Local Systemic Change:
Comparison of Teachers' and Principals'
Perceptions of Factors Influencing Instruction

by

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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 (LSC) program. Eighteen additional projects were funded in 1996, 20 in 1997, 12 in 1998, 13 in 1999, 9 in 2000, 7 in 2001 and 1 in 2002 for a total of 88 projects in Cohorts 1-8.

The goal of the LSC 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 130 hours of professional development over the course of the project.[1] In addition to its focus on involving all teachers in a jurisdiction, the LSC initiative is distinguished from previous teacher enhancement efforts by its emphasis on preparing teachers to implement designated exemplary mathematics and science instructional materials in their classrooms.

Each hierarchical level in a school system likely affects the levels above and below it; therefore, all levels must be evaluated and updated periodically in order for the system as a whole to improve. If principals feel they are supporting teachers adequately but teachers disagree, we can not assume that a change for one group will impact the other. In order to effectively and efficiently resolve differences of opinion between two groups, an association must first be identified. This study utilizes questionnaire data collected from teachers and principals in schools targeted by the LSC projects to explore the relationship between teachers' and principals' questionnaire responses regarding their attitudes towards reform-oriented teaching, perceptions of principal support, and the effect of resource availability on mathematics/science instruction.

Instrumentation

Data for these analyses come from teacher and principal questionnaires collected between 1997 and 2003 as part of the LSC core evaluation.[2] HRI used factor analysis to combine a number of the questionnaire items into composites, each of which represents an important construct related to one of the core evaluation questions.[3] (See Appendix A for composite definitions and reliabilities.) Composites scores are calculated as percentages of total points possible. An individual's composite score is calculated by summing his/her responses to the items in a composite and then dividing by the total points possible. For example, if a composite is based on six survey questions asked on a five-point scale of "strongly disagree" to "strongly agree," that composite has 30 total possible points. If the raw score on these six items adds to 24 points, the percentage score is 80 ($24 \div 30 \times 100\%$).

The following are descriptions of the three composites[4] of interest in this study:

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[1] Prior to 1999, the requirement for K-8 projects was 100 hours.

[2] The most recent versions of the questionnaires can be found online at http://www.horizon-research.com/LSC/manual/#5

[3] See "Technical Report: Analysis of the Psychometric Structure of the LSC Surveys" (12/07/98) by David B. Flora and A.T. Panter, L.L. Thurstone Psychometric Lab, University of North Carolina at Chapel Hill, NC for a detailed description of the factor analysis procedure. Core Evaluation questions may be found under Tab 1 of the Core Evaluation Data Collection Manual (online at http://www.horizon-research.com/LSC).

[4] Detailed information concerning the composites used in this analysis can be found online at http://www.horizon-research.com/LSC/news/composites/composites.pdf.

- "Attitudes towards reform-oriented teaching" is measured using teachers' and principals' levels of agreement with questions concerning the importance of teachers using reform-oriented activities such as making connections to other disciplines, having students work in cooperative learning groups, and using informal questioning to assess student understanding.
- "Perceptions of principal support" is comprised of responses from teachers and principals regarding principal support for teachers in the implementation of current national standards and their willingness to accept noise that comes with an active classroom.
- "Effect of resource availability on instruction" consists of teachers' and principals' opinions concerning the impact of resources (such as the availability of time for teachers to plan and prepare lessons and the importance that the school places on science and mathematics) on the teacher's ability to teach.

Teacher and principal questionnaires were designed to focus specifically on mathematics or science instruction; therefore, this study examines each subject independently.

The Sample

The teacher questionnaire data set contains nearly 73,000 cases. Before merging on principal questionnaire data, the teacher data were aggregated by school and data collection year, so that each case represents the mean composite score for all teachers in a school for a given year. The data set contains over 11,000 cases representing 4,236 schools across 7 years. The data in this report are analyzed by subject. Because some LSC projects target both mathematics and science, some cases are included in both sets of analyses. The mathematics analyses are based upon 5,536 cases; the science analyses are based upon 6,707 cases.

Table 1 below displays the breakdown of projects per targeted subject/grade range. The majority of projects (71) target elementary grades for mathematics and/or science. The projects are about evenly split between mathematics and science, with 48 projects targeting mathematics and 49 targeting science.

Table 1
Schools and Projects by
Subject/Grade-Range

Subject/Grade-Range	Number of Projects
K–8 Science	42
K–8 Mathematics	29
6–12 Mathematics	19
6–12 Science	7
Total	**85**[†]

[†] The sum of projects is greater than the total as some projects target more than one subject/grade-range.

As can be seen in Table 2, 16 percent of the teachers are relatively new to the profession, while roughly half have more than 10 years of teaching experience. Table 2 also displays teachers' levels of involvement in LSC professional development. At the time of the study, 34 percent of teachers had not yet participated in any LSC professional development while only 8 percent had reached the project's goal of 130 hours.

Table 2
Teacher Experience and
Level of Professional Development

	Percent of Teachers
Number of Years Teaching	
0 to 2 Years	16
3 to 5 Years	14
6 to 10 Years	17
11-20 Years	24
More Than 20 Years	28
Professional Development	
0 Hours	34
1-9 Hours	10
10-19 Hours	9
20-39 Hours	12
40-59 Hours	10
60-79 Hours	6
80-99 Hours	5
100-129 Hours	6
130-159 Hours	3
160-199 Hours	2
200 or Greater	3

As can be seen in Table 3, 2 out of 5 principals have five or fewer years of school administration experience overall; only one-third were at their school for more than five years. Table 4 displays principal retention at the school and district levels over the course of LSC participation. Seventy-nine percent of principals remained with the same school from the start of the LSC through Year 2 of the project, but only 45 percent of principals remained at the same school from the beginning of the LSC through the Final Year of the project. Eighty-six percent of principals had been in the district through Year 2 of the LSC, and 61 percent had been in the district through the Final Year of the LSC project.

Table 3
Principal Experience

	Overall	At School	In District
Number of Years as a Principal			
1 to 5 Years	41	67	49
6 to 10 Years	25	22	25
11-20 Years	24	9	19
More Than 20 Years	10	2	7

Table 4
Principal Retention Rates by Data Collection Year

	Percent of Principals	
	Year Two	Final Year
School	79	45
District	86	61

Analysis and Results

In order to compare teachers' and principals' perceptions of principal support, three variables, each pertaining to a specific topic of principal support, were created by combining sets of items, asked on both the teacher and the principal questionnaires, into composites. The mean scores of these composites allow us to gauge teachers' and principals' levels of agreement or disagreement with the topics of interest.

Table 5 displays principal and teacher mean scores and standard deviations for the three composites: attitudes toward reform-oriented teaching, principal support, and the effects of resource availability on instruction. Overall, teacher and principal mean composite scores for each of the three items are relatively high; however, teachers' composite scores tend to be lower than principals' scores. For both targeted subjects, science and mathematics, the largest discrepancy in mean scores is between principals' and teachers' perceptions of the effects of resource availability on instruction. In the case of projects targeting science, the mean composite score for principals is 79.63, while the mean score for teachers is 65.37. Similarly, for projects targeting mathematics, the mean composite score for principals is 80.92, and the mean score for teachers is 70.69. These findings indicate that science and mathematics teachers see lack of resources as more of a barrier to the quality of their instruction than do principals.

Table 5
Principal and Teacher Composite Scores

	Principals		Teachers	
	Mean Score	Standard Deviation	Mean Score	Standard Deviation
Science				
Attitudes Toward Reform-Oriented Teaching	89.95	8.81	86.59	6.48
Principal Support	83.14	11.19	75.05	10.53
Effects of Resource Availability on Instruction	79.63	16.53	65.37	15.11
Mathematics				
Attitudes Toward Reform-Oriented Teaching	89.92	9.64	86.01	7.47
Principal Support	84.30	11.79	76.82	10.27
Effects of Resource Availability on Instruction	80.82	14.65	70.69	14.39

From the composite scores in Table 5, it is clear that overall there are differences of opinion between teachers and principals regarding attitudes toward reform-oriented teaching, principal support, and the effects of resource availability on instruction. However, it is not clear whether one group's opinions are related to the other group's opinions. In order to identify whether or not an association exists between teachers' and principals' composite scores, Pearson's Product Moment Correlation "r" was calculated. Pearson's r can range from -1 to +1; a value of 1 (positive or negative) indicates a perfect linear relationship between the two variables; a value of 0 indicates no linear relationship between the two variables. The correlation coefficients for the composites range from .081 to .196, indicating weak positive relationships between principal and teacher composite scores, both in science and mathematics (see Table 6). As one group's composite scores increase, the other group's scores increase as well.

Table 6
Composite Correlation Coefficients, by Subject

	Science	Mathematics
Attitudes Toward reform-oriented Teaching	0.118**	0.196**
Principal Support	0.081**	0.152**
Effects of Resource Availability on Instruction	0.130**	0.129**

** $p < 0.01$

Correlation coefficients were also calculated for individual questionnaire items included on both the teacher and principal questionnaires. As can be seen in Table 7, the correlation coefficients range from 0.042 to 0.251, indicating fairly weak, but positive, relationships between principal and teacher responses. For 12 of the 14 items, teachers and principals from mathematics projects had opinions that showed slightly stronger correlations than those of teachers and principals from projects targeting science. The strongest association is between teachers and principals from projects targeting mathematics in terms of their attitudes toward the use of portfolios (.251).

Table 7
Item Correlation Coefficients, by Subject

	Science	Mathematics
Attitudes Toward reform-oriented Teaching		
Make connections to other disciplines	0.042**	0.073**
Have students work in cooperative learning groups	0.099**	0.174**
Have students participate in appropriate hands-on activities	0.055**	0.156**
Engage students in inquiry-oriented activities	0.056**	0.088**
Use computers	0.113**	0.116**
Engage students in applications of subject matter in a variety of contexts	0.044**	0.102**
Use portfolios	0.157**	0.251**
Use informal questioning to assess student understanding	0.059**	0.083**
Principal Support		
Principal is well-prepared to support teachers in the implementation of current national standards	0.110**	0.107**
Principal is willing to accept noise that comes with an active classroom	0.112**	0.174**
Effect of Resource Availability on Instruction		
Time available for teachers to plan and prepare lessons	0.114**	0.120**
Time available for teachers to work with other teachers	0.132**	0.136**
Time available for teacher professional development	0.140**	0.149**
Importance that the school places on science/mathematics	0.156**	0.128**

** $p < 0.01$

Conclusions

The Local Systemic Change through Teacher Enhancement (LSC) program has the goal of reforming districts' mathematics/science education systems. Since changes to one part of the educational system may or may not influence the rest of the system, relationships between the system's parts must be understood in order to maximize reform.

For this study, principals' and teachers' opinions of teaching, principal support, and effects of resource availability on instruction were compared to determine whether or not a relationship exists. Composite scores were created from items asked on both the LSC principal and teacher questionnaires over the past 7 years. Overall, teacher and principal mean composite scores are relatively high, but teachers' composite scores tend to be lower than principals' scores.

For both targeted subjects, science and mathematics, the largest discrepancy in mean scores is between principals' and teachers' perceptions of the effects of resource availability on instruction. These findings indicate that science and mathematics teachers see lack of resources as more of a barrier to the quality of their instruction than do principals.

Finally, correlation coefficients for the three composites indicate significant relationships between principals' and teachers' opinions of teaching, principal support, and effects of resource availability on instruction. However, these relationships, as evidenced by correlation coefficients ranging from .081 to .196, are extremely weak; principals' attitudes are not good predictors of teachers' attitudes, and vice-versa. Thus, any effort to assess school-wide attitudes should be sure to include measures suitable for each group. On a broader scope, these findings also suggest that efforts to influence the attitudes of one group may not have much of an impact on the other group, though further data collection and analysis would be needed test this hypothesis.