Modeling and Analyzing Education Systems: Two Applications for CSLS

Britte Haugan Cheng
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Problem 1: Scaling Educational Innovations
Problem 2: Reforming Educational Testing Systems
Problem 1: Scaling Educational Innovations
Challenges to Scaling Educational Innovations

• Emerging theory
  – Implementation models (variation, social dynamics)
  – Context of implementation

• Few resources to aggregate theory, design knowledge, research results
  – Publication is non-functional
  – Aggregating theory requires it’s own theory (systemic research is expensive and often narrowly focused)
Current Approaches

• Emerging Theory: Design-based Methods (knowledge to practice)
  – Design-based Implementation Research
  – Research-Practitioner Partnerships
• Resources to Aggregate Results: Large-scale Evaluations
  – RCTs
  – What Works Clearing House
New Solutions via CSLS: Computational Models of Systems

• Emerging Theory: Participatory Modeling of Implementation
  – Models as ‘boundary objects’
  – Integrating social networks and dynamics
• Resource to Aggregate Results: Functional, Reusable, Extensible
  – Retrospective analysis and simulation (prediction, experimentation)
    • Demonstrate success and failure
    • Illustrate crucial variation
  – Existing models are valuable in new contexts

Example: STEM recruitment and retention model in Higher Education
Problem 2: Reforming Educational Testing Systems
Challenges to Reforming Testing Systems

• System stakeholder outcomes do not align
  – Formal testing infrastructure vs. Classroom Learning
    • Trends (longitudinal comparisons)
    • Expensive

• Data streams do not converge
  – Classroom data is not easily aggregated or communicated
  – Large-scale data is not timely
Current Approaches

• Aligning system stakeholder outcomes
  – Vertical Assessment Systems (vertical alignment vs. vertical scaling)
  – Learning progressions (developmental alignment/coherence)

• Converging data streams
  – Cognitive models and data models (ITS)
  – Bayesian measurement models (game-based assessment) and emerging products of learning analytics
  – Computer-adaptive testing models
New Solutions via CSLS: Computational Models of Systems

• Aligning system stakeholder outcomes
  – Coordinate cognitive and measurement models across classroom and large-scale assessment contexts
    • Vast variation in student trajectories
  – Infrastructure for establishing this alignment in new contexts

• Converging data streams
  – New data corpuses for learning analytics/educational analytics
  – New insights into data organization and structure

Example: Formative Assessment Systems Model
Thank You