
The Theory of Interest

- Juniors/Seniors
- About 10 students

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Inquiry-Based Learning: (from AIBL)

a broad range of empirically validated teaching methods which emphasize
(a) deeply engaging students, and
(b) providing students with opportunities to authentically learn by collaborating with their peers.

Typical Features:

- **Sense-Making Activities**
- **Collaboration**
- **Presentations**

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Challenges in IBL

- Student Buy-In
- Content Coverage

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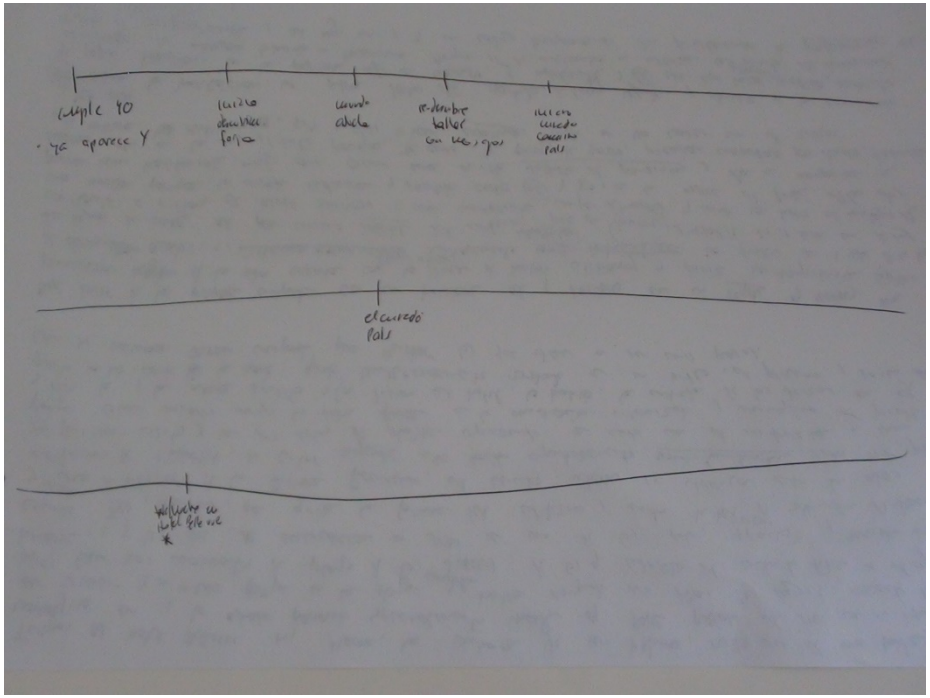

Justification for IBL in MATH 450:

- **Need for financial intuition**
- **Need for problem solving**

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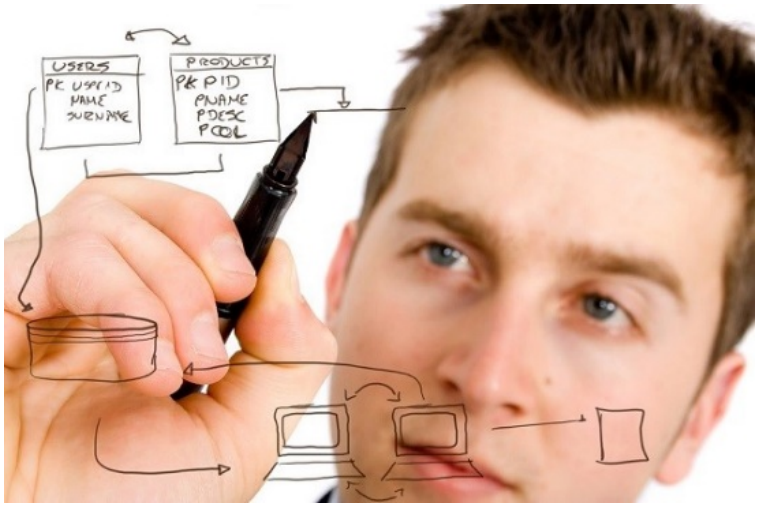
Activity Design:

1. Start with Problems
2. Develop the Mathematics
3. Solve Problems
4. Financial Calculator



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Example: Level-Pmt. Annuities

$$a_{\overline{n}|}$$

Part 1: FM Exam Problem Analysis

- Identify all annuities/lump sums on a timeline
- Determine if annuity due/imm.
- Determine if want PV or FV
- Write equation with notation.

Example: Level-Pmt. Annuities

Part 2: Geometric Series Review

- Identify geometric series
- Derive sum formula

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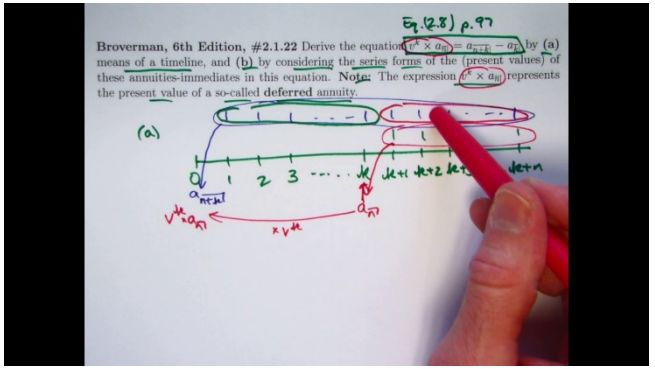
Example: Level-Pmt. Annuities

Part 3: Derive Annuity Formulas

- Derive FV formula for ann. imm.
- Use "timeline reasoning" for PVs
- Use limit for perpetuity formula
- Solve problems from Part 1



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Example: Level-Pmt. Annuities

Part 4: Financial Calculator

- Use manual to learn calculator functions
- Describe logic behind series of keystrokes
- Apply to problems from Part 1 as appropriate

Implementation:

Randomized groups of 2 or 3

Presentations:

- **write up solutions as come into class**
- **somebody from different group explains**
- **somebody from different group evaluates strategy**
- **somebody from last group checks the details**

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Coverage: Same as in Lecture

- Time value of money
- Level-Pmt Annuities
- Non Level-Pmt Annuities
- Loans
- Bonds

Rest: in exam prep course

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Student Buy-In

Quite successful!

- Students who passed exam credited IBL
- Students in exam course remarked wanted more IBL!

The key: couched activity in exam problems

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What I would do differently:

- More selective in “formula derivations”
- Explicit “timeline reasoning”
- Include explicit problem solving techniques as sophistication increases

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What I would do differently:

- More opportunities to explore
- Implement with "professionalism" (especially ethics)
- Prepare students to "teach themselves" (reading exercises?)

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Questions, comments, pies in the face?

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