Teacher Aides, Class Size and Academic Achievement
A Preliminary Evaluation of Indiana's Prime Time

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Abstract

We report the first large-scale evaluation of Indiana's Prime Time, which is a funding mechanism designed to reduce class size, or to reduce pupil-teacher ratio (PTR) in the early primary grades (K-3). We examined the academic performance of nearly 11,000 randomly selected third-graders on the state-mandated standardized achievement test, as a function of class size, PTR, and the presence of an instructional aide, using hierarchical linear modeling (HLM). Results showed that student achievement was strongly influenced by SES and by race. Larger class enrollment was associated with better composite and mathematics achievement, particularly in higher SES schools. Similarly, the presence of an instructional assistant predicted better achievement in reading, language and the composite score only in higher SES schools. Analysis of race and class size showed that black pupils report better achievement in smaller classes, but white pupils did better in larger classes. HLM analyses of pupil-teacher ratio also showed pervasive SES and race effects. Better language, mathematics and composite achievement was also associated with classrooms with Prime Time assistants in higher SES schools. Finally, better mathematics, reading and composite achievement was associated with classrooms with higher PTR.

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Introduction

Indiana's Prime Time is a funding mechanism that was designed to reduce class size, or to reduce pupil-teacher ratio (PTR) in the early primary grades (K-3). This program was predicated on the assumption that class size reduction (CSR) and lower PTR would result in better student achievement outcomes. To this end, and since the phase-in implementation in 1984-85, funding has been provided to local school corporations to hire additional teachers (or, more commonly, paraprofessional assistants) in order to assist school corporations in moving toward the target pupil-teacher ratio (PTR). The initial goal of funding was to achieve a *corporation* average of 18 students per teacher (18:1) in kindergarten and first-grade, and an average of 20 students per teacher (20:1) in second and third-grade. However, during the 1999 Legislative Session, the funding formula was changed. Under the new formula each school corporation has a target pupil-teacher *kindergarten through third-grade ratio* that ranges from 15:1 to 18:1, depending upon the corporations's at-risk index and the amount of tuition support that the corporation receives. Moreover, the monies are included in the basic grant that the corporation receives from the state. These monies are still to be used, of course, for hiring teachers or instructional assistants in order to reach these target ratios. Prime Time was one of the first state-wide efforts to address the problem of large enrollments in the primary grades, and, along with Tennessee's Project STAR, was considered widely a national model of innovative educational programming (Pate-Bain & Achilles, 1986).

Although Project STAR is a clear example of a class size reduction initiative, the status of Prime Time is more difficult to classify. When Prime Time was initiated it was described as an effort to reduce class size by providing monies to hire more teachers. Although monies are still used in this way (insofar as Prime Time monies are part of a school corporation's state grant), Prime Time has evolved into a PTR initiative rather than a pure CSR program. That is, Prime Time is largely directed towards reducing pupil-teacher ratio by adding instructional assistants to classrooms with large enrollments, rather than hiring teachers to create more classrooms with smaller enrollments.

In the seventeen years since its phase-in implementation, however, there have been few studies of the effectiveness of Prime Time (e.g., Barnes

& Quimby, 1986; Gilman and others, 1987; Gilman, 1988; McGiverin, Gilman & Tilleski, 1989), and none that have evaluated the program using state-wide representative samples. The literature occasionally suggests that lower PTR, or smaller classes, pays off in terms of student academic outcomes, at least in first- and second-grade, although many of these studies are hard to evaluate due to methodological concerns. Moreover, the majority of evaluation studies have been conducted in just a single school corporation.

In the first evaluation of Prime Time using state-wide representative samples Lapsley and Daytner (2001a, b) surveyed 680 teachers and 239 building principles (using a stratified random sampling procedure) regarding their use of instructional assistants. Teachers reported altering their instructional practices (e.g., using smaller grouping structures and less whole class instruction) in order to capitalize on the more favorable PTR that results from having an aide. Teachers also reported spending less time disciplining students and doing routine paperwork when they had an aide, and more time spent using educational technology, planning for lessons, and organizing learning centers.

Indeed, most teachers with Prime Time aides reported that their teaching was improved, and that having an aide required them to "greatly" or "moderately" alter their instructional practices (see also Mueller, Chase, & Walden, 1988). Of course, there is not always close agreement between what teachers say they do in their classrooms, and what they are observed to do by others (Boyd-Zaharias & Pate-Bain, 1998). Still, principals also indicated that most teachers who were assigned instructional assistants adapted their instruction accordingly; that students who has access to Prime Time assistants reported better academic performance in later elementary grades; and that the presence of aides was associated with better classroom management, better discipline and better teacher morale (Lapsley & Daytner, 2001b).

Consequently, Lapsley and Daytner (2000) concluded that the "Prime Time strategy" of supplementing teachers with aides might be as promising a way to encourage pedagogical best practice as simply reducing class size (and, indeed, there is little evidence that simply reducing class size has any bearing on teacher instructional practices, see Robinson, 1990; Stasz & Stecher, 2000; and Odden, 1990).

But this conclusion is controversial. Although the presence of an instructional assistant might indeed encourage better instructional practices, there is scant evidence that lowering PTR in this way pays off in terms academic achievement. Indeed, although there are surprisingly few studies on the effectiveness of paraprofessionals in the classroom, the available evidence does not encourage the use of aides as an alternative to class size reduction (Finn, Gerber, Farber & Achilles, 2000). Finn et al. (2000), using data from Project STAR, concluded that paraprofessionals in the classroom provided "no academic benefits in general, no advantage in terms of pupil behavior, no reduction in the problems encountered by classroom teachers" (p. 165). They argue that resources are better used to reduce class size rather than attempting to reduce PTR by adding paraprofessionals to classrooms with large enrollment (which is characteristically the "Prime Time strategy").

The present study revisits these issues in the context of a state-funded evaluation of Prime Time. This project examined the academic performance of nearly 11,000 randomly selected third-graders on the state-mandated standardized achievement test (called ISTEP+), as a function of class size, PTR, and the presence of an instructional aide, using hierarchical linear modeling, (HLM)

Method

Participants and Sampling

School corporations were randomly selected using a stratified cluster sampling procedure. Our original goal was to include 25% of corporations within each of 9 educational service regions. Our second sampling rule was that at least one urban corporation must be included from each region, with the remaining corporations per region determined by proportional representation within geographic category (urban, suburban, township, rural). This sampling strategy would have yielded a target sample of 78 school corporations, distributed across region and geographic category.

Table 1 reports the target and actual sampling distribution of school corporations. As Table 1 indicates we were reasonably successful in meeting our target goals. This stratified random cluster sample procedure yielded 61 corporations (or 78% of the target sample), totaling 10, 927 students (49.6% female) in 163 schools and 573 classrooms. The ethno-racial composition was representative of the state (85% Caucasian, 9.2% African-American, 3.2% Hispanic). Region and demographic categories were approximately equally (region) or proportionately (geographic category) represented in the sample. There were 4,016 youngsters in Prime Time-assisted classrooms, and 6,765 students in PT-unassisted classrooms.

Instruments

Third-grade students sit for the state-mandated standardized achievement test (ISTEP+) in September of the school term. The ISTEP exam is published by CTB/McGraw-Hill, and includes various assessments of language, reading and mathematics. Normal curve equivalent (NCE) composite scores for these domains, and for the total ISTEP composite score, was used in all data analyses. The official class enrollment, student race, and whether a Prime Time aide was assigned to the classroom, was recorded by school personnel. Four categories of class size were also constructed to accord with the Project STAR classification. PTR was defined using Indiana Department of Education (IDOE) criteria: classroom enrollment is divided by the number of teachers/aides assigned to the class, where a teacher =1, a full time aide = .33, a part-time aide = .165. The percentage of children not eligible for subsidized lunch (an IDOE statistic) was used as a school variable for SES.

Results

Descriptive Analyses

Enrollment and Class Size. Table 2 reports the frequency and mean enrollment of third-grade pupils by class size. Although Prime Time is designed primarily to reduce pupil-teacher ratio rather than class size, it is of interest to note that nearly half of third-grade pupils are in classrooms of 22 or greater (and almost 4% in classrooms of 27 or greater). About 10% of third-graders were in "small" classes of 17 or fewer; 37% were in classrooms of 20 or fewer.

Class Size and Race. Table 3 reports the distribution of students by racial background and class size. The most striking pattern evident in Table 3 is the fact that a much larger percentage of African-American and Hispanic children are in small classes (12-17) than are white children. For example, 16% of black children and almost 24% of Hispanic children are in classes of 12-17, compared to 8.7% of white and 6.4% of Asian-American children. This perhaps reflects a greater minority participation in smaller compensatory classes, an issue that we take up in more detail below.

Instructional Assistants, Class Size and ISTEP Achievement Table 4 reports mean NCE achievement scores in classrooms with and without Prime Time aides, and by class size. In every case achievement scores are higher in classrooms with Prime Time aides than in classrooms without aides. In contrast, achievement scores in these domains increase as class size gets larger. This pattern is further examined in Table 5, which compares achievement in Prime Time and regular classrooms, by geographic category. In nearly every comparison, in every geographic category, achievement scores were higher in Prime Time classrooms than in unassisted regular classrooms, with the Prime Time advantage particularly evident among children in suburban and township schools.

In contrast, when class size is examined (Table 6), it is clear that better student achievement is associated with larger class sizes in all four geographic categories. Table 7 reports mean NCE achievement scores in Prime Time assisted and unassisted regular classrooms, by class size. When class size is held constant, children in classrooms with Prime Time aides showed higher academic achievement than children in classrooms without Prime Time aides in all but two (of 16 possible) comparisons. Hence, these data show that the presence of paraprofessionals in the classroom is consistently associated with higher achievement scores, and that smaller class sizes is not.

Small Class Size and Race The fact that achievement scores tended to be lowest in classrooms with the smallest enrollments struck us as an oddity that required further analysis. As noted by Nye et al (2000), large scale studies (such as this one) typically possess satisfactory external validity, but oftentimes lack sufficient internal validity if one is unable to understand how particular classrooms are formed and with which kinds of students. For example, in the present analyses, we grouped classroom date into broad enrollment categories (12-17, 18-21, 22-26, > 26). These categories were chosen to allow certain comparisons with Project STAR classrooms (particularly with respect to small and regular classrooms). However, it is possible that at least some small classrooms in our analyses were formed for remedial or compensatory purposes *just because* students demonstrated low achievement. Given achievement differences commonly noted between white and non-white minority children, for example, and the relatively larger incidence of minority children in the small class category in this sample, it is indeed possible that many low-achieving youngsters were disproportionately represented in small classes. In this case it would not be surprising that our smallest enrolled classrooms would show the weakest profile of ISTEP achievement.

Although we are unable to explore this question with precision, we did examine the profile of achievement means with a more differentiated grouping of small class enrollment under the assumption that if classroom grouping was guided by children's individual differences (e.g., remedial and gifted programs), then differences in achievement would be most pronounced among children in classrooms with the smallest enrollment. Hence we further divided children in our 12-17 classroom grouping into classrooms of 12-14, and 15-17, and compared their performance against the remaining classroom groupings (18-21, 22-26, and > 26). Our results are reported in Table 7.

As can be seen in Table 7, it is apparent that the smallest class grouping in this analysis (12-14) is not associated with a uniformly poor profile of achievement. Although it reports the lowest mean score in reading, it shows broadly comparable achievement with other categories of class size in language and in the total composite score, and strong achievement in math. Hence this data would not support a claim that the smallest classes in our sample were primarily remedial or compensatory (and hence the association of better achievement with higher class enrollment).

We explored this further in Table 8, which included Prime Time assistance as a classification variable. There is, of course, no Prime Time assistant associated with classrooms as small as 12-14 pupils. But for the remaining groups, it is clear that the pattern noted earlier is present here as well. In virtually every comparison, students with a Prime Time instructional assistant reported higher mean achievement scores than students without an assistant. The advantage is particularly striking for reading in small classes of 15-17.

Hierarchical Linear Modeling

Although the preceding analyses do support the "Prime Time strategy" it is clear that the pattern of mean differences do not adequately reflect the influence of qualifying variables, such as race and socioeconomic status. Until recently it was common to use ordinary least squares multiple regression or analysis of variance procedures to analyze questions of this sort. But these analyses require a number of assumptions that are implausible given the multi-level nature of the school achievement data. Hierarchical linear modeling (HLM) is a set of procedures that allows one to consider multiple units of analysis in multi-level, hierarchical data structures. "With hierarchical linear models, each of the levels in this structure is formally represented by its own submodel. These submodels express relationships among variables within a given level, and specify how variables at one level influence relations occurring at another (Bryk & Raudenbush, 1992, p. 4). Consequently, we further explored the relation between class enrollment, PTR and achievement by testing hierarchical linear models (HLM) that better capitalize on the hierarchical, multi-level structure of the data (individuals nested within classrooms, nested within schools).

The Level 1 variables considered in this project were variables associated with <u>students</u>: gender and race. Preliminary analyses did not indicate any effects attributable to gender. Hence only race was included as a Level 1 variable. Our analysis of race was restricted to those categories with sufficiently large N (white/Caucasian, African-American, Hispanic), excluding Asian (N = 62), American Indian (N = 16) and Multi-Racial (N = 188) students. Level 2 variables included variables associated with the <u>classroom</u>: class size (and pupil-teacher ratio) and presence or absence of a Prime Time instructional assistant. Socio-economic status (SES) was modeled as a Level 3 <u>school</u> variable. The class size variable in these analyses is enrollment, or the number of students in a classroom, rather than the categorical class size groupings used for descriptive purposes. The criterion variables in all analyses were the NCE composite scores for reading, language, mathematics, and the total NCE composite score.

The first set of analyses included class enrollment (class size) and the presence or absence of a Prime Time instructional assistant as the classroom variable of interest (but also including student race and school SES status). In subsequent analyses we replaced class enrollment with pupil-teacher ratio.

Class Enrollment and Prime Time Assistants A graphic summary of the test of fixed effects for the composite NCE achievement scores for all criterion variables (reading, language, mathematics, composite) is reported in Table 10. A general summary of coefficients for main effects across all analyses is reported in Table 11. It is clear that the pattern of student performance on the third-grade ISTEP test is uniformly affected by SES and by race. Schools in higher SES categories, and white students, tended to report higher achievement scores in reading, language, mathematics and the composite score. Class size was a significant predictor of mathematics achievement and of the total composite score. In both cases, higher mathematics and composite achievement was associated with larger classes.

But several significant interaction effects were also observed. A general summary of coefficients for significant interactions with SES and with race are reported in Table 12 and Table 13, respectively. In three analyses (for reading, language and the composite score), the presence or absence of a Prime Time assistant interacted with SES, although the effects were often of marginal statistical significance. In all cases higher achievement was associated with the presence of an assistant in higher SES schools. Two additional interactions were observed: class enrollment x SES (better mathematics achievement in larger classrooms in higher SES schools) and race x SES (better reading achievement was associated with higher SES and white pupils).

Supplementary Analyses of Achievement Effects by Race. As these data indicate, there were pervasive racial differences in the pattern of achievement. Moreover, race interacted with class size, at least in the case of reading achievement. Similar effects have been reported previously in the class size reduction literature. Robinson and Wittbols (1986) have shown, for example, that minority youngsters might differentially profit from class size reduction in the early primary grades, as opposed to white youngsters. In light of these considerations we conducted subsequent HLM analyses within the samples of white and black pupils. Table 14 reports the final estimates of fixed effects for white pupils. Table 15 reports the same analysis for black pupils. In both analyses SES and class enrollment were significant predictors of student achievement. But the effect of class size cuts in different directions for white and black pupils. White students tended to do better in classrooms with larger enrollments, whereas black pupils reported better achievement in classrooms with smaller enrollment. A Prime Time Assistant x SES interaction was also evident in the black student sample.

Pupil-Teacher Ratio and Prime Time Assistants. In the previous analyses we treated class enrollment as the Level 2 classroom variable of interest, largely because of its prominence in the class size reduction literature. However, we also wanted to examine the influence of pupil-teacher ratio (PTR) on student achievement, insofar as the Prime Time strategy is largely one of reducing PTR in the interest of increasing student achievement. We adopted the HLM strategy in these analyses as well, which are summarized in Table 16. (See Table 11 for a summary of coefficients for main effects and Table 12 and Table 13 for a summary of interaction effects for SES and race, respectively). As these tables make clear, the general profile of achievement effects for PTR are strikingly similar to the results for classroom enrollment. As expected, achievement scores for reading, language, mathematics and the total composite score are strongly influenced by SES and by race. Similarly, the PT Assistant x SES interaction was significant for 3 of the 4 comparisons (language, mathematics and the composite score), indicating that better achievement was associated with classrooms with Prime Time instructional assistants in schools of higher socio-economic status. Finally, PTR is a significant predictor of reading, mathematics and the composite score. As with class enrollment, this effect suggests that better achievement is associated with larger pupil-teacher ratio.

General Summary of Coefficients for Main Effects. Table 11 presents a summary of coefficients across all analyses of the main effects SES, race, class enrollment, the presence or absence of a Prime Time instructional assistant, and pupil-teacher ratio. These coefficients can be meaningfully interpreted as effect sizes. For example, a percentage increase in school-wide SES results in a .1316 increase in NCE total composite achievement. A white student's predicted NCE total composite achievement score is 1.66 points above the mean intercept score of 60.46 (or 62.12); a black student's predicted score is 5.24 points below the intercept (or 55.22). Adding one student to a class increases average NCE total composite achievement .35 points (or, alternatively, adding 10 students to a class raises average achievement 3.5 points). The presence of a Prime Time instructional assistant lowers average NCE total composite achievement 0.92 points; the absence of a Prime Time instructional assistant increases average NCE total composite achievement 0.45 points (although this main effect was not statistically significant for any comparison). Finally, a unit increase in pupil-teacher ratio was associated with higher average NCE total composite achievement of .3763 points.

General Summary of Coefficients for Interactive Effects. Table 12 presents a summary of coefficients across all analyses for interactive effects with SES. As this table illustrates, there is a general absence of significant interactions with SES, particularly with respect to class enrollment (with the possible exception of mathematics, $p < .076$) and with pupil-teacher ratio (with the possible exception of language, $p < .08$). Hence, an increase of one student is associated with an increase of .0147 points in mathematics in higher SES schools; a unit increase in pupil-teacher ratio is associated with an increase of .0159 points in mathematics in higher SES schools. These effects are quite trivial, however. In contrast, the Prime Time Assistant x SES interaction was statistically significant for language, and marginally significant for reading and for the total composite. In all cases the benefits of a Prime Time instructional assistant on achievement was more pronounced in schools with higher SES.

Table 13 presents a summary of coefficients across all analyses for interactive effects with race. Most effects are not statistically significant, with the exception of the Class Enrollment x Race interaction for reading.

Discussion

The purpose of this project was to examine patterns of achievement in third-grade ISTEP+ scores as a function of class size, the presence or absence of Prime Time instructional assistants, and pupil-teacher ratio. To this end we analyzed the Normal Curve Equivalent scores (for language, mathematics, reading, and the NCE composite) of a stratified random cluster sample of nearly 11,000 third-graders. Two kinds of analyses were conducted. We first described the pattern of achievement, broken down by demographic and classroom variables. We then attempted to predict student achievement by testing a series of hierarchical linear models.

The descriptive results (which do not control for covariates) show clearly that achievement scores are higher in Prime Time assisted classrooms than in classrooms without Prime Time instructional assistants, particularly in reading. A similar pattern is evident when the presence or absence of a Prime Time instructional assistant is examined across urban, suburban, township and rural school corporations. In nearly every comparison, in every geographic category, achievement scores were higher in classrooms with a Prime Time assistant than in unassisted classrooms, with the Prime Time advantage particularly evident among children in suburban and township schools. Hence it would appear that student achievement is consistently and pervasively associated with the presence of Prime Time instructional assistants.

Although this pattern is encouraging, we hasten to add that it invariably masks important sources of variability, such as socioeconomic status and student race. Indeed, the aim of the HLM analyses was to disentangle nested effects in order derive a more precise estimate of the predictive relationship between classroom variables (class size, presence or absence of a Prime Time assistant, PTR) and student achievement.

As expected, student achievement in reading, language and mathematics (and the composite score) was strongly influenced by socioeconomic status and by race. Schools in higher SES categories, and white students, reported higher ISTEP+ achievement scores. Socioeconomic status was not only a uniformly significant main effect, it also interacted with the presence or absence of a Prime Time assistant (better achievement was associated with higher socioeconomic status and the presence of an instructional assistant), with class size (mathematics achievement was associated with higher SES and larger class size), and with race (reading achievement was associated with higher SES and white students).

Class size was not a significant predictor of reading or language achievement, although it did predict mathematics achievement, and the composite score, but in the opposite direction. That is, higher mathematics and composite achievement was associated with larger, not smaller, class size. But this result must be interpreted with caution. It does not support any conclusion to the effect that class enrollments should be allowed to swell in order to improve ISTEP achievement scores, for two reasons. First, the apparent benefits of larger class size effects were not evident for reading and language. Second, the class size effect interacted with other variables, and hence any general conclusion about class size must be qualified by reference to these interactions. For example, class size interacted with SES, indicating that the apparent benefits of larger classes for mathematics achievement was evident only in higher SES schools (and not lower SES schools). Moreover, class size also interacted with race, which introduces a significant qualification that should be emphasized.

For example, the class size reduction literature has often shown that the benefits of small class size may be greater for minority children in urban school settings. In light of this literature, and in light of the race effect noted earlier, we conducted a set of HLM analyses within samples of white and black students. We found that SES and class enrollment were significant predictors of student achievement, although the influence of class enrollment cuts in different directions for black and white pupils. For example, white students tended to do better in classrooms with larger enrollments, whereas black students tended to do better in classrooms with smaller enrollments. This pattern broadly supports the previous literature on the differential benefits of class size reduction for white and black students.

Hence, although we do find some evidence that higher class enrollment is associated with better achievement in mathematics (and on the composite score), there are two important qualifications. First, this effect may be mostly restricted to higher SES schools. Second, this effect does not hold for minority pupils, who report better achievement in smaller classes, a finding that has been reported elsewhere in the literature (e.g., Robinson & Wittebols, 1986).

Although the Prime Time funding formula also underwrites the hiring of teachers, the "Prime Time strategy" is often considered an intervention that attempts to reduce pupil-teacher ratio rather than class size, and to do so by hiring instructional assistants (in addition to hiring teachers). In no analysis did the presence or absence of a Prime Time assistant predict achievement as a main effect, although it did emerge in a number of significant interactions, as we have noted. In contrast, pupil-teacher ratio was a significant predictor of reading, mathematics and the composite achievement score, but in the opposite direction. That is, better achievement in these domains was evident in classrooms that reported larger pupil-teacher ratio.

Pupil-teacher ratio (PTR) has a controversial status in the class size reduction literature. For example, although the addition of paraprofessionals to the classroom is often touted as a low-cost alternative to class size reduction (because it obviates the need to hire more teachers), evidence for the effectiveness of teacher aides for raising student achievement is "bleak" (Finn, Gerber, Farber & Achilles, 2000). Indeed, Finn et al. (2000, p. 152) concluded, on the basis of an HLM analysis, that the "addition of a teaching assistant to a primary-grade classroom does not affect students' achievement any differently from classes of similar size without an aide." Moreover, much like the present study, Finn et al. (2000) also reported that, in some instances, students in aide classes performed more poorly than students without aides. We should note that pupil-teacher ratio was inferred, in the Finn et al. (2000) study, from a dummy contrast (aide, no aide), rather than the FTE (full-time equivalent) approach adopted here.

But Finn et al. (2000) also reported that the presence of an aide (note: rather than pupil-teacher ratio) might have a positive influence on student achievement as a function of *duration*. For example, in their data, first-grade students who had an aide for one year score nearly 6 points higher than first-grade students without an aide on the SAT reading test. Students who had an aide for two years scored 11 points higher than students without aides. As the authors put it, "The differences suggest that duration may be a factor in the effects of teaching assistants on student achievement" (Finn et al., 2000, p. 152).

This illustrates an important caveat that must attend the interpretation of the present data. Students sit for the ISTEP+ in the second week of September of the Fall term. This means that a Prime Time assistant would be active in a classroom for just a few weeks prior to the administration of ISTEP+. This may not allow sufficient time for the benefits of an instructional assistant to be evident within a classroom, given the critical importance of duration noted by Finn et al. (2000).

We conclude then, with the recommendation that future research undertake a longitudinal examination of the influence of Prime Time instructional assistants (and pupil-teacher ratio) on student achievement, in order to more fully assess the role of the duration variable. This would require the utilization of standardized assessments at second grade in classrooms with and without Prime Time assistants, with assessments administered in the fall and spring terms. These students should then be followed into third-grade, and their ISTEP+ scores be included in the analysis.

We also recommend a research strategy that examines the influence of instructional assistants, and other classroom variables, on the achievement of first-grade pupils, given the fact that the benefits of instructional assistants (and class size reduction) might be particularly evident in the early primary grades. Future research should also consider using assessments other than the state-mandated test and similar standardized assessments. This would include, for example, locally-constructed tests of proficiencies. Such an approach is necessary if the Prime Time evaluation is to be extended to first-grade, but these assessments would also be an informative adjunct to standardized achievement data.

Finally, the present data would support additional research on the intriguing possibility that a differentiated Prime Time strategy might be appropriate, one that seeks to reduce class size in lower SES schools, but utilizes instructional assistants in larger classrooms in higher SES schools.

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Table 1
Target (and Actual) Sampling Distribution of School Corporations, by Educational Service Region and Geographic Category

Educational Service Region	**Geographic Category**				
	Rural	Suburban	Town	Urban	Total
1	4 (3)	0 (0)	3 (2)	1 (1)	8 (6)
2	3 (3)	1(1)	2 (2)	1 (1)	7(7)
3	3 (2)	1 (1)	4 (4)	1 (2)	9 (9)
4	5 (4)	2 (2)	4 (3)	1 (1)	12 (10)
5	6 (3)	1 (1)	3 (1)	1 (1)	12 (6)
6	3 (2)	1 (1)	2 (1)	2 (1)	9 (5)
7	4 (4)	1 (0	2 ((1)	1 (1)	8 (6)
8	3 (4)	1 (0)	3 (3)	1 (0)	8 (7)
9	0 (0)	4 (4)	0 (0)	1 (1)	5 (5)
Total	31 (25)	14 (10)	23 (17)	10 (9)	78 (61)

Table 2
Frequency and Mean Enrollment, by Class Size

Class Size	Frequency	Percent	Mean Enrollment	Std. Dev.
12-17	1085	9.9	15.96	1.17
18-21	4571	41.8	19.85	1.02
22-26	4854	44.4	23.47	1.25
> 26	417	3.8	27.89	1.33

Table 3
Students by Racial Background and Class Size

	Class Size								
Race	12-17		18-21		22-26		> 26		Total
	N	%	N	%	N	%	N	%	
White	804	8.70	3833	41.63	4204	45.66	366	3.97	9207
Black	160	16.08	437	43.92	383	38.49	15	1.51	995
Hispanic	82	23.56	135	38.79	109	31.03	22	6.32	348
Total Black-Hispanic	242	18.02	572	42.59	492	36.63	37	2.75	1343
Asian	4	6.45	31	50.00	25	40.32	2	3.22	62
Other	17	8.33	107	52.45	71	34.80	9	4.41	204
Total Non-White	263	16.34	710	44.12	588	36.54	48	2.98	1609

Table 4
Means and Standard Deviations of NCE Achievement Scores (ISTEP+) by Prime Time Status, and Class Size

	Reading		Language		Mathematics		Total Composite	
PT Status	**Mean**	**S.D.**	**Mean**	**S.D**	**Mean**	**S.D.**	**Mean**	**S.D.**
Aide	59.26	16.82	62.46	19.47	66.14	21.99	62.64	16.75
Regular	56.34	17.18	60.66	19.36	63.13	21.89	60.10	16.78
Class Size	**Mean**	**S.D.**	**Mean**	**S.D**	**Mean**	**S.D.**	**Mean**	**S.D.**
13- 17	53.25	16.51	58.55	18.78	61.71	21.68	57.92	16.10
18-21	56.85	16.92	60.96	19.33	63.13	21.56	60.39	16.52
22-26	58.66	17.21	62.11	19.53	65.65	22.29	62.16	17.07
> 26	60.21	17.38	63.49	19.93	66.87	22.44	63.50	17.22

Table 5
Mean NCE Achievement Scores (ISTEP+) in Prime Time Assisted (PT) and Unassisted Regular (R) Classrooms, by Geographic Category (Urban, Suburban, Township, Rural)

	Urban		Suburban		Township		Rural	
	PT	Regular	PT	Regular	PT	Regular	PT	Regular
Reading	56.91	54.52	63.78	58.06	58.30	57.86	58.58	56.73
Language	60.83	59.33	68.57	63.01	60.99	62.60	59.93	59.03
Math	66.02	62.39	73.02	67.01	64.05	64.54	61.76	59.76
Total	61.29	58.82	68.51	62.75	66.11	61.75	60.09	58.52

Table 6
Means and Standard Deviations of NCE Achievement Scores by Class Size and Geographic Category

	Urban		Suburban		Township		Rural	
Reading	M	SD	M	SD	M	SD	M	SD
13-17	50.26	16.19	53.03	16.84	55.81	15.55	56.31	17.35
18-21	54.97	17.85	58.88	16.25	58.11	16.55	57.03	16.13
22-26	56.18	17.65	63.19	17.27	58.24	16.89	58.01	15.74
> 26	59.65	17.32	57.17	16.55	61.95	20.02	62.59	17.02
Language								
13-17	56.22	19.43	59.57	18.21	61.26	18.03	58.52	18.42
18-21	59.94	20.16	63.47	19.47	62.28	18.86	59.69	18.31
22-26	60.07	20.02	67.95	18.92	61.99	19.13	58.89	18.38
> 26	63.50	20.69	63.33	19.86	67.68	18.41	62.21	17.74
Math								
13-17	60.14	21.63	63.84	21.34	64.48	22.64	58.61	19.32
18-21	63.39	22.13	66.08	21.83	64.47	21.22	59.92.	20.54
22-26	64.13	22.68	73.39	21.25	63.93	21.29	61.19	21.79
> 26	66.43	23.16	53.71	19.67	82.80	18.85	67.40	18.74
Total								
13-17	55.71	16.23	58.86	15.50	60.54	16.17	57.80	15.60
18-21	59.53	17.36	62.93	16.46	61.75	16.03	58.87	16.63
22-26	60.16	17.53	68.18	16.53	61.39	16.36	59.38	16.05
> 26	63.13	18.11	58.58	16.10	70.72	15.53	64.01	14.13

Table 7
Mean NCE (ISTEP+) Achievement Scores in Prime Time Assisted (PT) and Unassisted Regular (R) Classrooms, by Class Size

	Reading		Language		Mathematics		Total Composite	
Class Size	PT	Regular	PT	Regular	PT	Regular	PT	Regular
13-17	57.16	52.66	60.98	58.23	60.73	61.99	59.59	57.72
18-21	58.71	56.54	61.48	60.93	64.81	62.88	61.72	60.20
22-26	59.42	57.49	62.58	61.22	66.47	64.16	62.84	60.97
> 26	59.71	61.24	63.95	62.54	68.00	64.58	63.91	62.65

Table 8
Means and Standard Deviations of Achievement Scores, by Differentiated Small Class Size

	Reading		Language		Math		Total
Class Size	Mean	SD	Mean		Mean	SD	Mean
12-14 N = 87	51.29	17.16	59.93	18.78	65.11	20.37	58.82
15-17 N = 991	53.42	16.44	58.43	18.78	61.42	21.70	57.84
18-21 N = 4557	56.85	16.92	60.96	19.33	63.13	21.56	60.39
22-26 N = 4848	58.66	17.21	62.11	19.53	65.65	22.29	62.16
> 26 N = 415	60.21	17.38	63.49	19.93	66.87	22.44	63.50

Table 9
Mean ISTEP+ Achievement by Class Size and Prime Time Status

	Composite ISTEP+ Achievement (NCE)							
Class Size/ PT Status	Reading		Language		Math		Total	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
12-14								
PT Assistant	–	–	–	–	–	–	-	-
Regular	51.29	17.16	59.93	18.78	65.11	20.37	58.82	16.14
15-17								
PT Assistant	57.16	16.80	60.98	20.02	60.73	21.98	59.59	17.43
Regular	52.80	16.28	58.06	18.59	61.67	21.70	57.61	15.92
18-21								
PT Assistant	58.71	16.52	61.48	19.30	64.81	21.25	61.72	16.22
Regular	56.54	16.94	60.93	19.32	62.88	21.58	60.20	16.55
22-26								
PT Assistant	59.42	16.92	62.58	19.42	66.47	22.07	62.84	16.82
Regular	57.49	17.67	61.22	19.72	64.16	22.62	60.97	17.49
≥ 26								
PT Assistant	59.71	16.52	63.95	20.03	68.00	22.35	63.91	17.07
Regular	61.24	19.07	62.54	19.76	64.58	22.54	62.65	16.83

Table 10
Summary of Significant Effects Across HLM Analyses of NCE Reading, Language, Mathematics and Total NCE Composite Achievement Scores, Race, Class Enrollment, Presence or Absence of a Prime Time Assistant, and SES

	Significant Effects					
NCE Scores	SES	Race	Class Enrollment (CE)	PT Assistant x SES	CE x SES	Race x CE
Reading	X	X		X		X
Language	X	X		X		
Mathematics	X	X	X		X	
Composite	X	X	X	X		

Table 11
General Summary of Coefficients for Main Effects Across All Analyses

Main Effects	Coefficient	p-value
Socio-Economic Status		
Reading	.1466	.000
Language	.1298	.000
Mathematics	.1245	.000
Composite	.1316	.000
Race		
Reading	6.727	.000
Language	6.422	.000
Mathematics	7.440	.000
Composite	6.975	.000
Class Enrollment		
Reading	.4496	.001
Language	.1839	.246
Mathematics	.3738	.044
Composite	.3509	.017
Prime Time Assistant		
Reading	-1.349	.124
Language	-1.388	.167
Mathematics	-1.399	.307
Composite	-1.382	.156
Pupil-Teacher Ratio		
Reading	.5160	.000
Language	.1970	.240
Mathematics	.4049	.046
Composite	.3763	.016

Table 12
General Summary of Coefficients for Interactive Effects with SES, Across all Analyses

Interactive Effects	Coefficient	p-value
Class Enrollment x SES		
Reading	-.019	.749
Language	.0039	.551
Mathematics	.0147	.076
Composite	.0049	.443
Prime Time Assistant x SES		.
Reading	.0858	.072
Language	.1108	.043
Mathematics	.0894	.240
Composite	.0959	.073
Pupil-Teacher Ratio x SES		
Reading	.0016	.787
Language	.0051	.495
Mathematics	.0159	.083
Composite	.0052	.446

Table 13
General Summary of Coefficients for Interactive Effects with Race, Across all Analyses

Interactive Effects	Coefficient	p-value
Class Enrollment x Race		
Reading	.7020	.056
Language	.4422	.314
Mathematics	.4419	.408
Composite	.4337	.260
Prime Time Assistant x Race		
Reading	-.8413	.676
Language	-1.608	.515
Mathematics	-.5488	.846
Composite	-.4426	.841
Pupil-Teacher Ratio x Race		
Reading	.5836	.113
Language	.4030	.381
Mathematics	.0512	.923
Composite	.3295	.409

Table 14
Estimate of Fixed Effects (with robust standard errors): White Students

Fixed Effect	Coefficient	Standard Error	t-ratio	d.f.	p-value
Intercept (grand mean)	61.5265	.4947	124.37	156	.000*
SES	.1245	.0292	4.257	156	.000*
Class Enrollment	.3869	.1528	2.53	156	.012*
Class Enrollment x SES	.0102	.0093	1.086	156	.278
PT Assistant Status	-1.27	.9697	-1.31	156	.190
PT Assistant Status x SES	.0754	.0639	1.178	156	.239

Table 15
Estimate of Fixed Effects (with robust standard errors): Black Students

Fixed Effect	Coefficient	Standard Error	t-ratio	d.f.	p-value
Intercept (grand mean)	53.600	.9148	58.590	960	.000*
SES	.1204	.0265	4.55	74	.000*
Class Enrollment	-.6728	.3211	-2.09	74	.036*
Class Enrollment x SES	-.0089	..0073	-1.226	74	.221
PT Assistant Status	-.3372	2.28	-.148	74	.813
PT Assistant Status x SES	.1985	.0784	2.53	74	.012*

Table 16
Summary of Significant Effects Across HLM Analyses of NCE Reading, Language, Mathematics and Total NCE Composite Achievement Scores, by Race, Pupil-Teacher Ratio (PTR) Presence or Absence of a Prime Time Assistant, and SES

	Significant Effects			
NCE Scores	SES	Race	Pupil-Teacher Ratio (PTR)	PT Assistant x SES
Reading	X	X	X	
Language	X	X		X
Mathematics	X	X	X	X
Composite	X	X	X	X