In-Depth Retrospective Studies of K-12 Science Curriculum Design

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Project Overview

Design and development are critically important to the educational enterprise. Unfortunately, there is little research on which design and development processes produce optimal outcomes for curricular materials intended for large-scale implementation. The Design Dimensions project asks: Across phases of design (analysis, development, and evaluation), what processes and strategies are critical to successfully obtain large scale implementation with significant impacts on learners? This collaborative project includes two distinct lines of research. TERC and the Lawrence Hall of Science are leading a series of ‘deep dive’ studies that examine, in depth, the process of curriculum design through retrospective case studies and ‘live design’ activities. The University of Pittsburgh is leading a series of ‘broad orientation’ studies that examine patterns of curriculum design across a wide range projects.

Dimensions = Y1(RetroTERC + RetroLHS + PortfolioReview) + Y2(LiveTERC + LiveLHS + BroadInterviews)

Theoretical Framing

Key challenges to having significant impact on learner outcomes at scale

- Knowledge of scientific ideas, inquiry, discourse
- Ability to apply, refine, and advance their knowledge

- (Social) spoken and/or written interactions mediated by social norms
- (Cultural) first and second hand engagements with the knowledge, beliefs, expectations, values, and practices of an interacting group
- Occur inside and outside the classroom as components of science teaching and learning

- The adoption, enactment, and sustained maintenance of an innovation...
- ... across diverse educational settings and critical resources and constraints

- Depth, sustainability, shift in ownership, spread (Coburn, 2003)
- Learner outcomes

Investigating challenges in curriculum representations

Intended Outcomes | Intended Enactment/Implementation | Manifestation in Curriculum | Design Process
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What kinds of ... | In what ways did the project endeavor to... | How were the project’s ideas about ... | How did the project’s analysis, development, and evaluation process...
...deep understanding and rich performance were important to this project? | ...eliciting their ideas about deep understanding and rich performance in the classroom? | ...deep understanding and rich performance manifested in the curriculum? | ...facilitate creation and refinement of these manifestations?
...social and cultural experiences were important to this project? | ...eliciting their ideas about social and cultural experiences in the classroom? | ...social and cultural experiences manifested in the curriculum? | ...facilitate creation and refinement of these manifestations?
...settings, resources, and constraints were important to this project? | ...attending to their ideas during adoption, enactment, and sustained maintenance? | ...setting, resources, and constraints manifested in the curriculum? | ...accommodate diverse settings with various resources and constraints?
Did this project intentionally set out to achieve scale? | In what ways did the project actively endeavor to achieve scale? | How were concerns of scale reflected in the curriculum? | How did the project’s analysis, development, and evaluation process influence their work towards achieving scale?

Methodology

Case Selection
- 2 from LHS, 2 from TERC
- Focus on K-12 science
- Designed as stand-alone classroom curricula
- Demonstrated evidence of success at scale (Coburn, 2003)
- Reasonable access to project documentation and staff

Data Collection
- Project documentation
- Interviews (Project PI + 5-8 design team members)
- Establish project timeline

Analysis
- Inductive and deductive coding processes
- Document structural characteristics
- Individual and cross-case analysis