



The quality of professional learning will influence its results

WHAT THE STUDY SAYS

The effects of teacher professional development are related to teachers' degree of exposure to professional development, the accountability context in which they teach, their grade level, and background in science.

The study confirms previous findings that multiyear interventions tend to produce changes in content knowledge and practice in year one and stabilize over the remaining years of the intervention.

In addition, researchers note that even well-designed curriculum units specifically designed to promote reform-oriented instruction in which teachers facilitate inquiry are adapted to align with teachers' traditional instructional practices.

The study looked at predictors of teacher change that included grade level taught, experience teaching, and courses in science. Only grade-level taught proved consistently to be a predictor of change.

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At a glance

While contributing to some change in teacher knowledge and practices in science instruction for English language learners, primarily in the first year of the intervention, the five-year professional development intervention consisting of workshops and curriculum units generated only limited instructional changes.

THE STUDY

Lee, O. & Maerten-Rivera, J. (2012). Teacher change in elementary science instruction with English language learners: Results of a multiyear professional development intervention across multiple grades. *Teachers College Record, 114*(8), 1-44.

Study description

Researchers studied the effects of a five-year professional development intervention that incorporated workshops and curriculum units for all teachers (198) in six elementary schools in an urban district. The intervention responded to changing student demographics, teachers' insufficient preparation to meet the needs of English language learners in urban schools, and heightened demands for accountability.

Teachers participated in a three-day summer workshop in the first year and three one-day workshops throughout the school year. In their second and third years of participation, teachers attended a one-day summer workshop and three one-day workshops during the school year, for a total of 14 days of workshops. Teachers who were new to the school and new to the project after its inception participated in a three-day summer workshop.

The workshops focused on

curriculum implementation, emphasizing how to use the curriculum units for reform-oriented science instruction to promote student learning. The curriculum units replaced the regular curriculum in grades 3-5. Each unit addressed grade-level specific topics recommended in national science standards and included comprehensive teacher guides and student books that scaffolded instruction and learning.

The workshops incorporated key research-based features of professional development, including duration over time, focus on science content and content-specific pedagogy, alignment with state content standards with an emphasis on English language development, active engagement, and collective participation.

The science components of the workshop emphasized inquiry-based instruction. Teachers discussed how to promote and support student-initiated inquiry while gradually releasing the amount of teacher guidance. Teachers

WHAT THIS MEANS FOR PRACTITIONERS

This study provides an important lesson for practitioners: The quality of the professional learning will influence its results. The intervention to change teacher knowledge and practice neglects some of the critical features of effective professional learning.

While satisfying some attributes of effective professional learning, the study's intervention falls short in providing implementation support or differentiated learning designs to accommodate for the small amount of change in year one. It mentions no engagement or specific role for leadership in supporting change and neglects to examine the effects of teacher practice on student learning.

The intervention does not include sufficient time for teachers to remodel instruction based on the new units, provide formative data or feedback to teachers throughout the intervention, differentiate

support, or offer classroom-based support.

The results of this study are a disappointment to the field. On the surface, the results add to the stockpile of professional development studies that produce little change in teacher knowledge and practice.

When researchers plan interventions, even based on features of effective professional learning, they neglect some of the basics related to the Standards for Professional Learning (Learning Forward, 2011). The intervention in this study demonstrates little application of those standards beyond the surface level. It is particularly weak in Learning Communities, Leadership, Implementation, and Outcomes.

REFERENCE

Learning Forward. (2011). *Standards for Professional Learning.* Oxford, OH: Author.

discussed key science topics and explored the application of science concepts in real-world situations.

In years two and three, teachers implemented the practices, reflected on their practices, and examined student work samples to understand how students think about science.

Five areas specifically designed to develop teachers' knowledge and practice with English language learning included literacy development such as activating background knowledge, language support structures such as hands-on activities and real objects, linguistic scaffolding, using the students' home language for instructional support, and building students' knowledge resources through integration of culturally relevant and community resources in teaching.

Questions

Researchers asked these questions:

1. What were teachers' knowledge and practices related to four domains (teacher content knowledge in science; teaching practices to promote scientific understanding; teaching practices to promote scientific inquiry; and teaching practices to support English

language development) at the inception of the intervention?

2. Were there differences among teachers in predictor variables, including highest degree, number of college courses in science, years of teaching experience, and grade level taught?
3. Was there any change in teachers' knowledge and practice in each of the four domains?
4. What were the differences by predictor variables?

Methodology

Researchers implemented a five-year professional development intervention with a pre- and post-test design beginning in 2004-05. Participating teachers included all grade 3-5 teachers in six elementary schools in a large urban school district in the Southeast. Teachers participated for three of the five years. One hundred and ninety-eight teachers participated in the study.

Researchers measured change in teacher knowledge and practice using two instruments. The first was a questionnaire given at the inception of the study to serve as a baseline and then each year of participation. The self-report questionnaire measured the

four domains outlined in the research questions. Researchers also collected data through a fall and spring classroom observation using an observation guide aligned with the four domains.

Mobility of teachers, typical in urban school systems, contributed to missing data across the years of participation. For example, the total number of twice-yearly observations (149 in the fall and 139 in the spring) in year one fell to 32 in the fall and 33 in the spring in year three.

Researchers handled the substantial amounts of missing data through a model-based rather than case-based approach. Most missing data is a result of teacher mobility.

Analysis

The questionnaire included four to six items related to four scales, each associated with one domain as well as additional items not used in this study. Researchers used means for each scale for each administration to compute change over time.

Trained observers conducted the fall and spring observations. Observers generated field notes and a quantitative score for each domain using a five-point rating system.

Researchers examined two levels of change, within-individual changes and between-individual changes, over time. Teacher mobility contributed to missing data across the years of participation. As a result, researchers were unable to confirm that missing data due to attrition was random. Because of missing data resulting in insufficient sample sizes, researchers were unable to add a third level, school, to the analysis.

Results

Analyses of the questionnaire indicate that significant change between initiation of the intervention and the end of year one occurs in scientific understanding, scientific inquiry, and English language development. Beyond year one, differences are not significant.

Predictors associated with primary changes, those occurring in year one, include college courses in science, time between inception and end of year one, and grade level taught. Following year one, no statistically significant changes occur in the questionnaire scales, although changes do occur across the years.

Analyses of the first fall observation data indicate that teacher practice in all four domains is about three on a five-point rating scale, with scientific inquiry the lowest at 1.78.

For the fall observation results, no predictors were statistically significant. The initial spring observation scores were similar to the fall ratings. No changes were significant. For the spring observations, grade taught was a common predictor of change.

For primary changes, from fall to spring in year one,

grade taught, college courses in science, and number of years taught predicted change in scientific understanding, scientific inquiry, and English language development.

Across all years of the intervention, teacher practice in scientific knowledge and English language development improved, although not significantly. In assessing linear change across all three years of the intervention based on spring observation ratings, no changes or predictors were statistically significant.

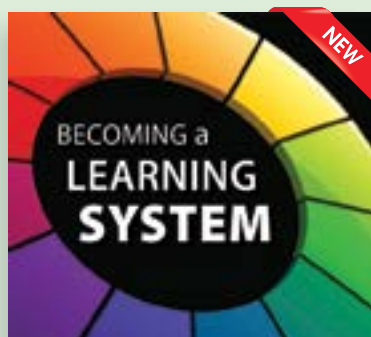
Limitations

This study demonstrates that change in teacher knowledge and practice can be observed and measured using appropriate instrumentation. Yet the study fails to take advantage of the value of baseline data in observations.

An important limitation of this study is the lack of baseline observation data collected prior to the inception of the intervention. Other limitations include:

- Using a pre- and post-test design rather than a randomized trial;
- Missing data due to high levels of attrition in teachers and inadequate sample size to determine if missing data occurred at random;
- Not including student effects resulting from teacher practice, particularly for English language learners.

Perhaps the greatest limitation of the study is the design of the intervention. It falls short of meeting current standards for professional learning, therefore signaling challenges in achieving change in teacher knowledge or practice. ■



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By Stephanie Hirsh, Kay Psencik, and Frederick Brown

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