

[DRAFT] SMPLs for Learning Math v1.1 --- Outline

1. Problem: Math education in the US has not worked
 - 1.1. Students are training skill of recognizing problem types and applying prescribed procedures --- “Best Fit” learning leads to persistent misconceptions.
 - 1.2. Proper math practice is a continuous translation of mental models to math models to symbolic representations --- leads to effective consolidation of learning
 - 1.3. Pencil and paper → little to no behavioral reinforcement during translation
 - 1.4. Students need rapid, precise, accurate feedback to correct errors.
 - 1.5. Without feedback, waste of effort and time, formation of misconceptions
2. Solution: SMPLs enable practices which meet needs of the learning mind...
 - 2.1. These practices have been used in other disciplines for a very long time
 - 2.1.1. Learning a musical instrument (per [Lockhart's A Mathematician's Lament](#))
 - 2.2. Students receive feedback in translation of mental models to math symbolic language
3. Why SMPLs work:
 - 3.1. Precise, accurate feedback
 - 3.1.1. Precision → Syntax checker
 - 3.1.2. Accuracy → Is the algorithm output correct? Visualizations
 - 3.2. Rapid Reinforcement
 - 3.3. Successive Consolidation
 - 3.4. Retained, authentic performance capability

Semantic Cluster Terminology

1. Memorable Insight through visualization (Area of circle, triangle, etc)
2. Understanding
3. Uncoverage
4. Transfer (Near and Far)
5. Mental Models / Concept Images
6. Persistence of Cognitive Structures
7. Assessment / Self-assess
8. DevStages Expertise
9. Inference
10. Truncated, Best Fit learning vs Continually improving models
11. Capable of using Math Semantic Cluster

Essential Questions

What makes math hard to learn?

What would it look like if math were easy to learn?