

# Holistic Math Pedagogy: An Educator's Perspective

NEMATYC

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# Abstract

- According to the Occupational Information Network (O\*NET)\*, a “Bright Outlook” is predicted for quantitative occupations in the next decade, including jobs for mathematicians, software developers, and data analysts. To help prevent a workforce gap, math departments at two-year colleges are obviously called to increase student interest in — and success through — their quantitative- and logic-intense coursework.
- To help to address this challenge, this talk presents one perspective on “holistic” math pedagogy for two-year college courses. Built on personal experience, the talk outlines methodology, teaching strategies, and tactics to implement this viewpoint.

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# Motivation: MATH FOR FUTURE

- Goals of community college math departments include:
  - Preparing students for lifelong learning and success
  - Fostering interest in math-related disciplines
  - Engaging these students with the regional STEM workforce
- Failure/switch rate for prospective STEM majors in 2yr programs
  - Reasons given (if can find)
-

# Math Educator: Highlights

- **Leysin American School** – *Algebra, Pre-calculus, Calculus, Differential Equations, Statistics, etc.*
- **Princeton University, “Engineering Projects in Community Service”** – *Mathematical Finance, STEM, Microsoft SharePoint 2010, etc.*
- **MassBay Community College** – *Developmental Algebra*
- **Framingham State University** – *Business Calculus, Statistics, Pre-Algebra, Algebra, Pre-Calculus, Calculus, Mathematical Finance, Abstract Algebra*

# Technical Analyst: Past Projects

- Designed methodology for and analyzed impact of a classroom/school intervention
- Quantified trends in urban growth and hydrology using statistical analysis
  - Tax parcel, LU, and LC data (ArcGIS, Excel)
  - 50+ years of rainfall data (MATLAB, Excel)
- Collaborated with industrial sponsor to produce analyses saving \$1,000 in company R&D costs

# Agenda

- Understanding the problem: Math for the future
- My perspective (i.e., me talking)
- Discussion & reflection
- More “me talking”
- Q&A



# Math for the future

“Increasing student interest in — and success through — their quantitative- and logic-intensive coursework.



BIG GOAL...

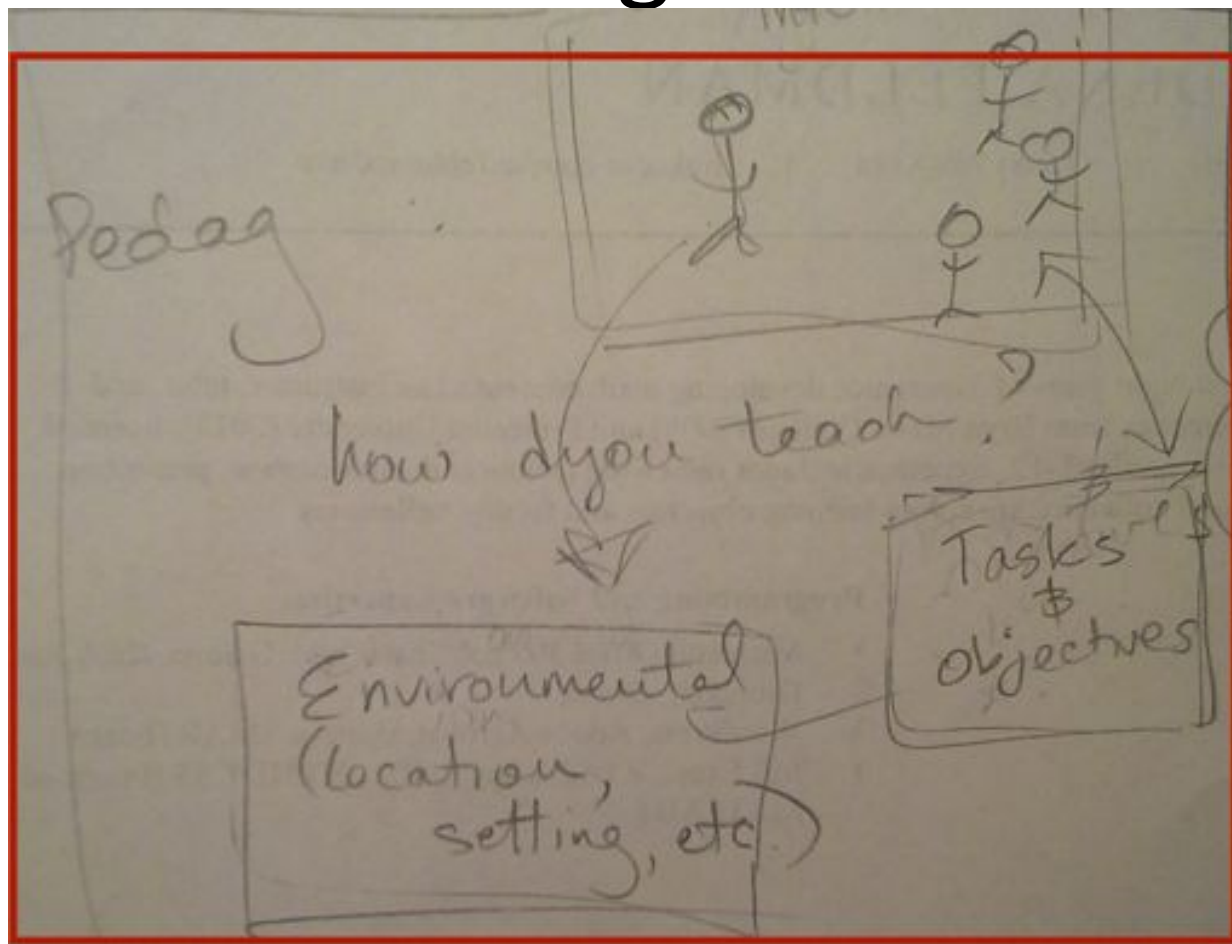
*...let's break down this problem.*



# Understanding the Problem

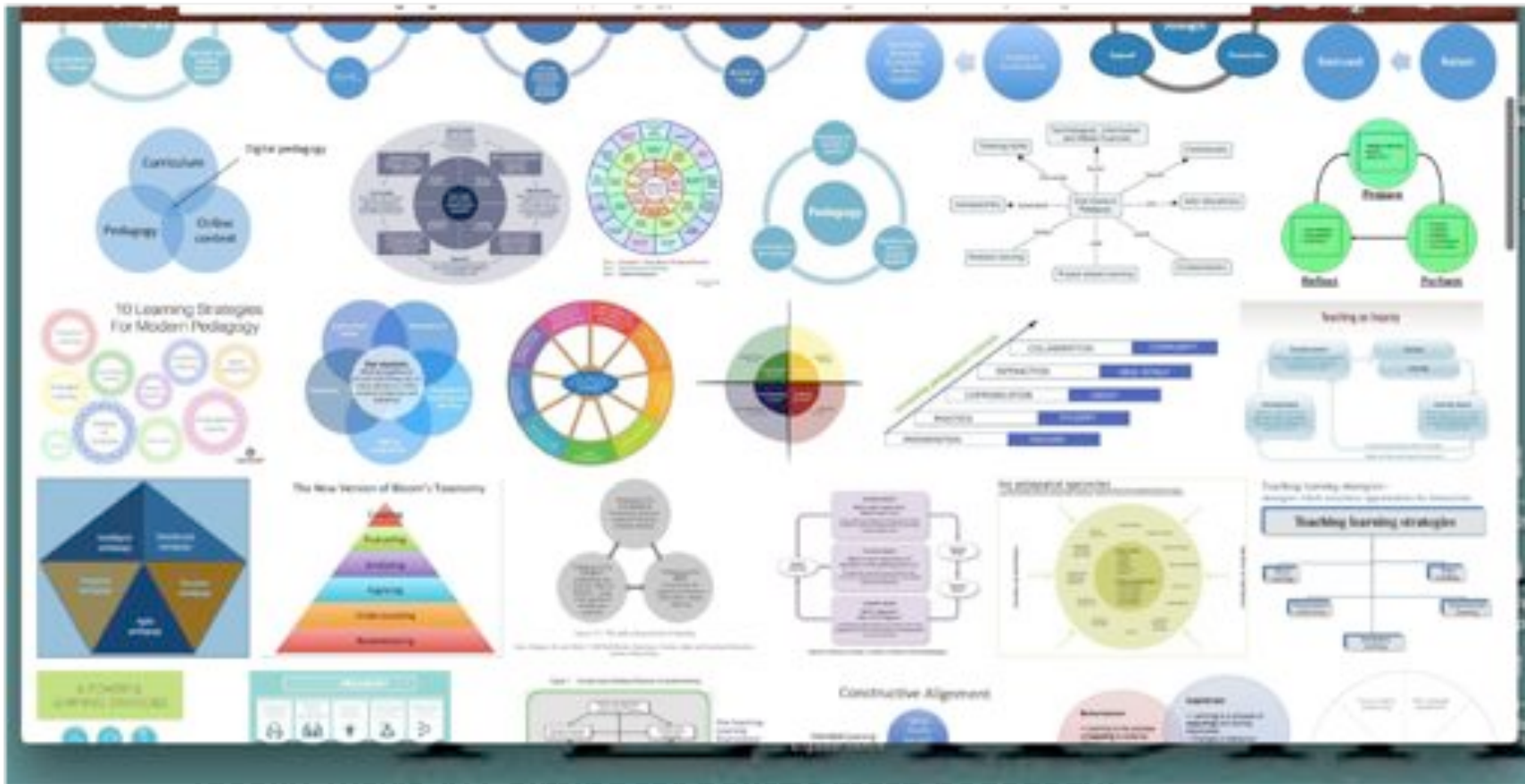
- **Pedagogy:** “...interactions between teachers, students, and the learning environment and the learning tasks.” - IIEP, UNESCO
- **Holistic:** “...characterized by comprehension of the parts of something as intimately interconnected and explicable only by reference to the whole.” – Google

# Understanding the Problem



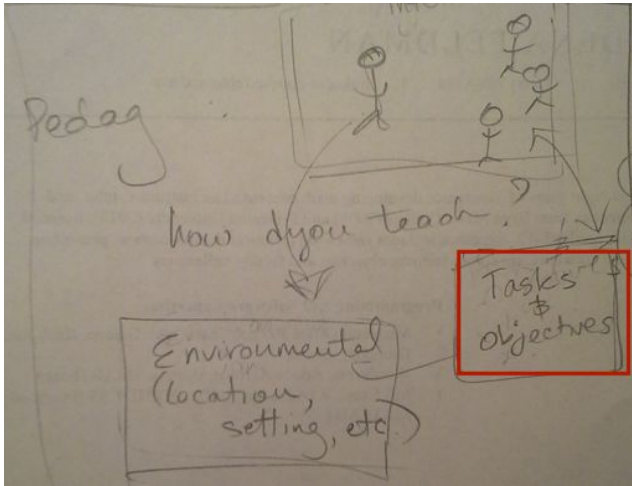
Ideally, we're ALL aiming for holistic math pedagogy, right?

# Understanding the Problem



ideally, we're ALL aiming for holistic math pedagogy!

# Student Objectives?

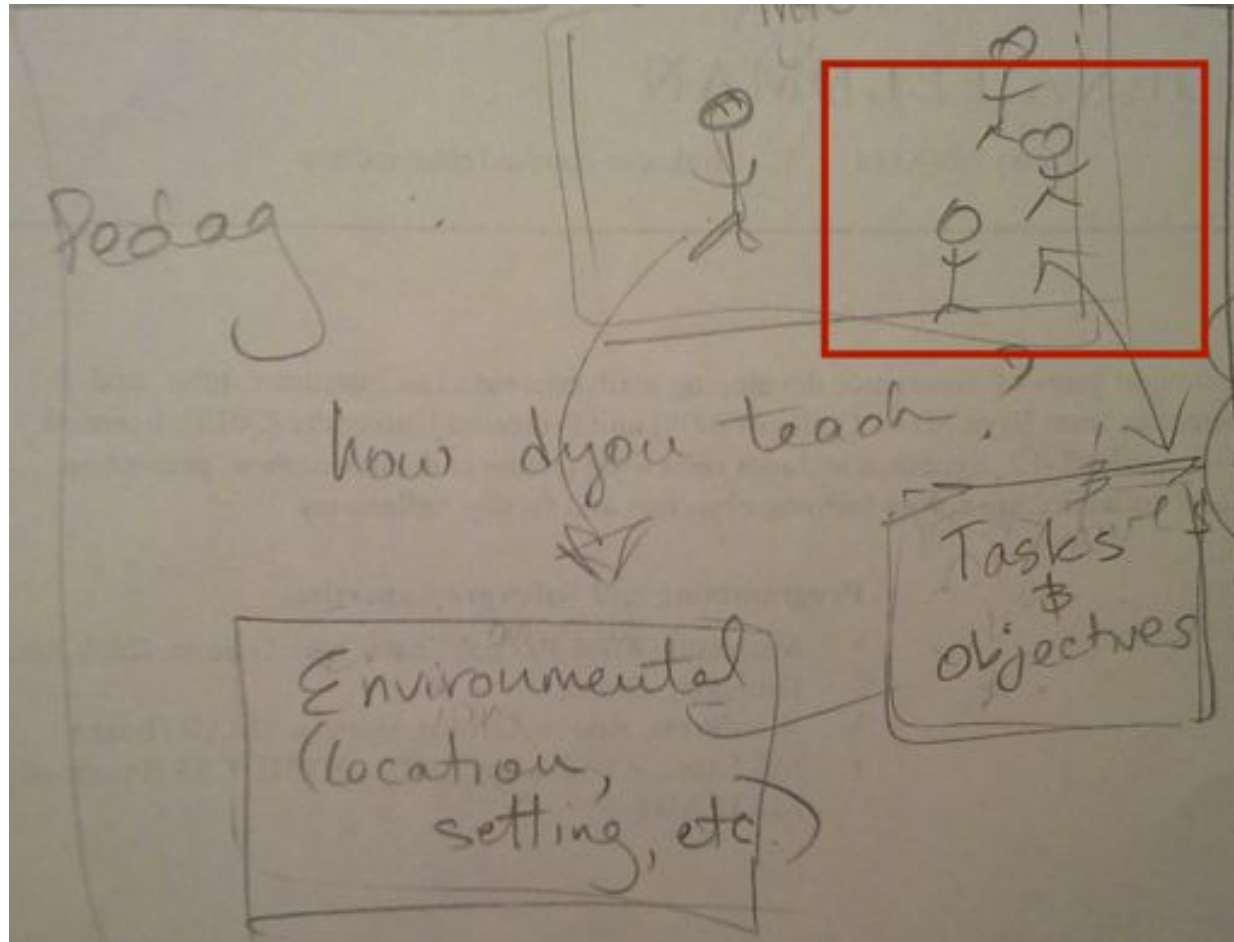


software engineer  
statistician  
mathematician  
data analyst  
... everybody?

Numerical Literacy  
Problem-Solving Skills  
Ability to understand logical/analytical reasoning

...what are *your* desired learning outcomes?

# Students



# Students

...returning to school?

...seeking professional development  
or continuing education?

...deciding on future investment in  
education?

...?

*"Everyone you will ever meet  
knows something you don't."*

- Bill Nye (the Science Guy)

# Student Engagement in Class

- Keeping the material relevant
- “Autonomy, mastery, and purpose.” – Dan Pink, TED.com
- Varying student-teacher, student-student interactions, regularly, takes advantage of different strengths
- Every class has different dynamic



# Student Interest in STEM\*

- Proactive, not *reactive*
  - “Assess early and often”
  - Encourage group cohesion
  - Set clear expectations (group *and* personalized)
- Bring the world to the classroom
- Create and foster opportunities for students to learn about STEM careers

\*Or math. Take your pick!



# Supporting student *success*

- Roadblocks to math success:

- Impatience

- Pride

- Negative self-talk

- Sleep, food...

*“Am I a Debbie  
Downer, or an  
Ursula Upper?”*

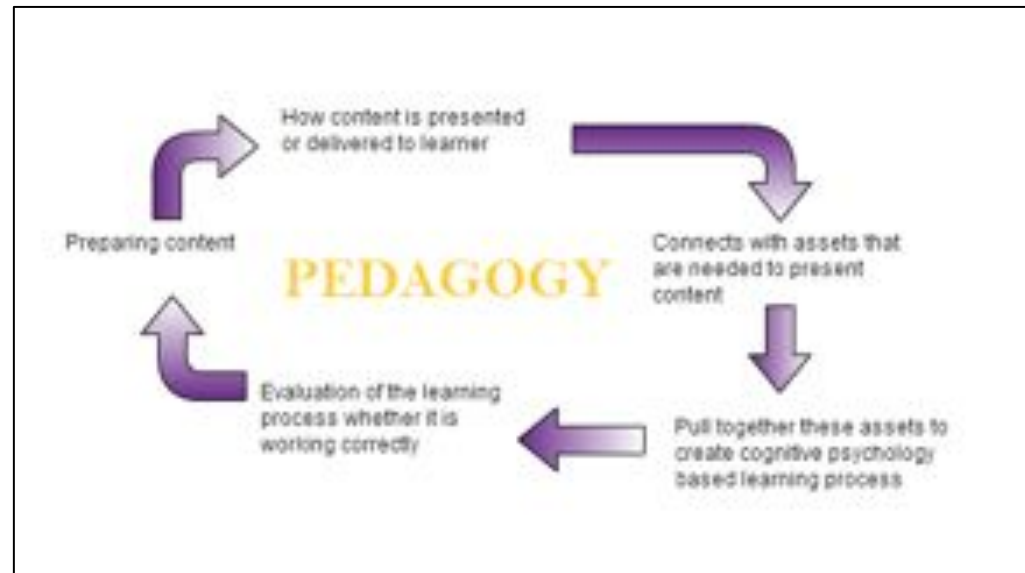
- Self-awareness is key!

[https://www.ted.com/talks/  
angela\\_lee\\_duckworth\\_grit\\_the\\_power\\_of\\_passion\\_and\\_perseverance](https://www.ted.com/talks/angela_lee_duckworth_grit_the_power_of_passion_and_perseverance)

# Math for the future

- “Increasing student interest in — and success through — their quantitative- and logic-intensive coursework”
- Ongoing faculty self-reflection

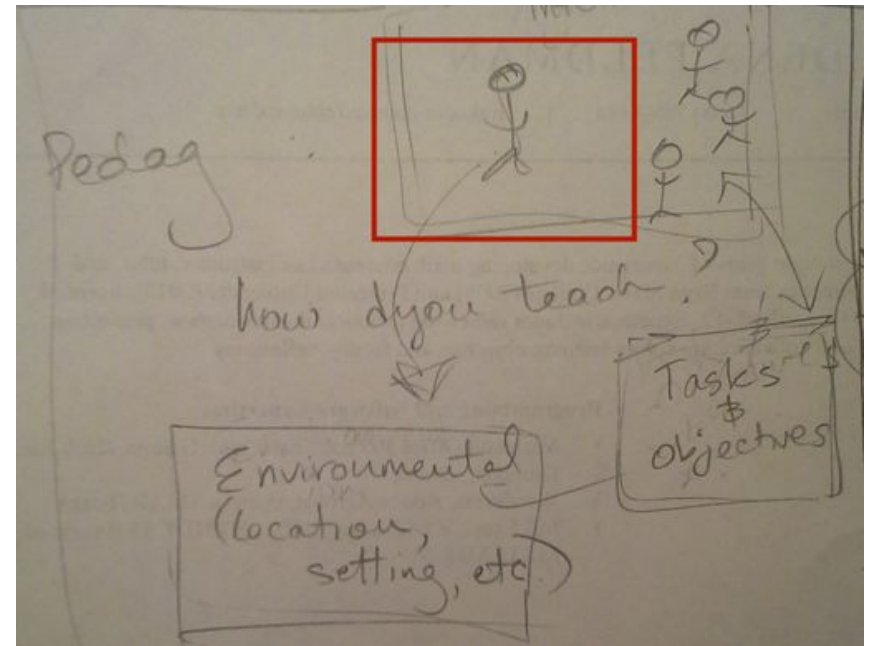
“Teaching without learning is just talking.”  
- K. P. Cross, *scholar of adult education and higher learning*



# Challenges for teachers

- “What’s in my Circle of Control?”
- Defining & maintaining boundaries

"If I feel unhappy, I do mathematics to become happy. If I am happy, I do mathematics to keep happy." – *Alfréd Rényi*

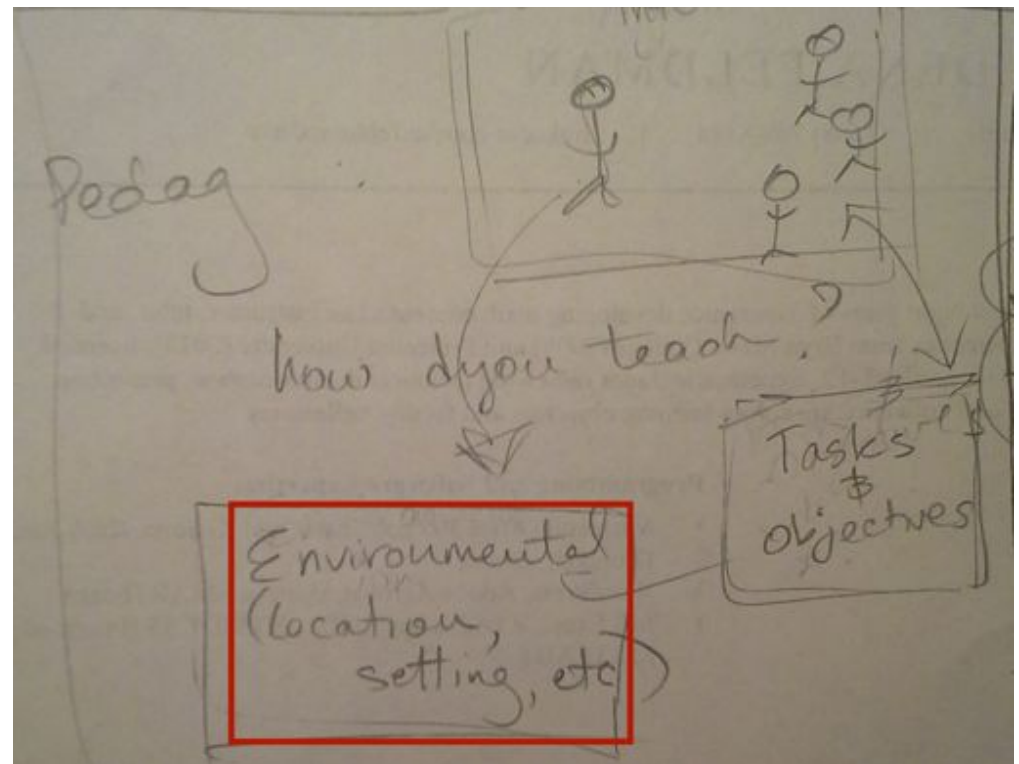


# Reflection Time (10-15 min)

- Classrooms? Supplies? Electronic resources?
- Academic calendar? Number of sessions?

“What unique challenges  
am I facing?”

Additional topics that you  
would like me to discuss?



Questions?

“The ultimate measure of a man is not where he stands in moments of comfort and convenience, but where he stands at times of challenge and controversy.”

*- Martin Luther King Jr.*

Thank you!

# Cited Sources

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