

# The Challenges and Benefits of Creating a Program Theory Model for an NSF Math Science Partnership Project: Perspectives from Program Stakeholders and from the External Evaluator

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## Introduction

**Purpose**  
We look at the challenges and benefits of creating and using a fully articulated program theory model from the perspective of the PI and program stakeholders and from the external evaluator. We use the term "program theory model" to reflect a model that goes beyond the inputs and outputs of a simple logic model, that incorporates the context (and partners) in which the program operates and where a theory of change model is explicitly embedded.

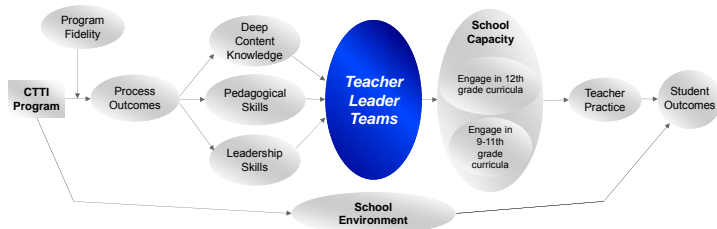
- Key Questions**
- What are some of the challenges in the development of a program theory model?
  - What factors might be needed to help insure that the program theory model is used?
  - How does a program theory model evolve from a requirement at the proposal development stage to become a live document that is useful and used by both program stakeholders and the external evaluator?
  - What are select factors that we see as key to this process?

### The Math Science Partnership

The Chicago Transformation Teacher Institutes (CTTI) was a collaboration between five Chicago-area universities (i.e., University of Illinois at Chicago, DePaul University, Loyola University, Illinois Institute of Technology, and Northwestern University) and the Chicago Public Schools (Wink, *et al.*, 2010). The program, which ran from 2009 – 2015, was designed to increase the content, pedagogical and leadership skills of high-school mathematics and science teachers through a teacher-leader team approach directed toward leadership and content training. The ultimate goal of the program was new and revised grade-12 curricula and improved instruction throughout the participating high schools. As originally planned, 160 teachers and 20 high schools across two cohorts were expected to participate in the program. As implemented, over 191 teachers from over 68 high schools participated in CTTI.

## Evaluation Efforts and Theory of Change Model

External evaluation efforts began with the development of a program theory model. We anchored this by initially aligning our thinking with the theory of change model proffered by Newman, King and Young (2000), wherein **deep content knowledge + pedagogical skills + leadership training** for teachers changes **school capacity** to implement and support innovative math and science curricula. In turn, this affects **teacher practice** and improves **student outcomes** (CTTI proposal, Wink, 2009). Our initial thinking was also guided by the *scaffolding* diagram of outcomes developed by Wenzel (Wink, 2009).



CTTI Theory of Change adapted from Newman, King & Young, 2000; Wenzel, 2009; and CTTI Program Model, 2010

## Program Theory Model

- Recommended by Institute of Education Sciences, U.S. Department of Education and the National Science Foundation (2013)
- Offers program staff and evaluator a common understanding of the program (Donaldson, 2007)
- Efforts to make the theory of a program explicit may ultimately be more valuable than eventual findings (Weiss 1995)
- May have more influence on policy and popular opinion (Rallis, 2013)

### From the Program Stakeholders' Perspective

Possible Challenges:	For this Particular MSP Program the Benefits Were:
<ul style="list-style-type: none"> <li>• Required reflection on programmatic planning across a wide range of activities.</li> <li>• Incorporated all aspects of the project, including ones not often found in concert with one another. This pointed at areas where theoretical foundations of the project were weak (for example, in the interaction between university content expert and teacher practice).</li> <li>• Documented activities and their connection in theory, but this did not attend to significant motivational issues that arose around activities (specifically, the need to market and incentivize well).</li> <li>• Theoretical strength of the model was seen as a threat to the strong practice orientation of some of the work: participants had little experience discussing their work within the context of an external articulation of the theory of change.</li> <li>• Novel findings within the research seemed dissonant with the model, though the model was actually a structure that highlighted that novelty.</li> <li>• Seen as an activity of an external evaluator for that part of the project and people inferred that it was a constraint, not a tool or a flexible document.</li> <li>• Novel ideas and activities were sometimes outside the bounds of the model; program participants were unsure how (or even, whether) to articulate new findings with the original model.</li> <li>• Produced artifacts (specifically, the rubric) that, while capturing all aspects of the project, some of which were not thought to matter in the specific areas of activity.</li> <li>• Assumed specific kinds of participation and interaction and, when they did not occur, seemed to refute the work instead of highlighting that the project work needed to adapt.</li> <li>• Was undermined, as were many other aspects of the work, by the chaotic situation in the partner district.</li> </ul>	<ul style="list-style-type: none"> <li>• Provided an opportunity to reflect deeply and discuss in detail the basic theory of change of the project, articulated in the grant-writing phase, as the project was converted from an initial plan into a detailed, wide-ranging set of activities.</li> <li>• Contributed a tool that became the basis of a classroom observation protocol previously unavailable for the project.</li> <li>• Served as a long-standing document that was available over the entirety of the project, highlighting what was consistent and what was shifting over a period of six years.</li> <li>• Generated specific ideas about how particular outcomes emerged from different parts of the work. This pointed out opportunities to collect and analyze data that were meaningful practically and theoretically.</li> <li>• Served to bring together very disparate activities and the fields of math and science within a single document, highlighting opportunities for cross-disciplinary work and to compare and contrast pedagogy and content in different classrooms.</li> <li>• Created a framework within which especially novel research findings were highlighted as potentially important new phenomena.</li> <li>• Provided a specific rubric that could support professional development work, even at the level of individual teacher reflection and planning.</li> </ul>

### From the External Evaluator's Perspective

Possible Challenges:	For this Particular MSP Program the Benefits Were:
<ul style="list-style-type: none"> <li>• Not differentiating or appreciating differences between strategies and activities</li> <li>• Need to distinguish between program theory and program implementation</li> <li>• Need to make explicit how change happens by linking program strategies and outcomes</li> <li>• May not achieve buy-in from everyone; not used to its potential, e.g., limited use by internal evaluation team</li> <li>• Over-emphasize the unique components of a given program or project</li> <li>• Need to routinely and repeatedly bring the program theory model front and center of project and restate its value</li> <li>• Seen as satisfying a proposal requirement and not much else.</li> <li>• In this particular program, the catalytic role of teacher-leader teams was being overlooked.</li> </ul>	<ul style="list-style-type: none"> <li>• Articulated strategies have wider appeal or more sustainability than specified program activities</li> <li>• Helped to differentiate program theory and an implementation of a program</li> <li>• Theory of Change model (aligned by program theory model) was embedded and made explicit</li> <li>• Used by program (select examples) and framed the external evaluation throughout</li> <li>• Balanced the program's unique components and suggested its potential to generalize to other projects or other implementations</li> <li>• PI of the project saw the value and used the program model when opportunities presented themselves</li> <li>• In line with common guidelines of IES, DOE and NSF, a well articulated theory of action</li> <li>• Theory of Change model helped keep the proposed catalytic role of teacher-leader teams front and center to program and evaluation</li> </ul>