

Using a Program-theory Model Throughout the Evaluation: From Development of a Curriculum Rubric to a Theory of Change

Kathryn Race, Race & Associates, Ltd.
Donald J. Wink, University of Illinois at Chicago
Dean J. Grosshandler, University of Illinois at Chicago

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Purpose of Presentation

Briefly present a fully articulated program model and show how it was used to help:

- Develop a Curriculum Rubric for use in the program (in support of 12th grade math/science course development/modification)
- Create a Theory of Change (underscore the role of teacher/leader teams)

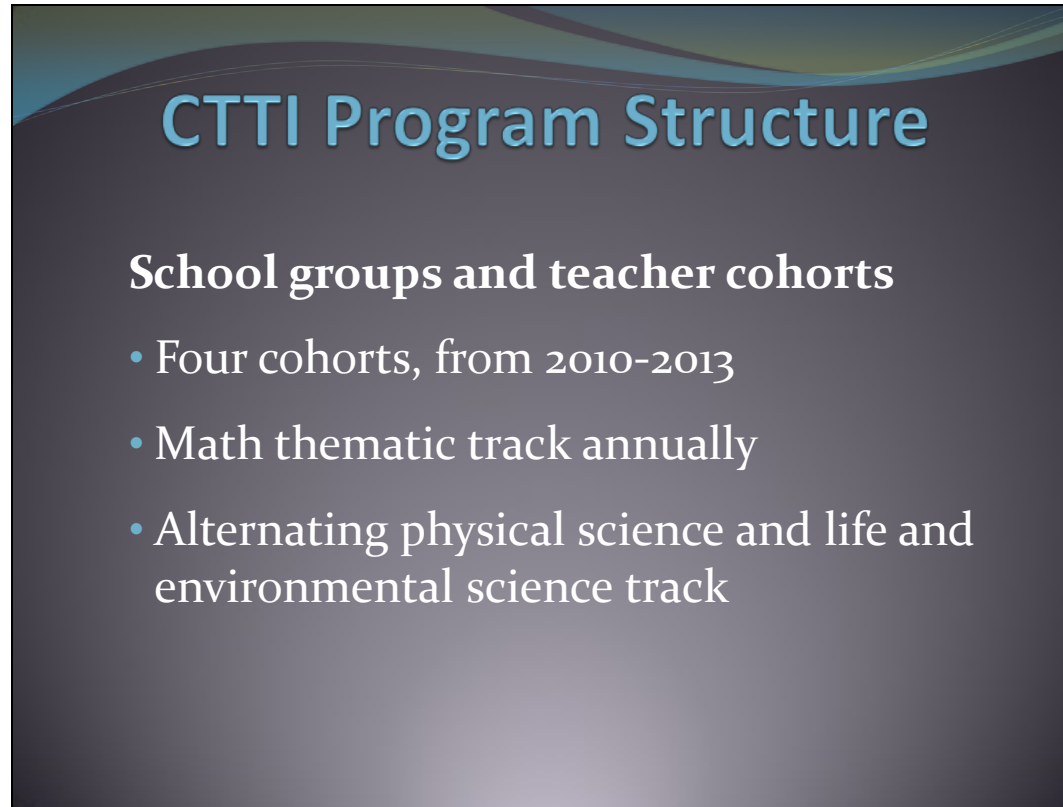
Overview of CTTI Program

The Chicago Transformation Teacher Institutes (CTTI) is a program designed to increase the content, pedagogical and leadership skills of high-school science and mathematics teachers through a teacher leader-team approach directed toward leadership and content training.

CTTI Program Structure

**An NSF Math and Science Partnership
with the Chicago Public Schools**

University of Illinois at Chicago
DePaul University
Illinois Institutes of Technology
Loyola University Chicago
Northwestern University

A presentation slide with a dark blue background and a wavy, lighter blue header. The title 'CTTI Program Structure' is in a large, light blue, sans-serif font. Below it, the subtitle 'School groups and teacher cohorts' is in a smaller, white, sans-serif font. A bulleted list follows, with three items in white text: 'Four cohorts, from 2010-2013', 'Math thematic track annually', and 'Alternating physical science and life and environmental science track'.

CTTI Program Structure

School groups and teacher cohorts

- Four cohorts, from 2010-2013
- Math thematic track annually
- Alternating physical science and life and environmental science track

Our cumulative fiscal year 2009 – 2013 totals are

(1) **225** Teacher Leader/Master Teacher Participants, with a total of **68** new participants coming from the past year (Oct 1, 2012 - Sept 30, 2013), and

(2) **117** Teacher Leader/Master Teacher Participants Receiving Certification/Graduate Credit, with a total of **23** of these coming from the past year.

CTTI Program Structure

- Four courses in math or science content
- Workshops on leadership in schools, leadership in math or science, and implementation of new curricula
- Semiannual institute-wide meetings
- Teacher-leader meetings in schools
- *Ad hoc* workshops

CTTI Program Structure

Financial support for teachers and schools

- Teachers receive a \$1000 stipend for each course and a \$1000 stipend for each workshop
- Tuition subsidies, including from CPS, have been provided after initial cohort
- Upon implementation of the new 12th grade curricula, each school may request \$5000 for class materials or other uses (once for math, once for science, up to \$10,000 total)

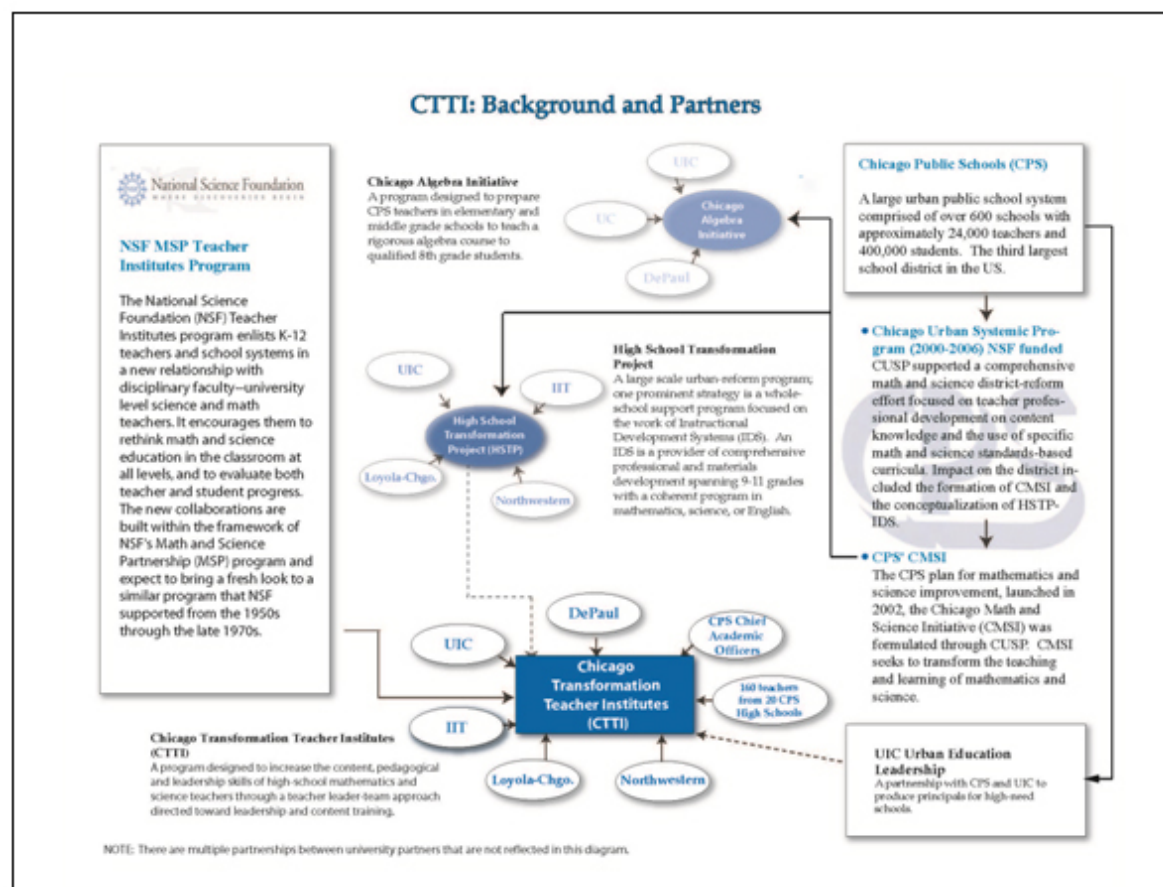
Program Model: Overview

A fully articulated program model was created that detailed:

- Program components at the strategic level
- Program outcomes at the latent variable level

We anchored the program model development by initially aligning our thinking with the theory of change model proffered by Newmann, King and Young (2000) and from a *scaffolding* diagram of outcomes (Wenzel, 2009), which guided project thinking at the time the proposal was written.

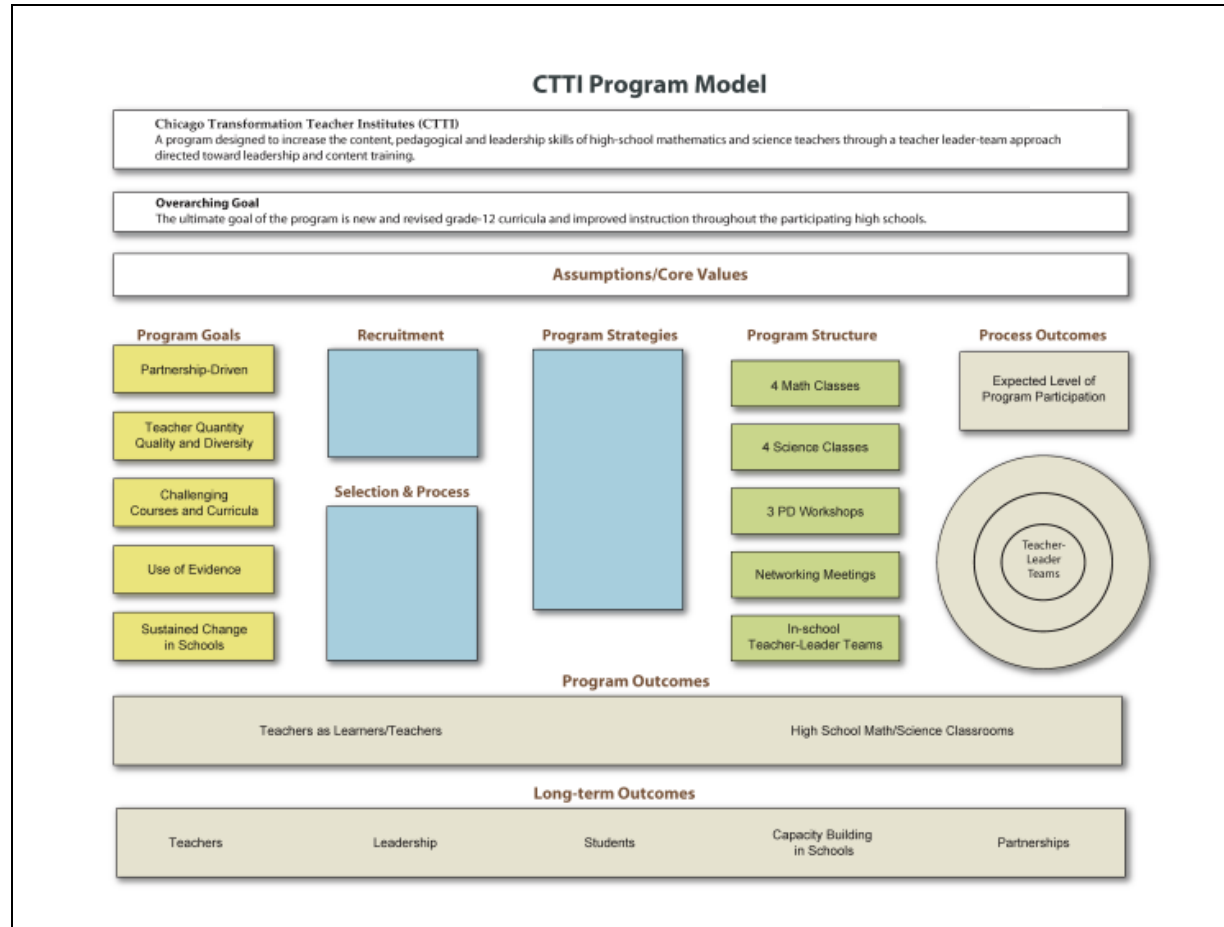
What was needed was an expansion of thought to include articulated details of the program structure and components and to link these to program outcomes.



This is the first page of the program model. It shows the funder of the program (NSF); two previous initiatives that fed into the development of the CTTI program; an Algebra initiative for 8th grade math; and a High School Transformation project, a whole school support project, focused on 9-11 grades.

Also, shown are the partners involved in the CTTI program. It is intended to show an encapsulated history of the program, the partners involved and the context within which the program was developed and implemented.

Slide 10



The fully articulated program model is quite detailed; we are only showing the overview of the model. Each of the boxes (or circles) represented here are fully detailed in subsequent sections (pages) of the model. We can share the fully model with those who are interested. The primary focus of the program model is the articulation of program strategies and identifying program outcomes, and the logical link between the two.

Program Model: Explanation of Need

Multiple Program Components

- Complex program comprised of workshops, graduate-level courses and networking meetings

Not All Components Were Fleshed Out

- Early on, leadership workshops (particularly workshops II and III), and networking meetings were not fully developed

Having a fully articulated program model has many benefits: Program is articulated in a representative way reflecting its integrated components; program strategies and measurable program outcomes logically link together; identified indicators and proposed measures align with priority outcomes; program modifications, if any, adhere to strategies identified as core to the program; program staff and the evaluator have a common understanding of the program; and, has the potential to facilitate the generalization of the program and evaluation efforts to other transformation teacher institutes and initiatives.

Program Model: Explanation of Need (con't.)

Multiple Stakeholders with Multiple Roles

- A large partnership, 5 universities; 1 large public school district; Steering Committee (comprised of representatives from each entity)

Distinct Need: Transformation Teacher Institutes

- Program more than a traditional professional development program (beyond individual teacher improvements)

Program Model: Explanation of Need/Uses

- Differentiate Program Theory and Implemented Program
- Align Program Model with Research and Evaluation Plan

Without a fully articulated program model, the underlying theory of the program, how it operates and how it connects to program outcomes tends to become synonymous with the implemented program. The alignment between the program as designed and the program as implemented may vary from vastly different to near equivalence. These last two needs are also specific uses of the program model.

Program Model: PI Engagement

PI was:

- Highly involved in articulating program model
- Understood its purpose/supportive of use
- Actively used it

Overview of Curriculum Rubric

Designed to be used as an assessment tool to determine the quality of the 12th grade capstone math or science courses identified/modified/implemented during the program by participating high schools.

Intended as an assessment of the entire 12th grade curriculum for a particular course. Many observation protocols exist but there are few assessment tools designed to review the entire curriculum. The full curriculum rubric is available upon request.

Curriculum Rubric Sources

Rubric created from CTTI Program Model and other sources, including:

- Kaser, J. S., Bourexis, P. S., Loucks-Horsley, S., & Raizen, S. A. (1999) *Enhancing program quality in science and mathematics*
- Quality Curriculum Evaluation Rubric
- Rubric for Evaluating Math Intervention Materials
- Westat (2001) ABCS on scoring rubrics

Although rubrics designed to aide classroom observations are quite plentiful – rubrics designed to assess courses at the curriculum level are not.

Curriculum Rubric Structure

The rubric is comprised of 6 categories of program strategies related to Curriculum:

- Overall
- Content and Design
- Pedagogy and Student Engagement
- Assessment
- (Strategies) Specific to Math
- (Strategies) Specific to Science

The curriculum rubric was designed to assess the quality of 12th grade science and math curricula at the course level and was not intended nor envisioned to be used – in its entirety – as a classroom observation protocol guide. We will see shortly, however, that portions of the curriculum rubric was used in this way.

Curriculum: (Overall)

1. Anticipates the requirements of post-secondary careers or college work in math or science.

Curriculum: Content and Design

1. Reflects current understandings and research in mathematics and/or science.
2. Is designed to reflect the findings of research and knowledge of best practice.
3. Lessons are designed with an appropriate balance of concepts, problem solving and strategies/practice.
4. Rich conceptual problems allow for students to engage with the material on a deep level by encouraging inquiry, discourse, conjecture, and sense-making opportunities, in an authentic way that is appropriately scaffolded.
5. Integrates big ideas in mathematics and/or science.

Curriculum: Pedagogy and Student Engagement — *Provide opportunities...*

1. For learners to build on prior knowledge and construct meaning (build expertise).
2. To model conceptually- based and inquiry- oriented instruction.
3. To facilitate high levels of engagement of students.
4. For students to work individually and collaboratively on meaningful mathematics and/or science.
5. For student-centered activities, questions or problems directed by student learning.

Curriculum: Assessment

1. Includes diagnostic assessments throughout to determine what students need to learn and what teachers need to teach.
 - a) Identifies misconceptions held by students.
2. Provides summative assessments and includes guidelines for their use and instructional interpretations.

Curriculum: Specific to Math

1. Includes specific examples to illustrate the roles of big ideas and connections in mathematics.
2. Course work is sequenced in a logical way.
3. Provides opportunities for mathematics to be understood, not memorized.
4. Offers ample opportunities to present content using reformed-based pedagogy and relevant or real-world applications.
5. Connects concrete concept to abstract ones (i.e., multiple representations)
6. Addresses mathematical practices in Common Core State Standards

Curriculum: Specific to Science

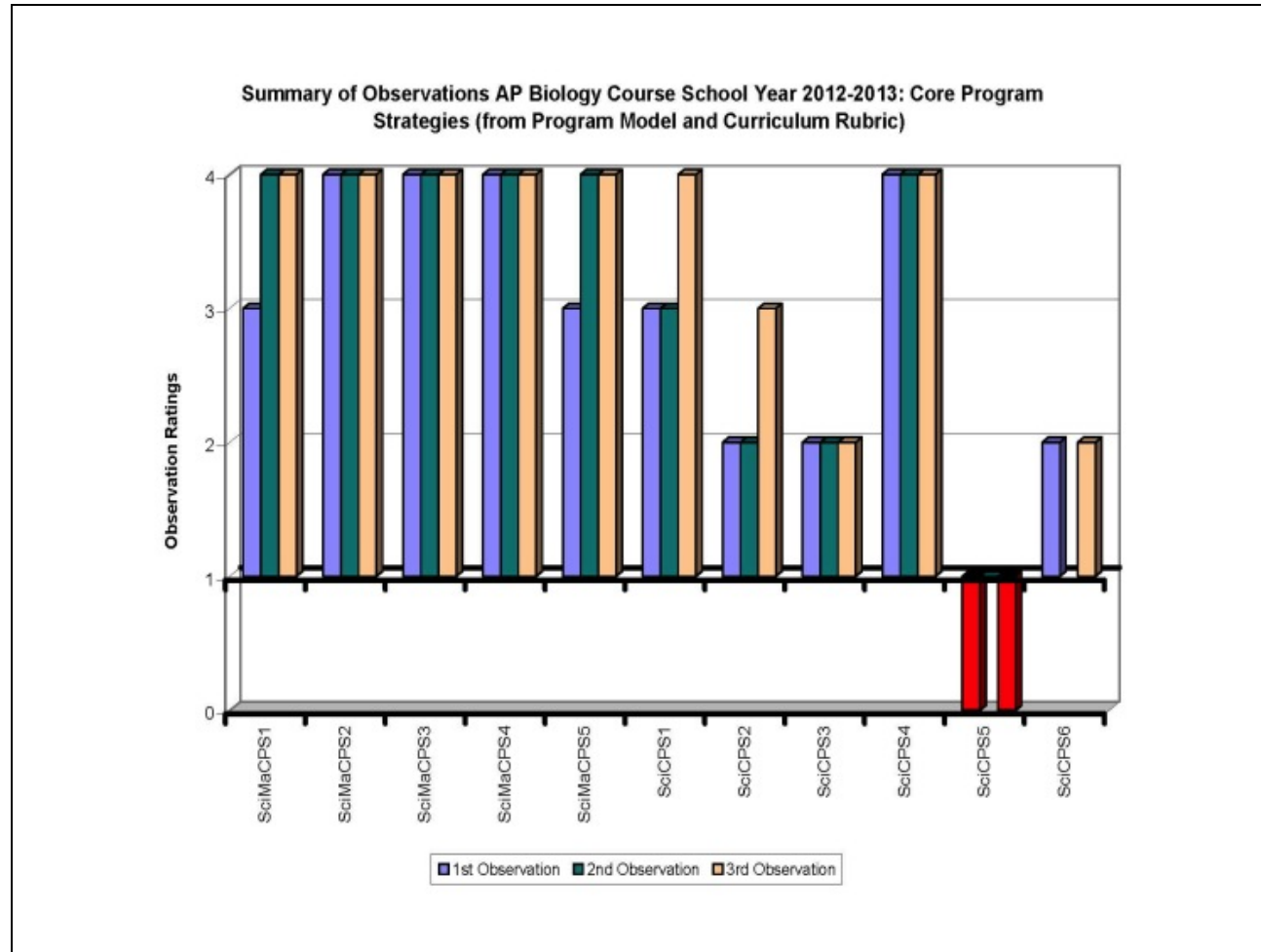
1. Content reflects current opportunities and needs within science as a discipline.
2. Is project-based pulling from inquiry-based science.
3. Provides a capstone project opportunity (inquiry-based and incorporating inquiry- based activities).
4. Opportunities throughout the curriculum for teacher to exercise best practice pedagogy.
5. Emphasizes nature of science and knowledge about scientific inquiry.
6. Involves students in actually doing science that demonstrates that research has unknown outcomes, uncertainties, and loose ends.

The strategies that are highlighted here are those strategies that were extracted from the program model.

Curriculum Rubric Uses

Not yet using the rubric to assess course quality but...

- Teachers are using it to help guide their thinking as 12th grade courses are identified/modified/implemented
- We have incorporated a portion of the rubric as part of our classroom observation protocol



We used a combined protocol in observing select 12th grade math and science course. This included the RTOP (Reformed Teaching Observation Protocol) (Sawada, et al. 2000) plus select core strategies taken from the CTTI program model and math/science strategies from the curriculum rubric. What is shown here is the consensual ratings of three observed science lessons.

Overview of Theory of Change Model

Theory of Change Model builds on the CTTI Program Model to envision the chain of events with Teacher/Leader teams seen as agents of change guiding curriculum development, change in teacher practice and student outcomes.

Now that a detailed program model was developed, we were able to revisit Newmann, King and Young (2000) and our scaffolding diagram to create our theory of change model.



The Theory of Change Model, building on the CTTI Program Model, envisions the chain of events with Teacher/Leader Teams seen as agents of change guiding curriculum development, change in teacher practice, and student outcomes.

The Theory of Change Model focuses the teacher-leader teams as the central catalyst of change in identifying/modifying/implementing 12th grade math and science courses within participating high schools.

Teacher-leader Teams

Next panel will examine the leadership development program component of CTTI and discuss how the program activities aimed at developing leadership among participants affected teachers and their work in schools.