

## ***Chapter One***

### **Introduction**

In the spring and summer of 1995, the National Science Foundation (NSF) funded the first cohort of eight projects in a new initiative, the Local Systemic Change through Teacher Enhancement Program (LSC). The following year, 18 additional projects were funded, for a total of 26 projects in Cohorts 1 and 2.

The goal of the program is to improve the teaching of science, mathematics, and technology by focusing on the professional development of teachers within whole schools or school districts. Each targeted teacher is to participate in a minimum of 100 hours of professional development with an emphasis on preparing them to implement exemplary science and mathematics instructional materials in their classrooms. Projects are expected to align policy and practice within the targeted district(s) and to include:

- A shared comprehensive vision of science, mathematics, and technology education;
- Active partnerships and commitments among stakeholders;
- A detailed self-study that provides a realistic assessment of the current system's strengths and needs;
- Strategic planning that incorporates mechanisms for engaging each teacher in intensive professional development activities over the course of the project; and
- A set of clearly defined, measurable outcomes for teaching, and an evaluation plan that provides on-going feedback for the project.

The LSC solicitation indicated NSF's plan to "provide a framework for data collection (including a set of instruments and procedures) that will allow the Foundation to evaluate individual projects, aggregate data and information across projects, and produce a cross-project analysis" (NSF 94-73). NSF contracted with Horizon Research, Inc. (HRI) of Chapel Hill, NC to design the data collection framework, provide technical assistance in its implementation, and prepare a cross-site analysis of the evaluation results.

### **Description of Core Evaluation Data Collection Activities**

HRI has worked with the National Science Foundation, and PIs and evaluators of the LSC projects, in the design and implementation of a core evaluation system to allow aggregating information across projects. This chapter describes the data collection activities associated with the core evaluation and provides an overview of the first two cohorts of LSC projects. Results

organized by core evaluation question are presented in the next chapter, followed by a summary and conclusions chapter.

The core evaluation system includes qualitative and quantitative data collection by the LSC projects to address the following questions:

1. What is the overall quality of the LSC professional development activities?
2. What is the extent of school and teacher involvement in LSC activities?
3. What is the impact of the LSC professional development on teacher preparedness, attitudes, and beliefs about science and mathematics teaching and learning?
4. What is the impact of the LSC professional development on classroom practices in science and mathematics?
5. To what extent are the district and school contexts becoming more supportive of the LSC vision for exemplary science and mathematics education?
6. What is the extent of institutionalization of high quality professional development systems in the LSC districts?

Data collection activities for the projects' 1995–96 Core Evaluation Reports were conducted from September 1, 1995 through August 31, 1996. This was the second year of data collection for Cohort 1 projects; Cohort 2 projects were collecting baseline data for their first year of funding. Activities included the following:

- Observations of professional development activities;
- Observations of teachers' classrooms<sup>1</sup>;
- A questionnaire to a random sample of all targeted teachers; and
- A questionnaire to principals of all targeted schools.

In addition, each Cohort 1 project was asked to conduct interviews with ten teachers randomly selected from among those who had participated in the LSC professional development.

The core evaluation calls for projects to conduct 5–8 observations of professional development sessions each year and record their observations on standardized protocols. Evaluators were to consult with PIs on what professional development experiences were planned throughout the data

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<sup>1</sup> Teachers observed in Cohort 2 projects were randomly selected from among all teachers targeted for professional development by the project. Teachers observed in Cohort 1 projects were randomly selected from among those teachers who had already participated in LSC professional development.

collection year, and select a sample that was representative of the diversity of the project's activities. Program-wide, a total of 180 observations of professional development sessions were conducted.

HRI provided the lead evaluator of each project with a list of 10 randomly selected teachers for each targeted subject to be observed in the spring of 1996. There were a total of 273 classrooms observed, including 76 science classes taught by Cohort 1 teachers who had participated in LSC professional development, and 145 science and 52 mathematics classes as baseline for Cohort 2 projects. In each case, the data were weighted to represent the total population of eligible teachers in the project.

Each project was asked to administer the teacher questionnaire developed for the core evaluation to a sample of 300 teachers per targeted subject; the median response rate was 70 percent. Weights were added to the data file to reflect the probability of each teacher's selection into the sample, adjusted for any non-response in that project. Projects were also asked to administer a questionnaire to the entire population of principals of targeted schools. Return rates on the principal questionnaire were generally higher than for the teacher questionnaire, with a median response rate of 89 percent.

Evaluators of Cohort 1 projects were asked to interview a sample of 10 teachers who had participated in LSC professional development activities. A total of 79 interviews were conducted among the eight projects.<sup>2</sup> Most interviews (85 percent) were conducted by phone; the remaining 15 percent were conducted in person. Evaluators summarized the interview data by completing an interview summary form that consisted of both close-ended assessments and open-ended descriptions of the information provided by each teacher. Data from each project were weighted to reflect the total number of teachers who had participated in LSC professional development in that project.

Project evaluators were asked to report their findings using guidelines developed for the core evaluation system, including responding to the six core evaluation questions and providing overall ratings of the quality of professional development activities, the supportiveness of the context, and the sustainability of high-quality professional development systems. In some cases, evaluators used additional data in preparing their reports, including expanded use of the core evaluation instruments and use of project-specific data collection activities.

The cross-site results were analyzed separately for science and mathematics projects and for the two cohorts of science projects. Differences noted in this report were statistically significant at the .05 level.

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<sup>2</sup> Each lead evaluator was provided a list of 10 teachers selected randomly from those who had participated in the LSC professional development. In two cases, however, evaluators substituted other teachers for the randomly selected ones. Therefore, these results may not be representative of the entire population of "treated" teachers.

## An Overview of Cohort 1 and 2 Projects

Project data sheets completed by the PIs provide some basic information about the 26 projects included in Cohorts 1 and 2.<sup>3</sup>

- Roughly half of the Cohort 1 and Cohort 2 projects are single-district projects; at the other end of the scale, 4 projects involve more than 10 districts, including 1 with 21 districts.
- The 8 Cohort 1 projects and 18 Cohort 2 projects plan to involve a total of 28,239 teachers in 1,312 schools in 121 districts across the United States.
- By the completion of these projects, an estimated 706,000 students will receive instruction from LSC-treated teachers each year.
- 20 projects target K–8 science; 2 projects target K–8 mathematics; and 4 projects target both K–8 science and mathematics.

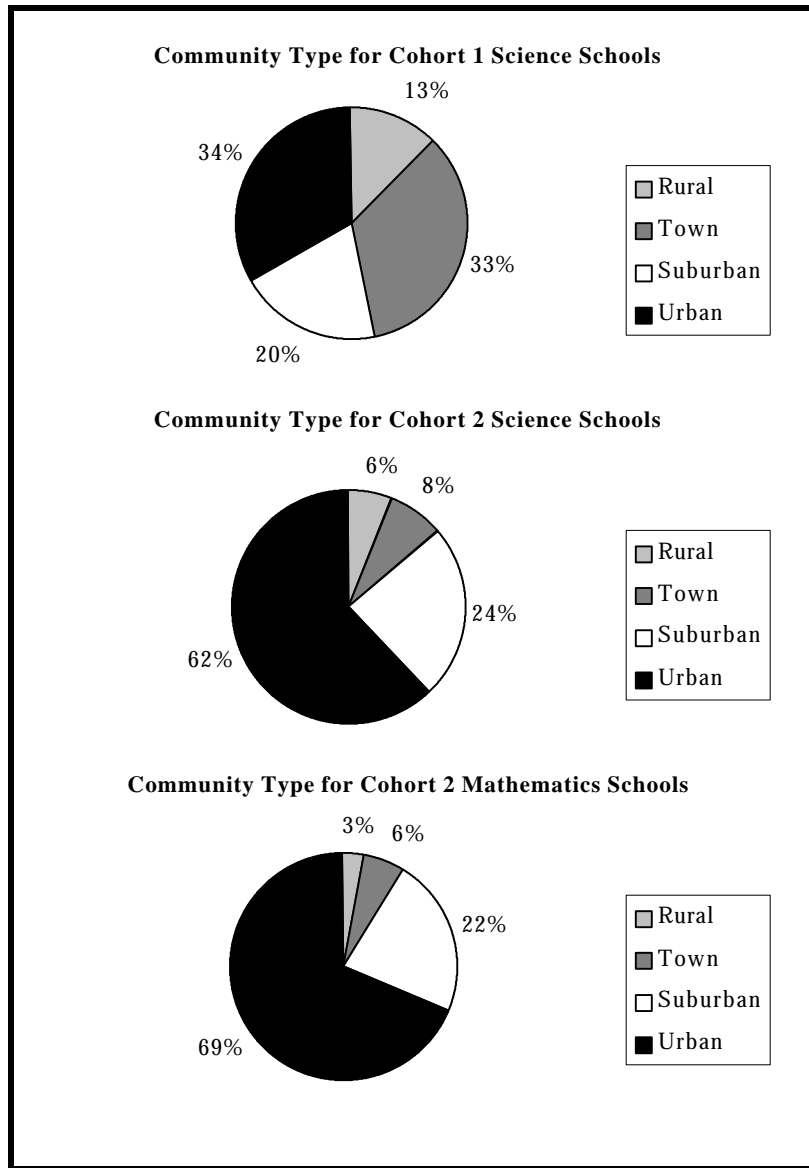
In the results presented in this report, the eight Cohort 1 projects, all of which target elementary science teachers, are analyzed in a single group referred to as C1S. Cohort 2 includes project targeting elementary science (C2S) and elementary mathematics (C2M).<sup>4</sup>

Note that there are clear differences in the populations of schools funded in Cohort 1 and Cohort 2. As can be seen in Figure 1, approximately one-third of Cohort 1 schools and two-thirds of Cohort 2 schools are located in urban areas. Cohort 2 schools tend to be larger, averaging 634 students in schools targeted for LSC science programs and 791 in schools targeted for mathematics programs, compared to 467 students in Cohort 1 schools. Cohort 2 schools also have a higher percentage of students who are members of underrepresented minority groups. (See Figure 2).

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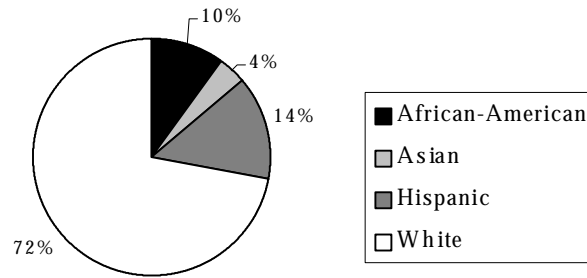
<sup>3</sup> An abstract of each of these projects is included in the “Local Systemic Change Project Directory” available from the National Science Foundation and can be accessed through the NSF home page at [www.nsf.gov/cgi-bin/getpub?nsf 97145](http://www.nsf.gov/cgi-bin/getpub?nsf 97145).

<sup>4</sup> Four Cohort 2 projects target both science and mathematics. For analysis, observations of professional development sessions that dealt with science topics are included in C2S; observations of professional development sessions that dealt with mathematics topics are included in C2M.

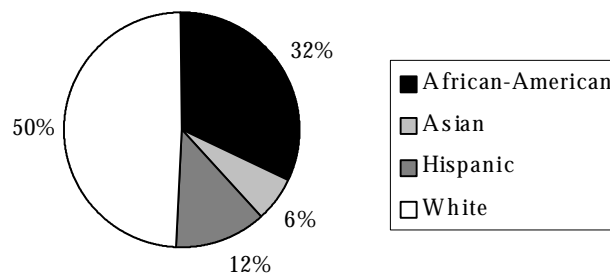


*Figure 1*

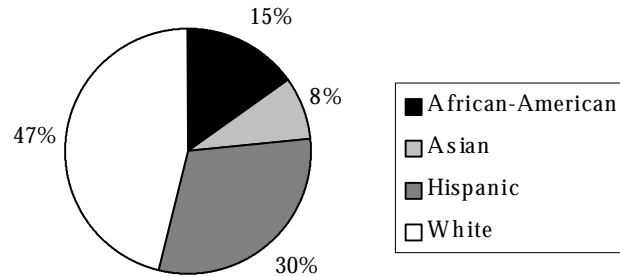
**Student Race/Ethnicity for Cohort 1 Science Schools**



**Student Race/Ethnicity for Cohort 2 Science Schools**

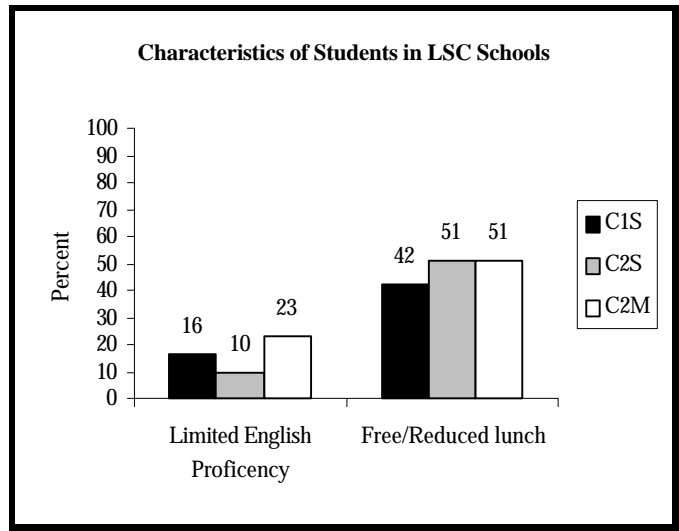


**Student Race/Ethnicity for Cohort 2 Mathematics Schools**



**Figure 2**

On other measures, Cohort 1 and 2 schools are more similar, including the percent of students with limited English Proficiency and the percent receiving free or reduced lunch. (See Figure 3.) The two cohorts are also similar in terms of principal experience; in both cohorts principals have a median of 6–10 years experience as principal and 3–5 years as principal at the current school.



*Figure 3*

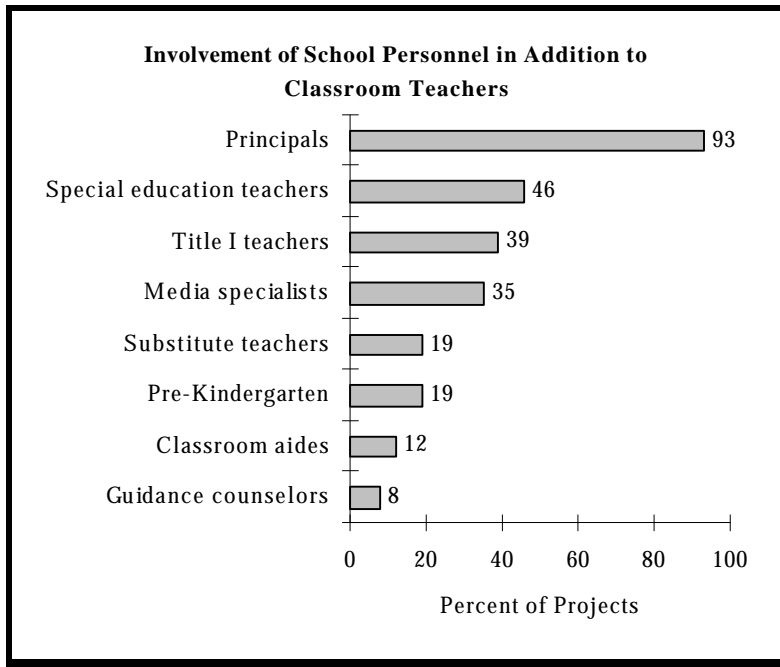
Nearly all of the LSC projects (93 percent) report that they are preparing teacher leaders to serve as mentors within the school. Somewhat fewer (81 percent) include a peer mentoring/teaching component, and nearly that many (73 percent) include teacher study groups as part of their repertoire of professional development activities.

In terms of professional development providers, all of the projects report that they are using lead teachers in some capacity. Many also involve scientists, mathematicians, and/or engineers from higher education, business/industry and museums or other community organizations. (See Table 1.)

**Table 1**  
**Professional Development Providers in LSC Projects**

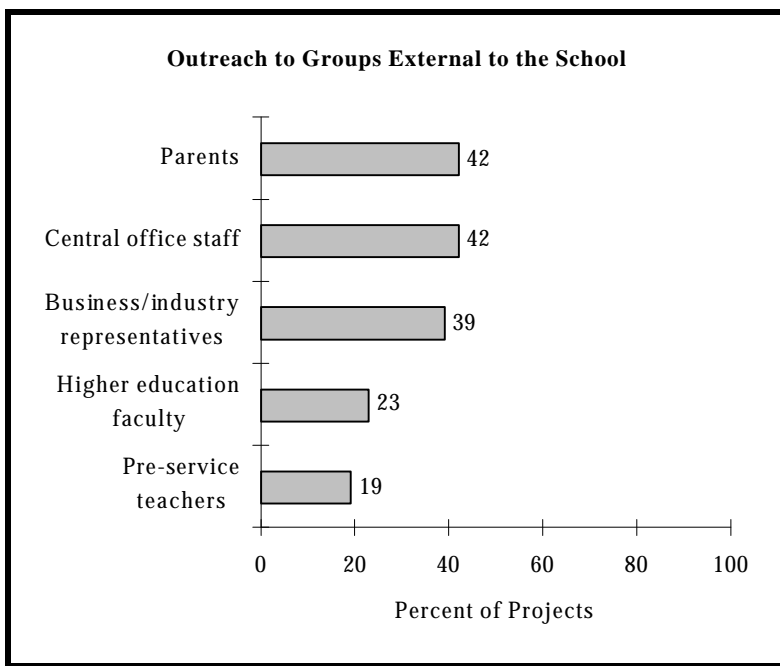
	Percent of Projects
Scientists/Mathematicians/ Engineers	89
Higher Education	77
Business/Industry	58
Museums/Community Organizations	42
Education Professionals	100
Lead Teachers	100
Higher Education	81
District-Level Personnel	54
Museum/Community Organizations	50

While the focus of the LSC is on providing high-quality professional development services to science and mathematics classroom teachers, many of the projects are also involving others in the school, district, and larger community. Figure 4 shows the percent of projects reporting that they have a formal component aimed at each of a number of groups within the LSC schools. Note that almost all of the Cohort 1 and Cohort 2 projects have a formal component aimed at principals. Other groups are less frequently targeted; almost half of the projects involve special education teachers and nearly that many involve Title I teachers and media specialists.



**Figure 4**

Figure 5 shows analogous data for groups outside the individual schools. Roughly 40 percent of the projects include activities for central office staff, parents, and business/industry representatives, while roughly 20 percent report targeting higher education faculty and pre-service teachers. None of the projects reported having a component aimed at the general public.



**Figure 5**