MU Science QUEST

Quality Elementary Science Teaching

DESIGN RATIONALE

- A growing body of literature has identified 'best practices' in professional development (Loucks-Horsley et al., 2010) for teachers. Research demonstrates, however, that teachers vary considerably in what they learn (even in 'high quality' programs) and how they translate that knowledge into practice (Hill, Rowan, & Ball, 2005).
- Field experiences and practice teaching have long been recognized as essential to the learning of prospective teachers, yet rarely have professional development experiences for teachers been based around actual teaching experiences.
- Perspectives on teacher learning emphasize that pedagogical content knowledge arises from experience teaching– but that the kind of experience matters.

QuEST PROFESSIONAL DEVELOPMENT MODEL

SUMMER INSTITUTE – WEEK ONE

MORNINGS – PHYSICS

- TEACHERS WORK IN COLLABORATIVE TEAMS USING CURRICULA THAT FOLLOWS THE 5E LEARNING CYCLE, PRINCIPLES OF UDL, AND EMBEDS FORMATIVE ASSESSMENT THROUGHOUT

AFTERNOON – PEDAGOGY

- TEACHERS LEARN ABOUT THE 5E LEARNING CYCLE, UNIVERSAL DESIGN FOR LEARNING, AND FORMATIVE ASSESSMENT

QuEST PROFESSIONAL DEVELOPMENT MODEL

SUMMER INSTITUTE – WEEK TWO

TEACHING SUMMER SCIENCE CAMP

- TEACHERS WORK IN COLLABORATIVE TEAMS OF 5 TO INSTRUCT CLASSES OF 15-20 STUDENTS

"PLANNING PERIOD"

- TEAMS EVALUATE THEIR PLANS AND USE ASSESSMENT DATA TO INFORM & ADAPT INSTRUCTION TO MEET STUDENTS' NEEDS

DESIGN RATIONALE

"The classroom is a powerful environment for shaping and constraining how practicing teachers think and act. Many of their patterns of thought and action have become automatic—resistant to reflection or change. Engaging in ~~learning~~ [*teaching*] experiences away from this setting may be necessary to help teachers 'break set'—to experience [*teaching*] things in new ways" (Putnam & Borko, 2000, p. 6).

NSF DISCOVERY RESEARCH K12 GRANT

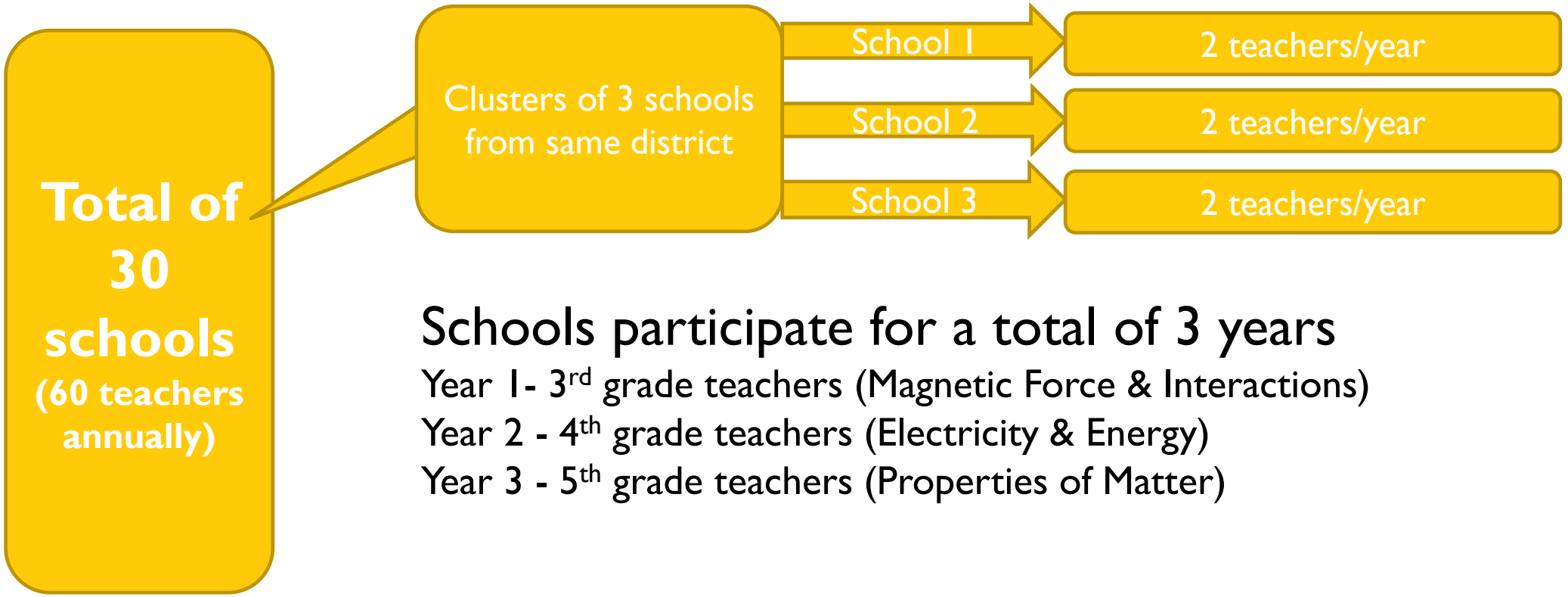
Project Goals:

1) undertake more in-depth and targeted research to better understand the efficacy of this professional development model and impacts on teacher AND student learning;

2) develop and field test resources from the project that can produce broader impacts; and

3) explore potential scale-up of the model for diverse audiences.

RECRUITMENT MODEL



Schools participate for a total of 3 years

Year 1- 3rd grade teachers (Magnetic Force & Interactions)
Year 2 - 4th grade teachers (Electricity & Energy)
Year 3 - 5th grade teachers (Properties of Matter)

IMPLEMENTATION MODEL

Group1 (n=20)

- Summer Week 1: Physics & Pedagogy
- Summer Week 2: Designing & Implementing Instruction (Kids' Camp)
- Academic Year Saturday follow-up sessions

Group 2 (n=20)

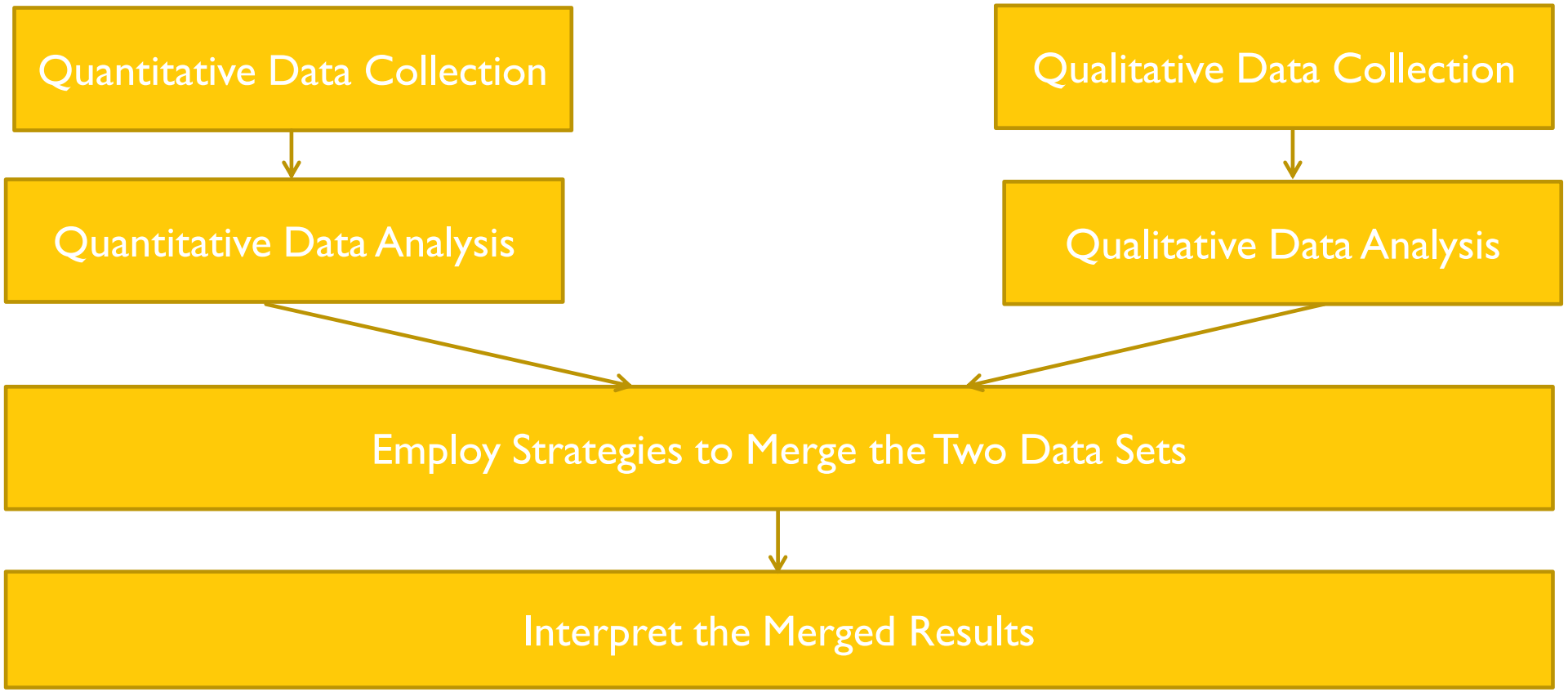
- Summer Week 1: Physics & Pedagogy
- Summer Week 2: Designing Instruction only
- Academic Year Saturday follow-up sessions

Comparison Group (n=20)

- No Summer Institute
- No Academic Year Sessions
- Summer 2-day Workshop Subsequent Year

CONVERGENT MIXED METHODS DESIGN

CRESWELL & PLANO-CLARK



QUANTITATIVE STRAND

RESEARCH QUESTIONS

1. Do teachers who participate in different models of PD demonstrate differential growth in content knowledge (CK), pedagogical knowledge (PK), and pedagogical content knowledge (PCK)?
2. Do students of teachers who participate in different models of PD demonstrate differential performance on measures of science knowledge and skills?

DATA SOURCES

Research Question 1 (Pre/Post/Post measures)

- Misconceptions-Oriented Standards-based Assessment Resource for Teachers (MOSART)
- Test of Understanding of the Learning Cycle (ULC)
- UDL measure
- Project-specific Content Assessments

Research Question 2 (Academic Year measures)

- Pre/Post Student Concept Tests
- State Assessments

QUALITATIVE STRAND

RESEARCH QUESTIONS

- How does participation in different models of PD support the development and enactment of teachers' PCK in their classroom practice?
- How does participation in different models of PD support teachers in meeting the needs of learners, in particular struggling learners, students from culturally and linguistically diverse backgrounds, and students with disabilities?

DATA SOURCES

- Observations of Teaching (EPIC Protocol*)
  - Summer (Treatment 1)
  - Academic Year (*Subset of teachers)
- CoRe (Loughran et al., 2004)
  - Pre/Post Institute*
  - Post-Program
- Lesson Preparation Task/Interviews
  - Pre/Post
- Conceptual Storyline Probe
- Collaboratively designed lesson plans
  - (Summer/both groups)