SB

204

ALASKA STATE LEGISLATURE

SENATOR THOMAS H. WAGONER

- Chair, Senate Resources Committee
- Vice-Chair, Senate State Affairs Committee
- Member, Community & Regional Affairs
- Member, Legislative Council
- Member, World Trade

Official Business

Session: January – May
State Capitol, #427
Juneau, AK 99801
Phone: 907-465-2828 Fax: 907-465-4779

Interim: May – December
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February 14, 2006

MEMORANDUM

To: Senator Fred Dyson, Chair
Senate Health, Education and Social Services Committee

From: Senator Tom Wagoner

Subject: Hearing Request

I would like to request that you schedule SB 204 in the Senate HESS committee at your earliest convenience.

Senate Bill 204 would set requirements for classroom size in grades one through three. Instead of requiring another class once there are over 20 students, this bill allows for teachers aids to help in situations where there is not room for another class, or not enough funds for another full time teacher.

I would appreciate your consideration on this bill. If you should have any questions please contact Amy Seiz, 3421.

Thanks.

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1/31/06

AMENDMENT

OFFERED IN THE SENATE BY SENATOR WAGONER

TO: SB 204

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Insert "classroom for pupils who are"

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Page 1, line 10:

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Page 1, line 11:

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Sponsor Statement
Senate Bill 204

Many studies and discussions have taken place over the years on the effectiveness of learning in classrooms of various sizes. These studies show that smaller classrooms have a positive affect on a students learning, especially in the lower grades. Studies have also shown that students in smaller classes in grades Kindergarten through third grade tend to perform better in subsequent years as well.

Senate Bill 204 would require that grades one through three have a 20:1 pupil: teacher ratio. If reaching that goal is not possible, for whatever reason, there is the ability to have more students with a teacher's aid. For up to 24 students SB 204 requires a half time teacher's aid, and 25 students on up would require a full time aid. This would make for a better classroom environment for both the students and the teachers.

One of the main concerns raised each time the discussion of lowering classroom size comes up is the financial burden. Lowering classroom sizes around the state will cost money. Senate Bill 204 addresses that issue by implementing these provisions over a three-year period. This way the school districts will not suffer from a large increase in cost, but will get the benefits of smaller classrooms where it is most needed.

Class Size and Students At Risk: What is Known?...What is Next? - April 1998

Research on the Academic Effects of Small Class Size

The question "Are smaller classes better than larger classes?" continues to be debated among teachers (and their unions), administrators, and parents as well as in the research community. The issue persists because of the powerful common-sense appeal of small classes to alleviate problems indigenous to our classrooms. Small classes are an integral component of nationally subsidized programs including special education classes for disruptive or learning-disabled students and Title I interventions for children living in poverty. Small classes or small groups working with one teacher or tutor also are a key element of programs targeted most often at students at risk, for example, *Success for All* (Slavin, *et al.*, 1990; Slavin & Madden, 1995) and *Reading Recovery* (Pinnell, deFord, & Lyons, 1988).

The issue persists because of the tension between the research findings and the cost of implementation. A great deal of empirical data have been collected. However, they have so far been less than convincing and not consistent enough to justify the expense of the additional classrooms and teachers that would be required. Targeted remedial programs are generally less costly and easier to deploy. They tend to be adopted for a portion of the school day to address learning problems in one or a small number of subject areas. In contrast, maintaining small classes throughout a grade level or school requires pervasive organizational changes. Of course, proponents would argue that the benefits are also pervasive--being realized throughout the school day and affecting the entire range of school subjects--unlike the band-aid approach of experimenting with one targeted program after another.

Overviews of Research on Small Classes

Over the past 2 decades there have been many summaries of research on the relationship of class size to academic achievement. Three are particularly worthy of note because of their comprehensiveness, and because they planted the seeds for much of the research that followed.

Without doubt the most widely cited review is the classic *Meta-analysis of research on the relationship of class size and achievement* (Glass & Smith, 1978). The authors collected and summarized nearly 80 studies of the relationship of class size with academic performance that yielded over 700 class-size comparisons on data from nearly 900,000 pupils. The two primary conclusions drawn from this material are:

- reduced class size can be expected to produce increased academic achievement (p. iv); and
- [t]he major benefits from reduced class size are obtained as the size is reduced below 20 pupils (p. v).

Although the extensiveness of the Glass-Smith meta-analysis was commendable, the selection of studies to include was subject to justifiable criticism. A number of studies were of short duration; many compared normal-sized classes to one-on-one tutoring; other studies did not include "realistic" class sizes as their comparison groups; and at least one study related to instruction in non-academic subjects (i.e., tennis). In spite of these deficiencies, however, the two conclusions drawn by Glass and Smith

have endured and have received further support.

A compilation of studies examined by Educational Research Service (Robinson & Wittebols, 1986; Robinson, 1990) is noteworthy because of its extensiveness--more than 100 separate studies were reviewed. Robinson's (1990) conclusions added an important set of qualifications to the findings of Glass and Smith:

> [R]esearch does not support the expectation that smaller classes will of themselves result in greater academic gains for students. The effects of class size on student learning varies (sic) by grade level, pupil characteristics, subject areas, teaching methods, and other learning interventions. (p. 90)

In particular, the review concludes that small classes are most beneficial in reading and mathematics in the early primary grades and that: "[t]he research rather consistently finds that students who are economically disadvantaged or from some ethnic minorities perform better academically in smaller classes" (p. 85). Unfortunately, the wide-ranging review failed to distinguish even the best designed studies from those using the poorest methodology, and thus the conclusions must be viewed as tentative.

A third review is noteworthy because of its focus on high-quality research conducted in accordance with accepted scientific standards. Using a procedure termed "best evidence synthesis," Slavin (1989) reviewed only those studies that lasted a minimum of 1 year; involved a substantial reduction in class size, that is, larger classes were compared to classes that were at least 30 percent smaller and had 20 students or fewer; and involved either random assignment of youngsters to class sizes or matching to assure that the groups were initially equivalent.[1]

Of the research summarized by Glass and Smith (1978) and others, Slavin identified only eight studies that met all three criteria. From these eight studies, Slavin concluded that substantial reductions in class size have a small positive effect on students (the median effect size for the eight studies was only 0.13σ); and the effect was not cumulative and even disappears in later years.[2] Slavin's reinterpretation of the Glass-Smith findings is that large effects are not likely to be seen until the class size is reduced to one (e.g., one-on-one tutoring).

Other research syntheses. In a brief overview of research, Finn and Voelkl (1994) identified three approaches to studying the issue of class size: the *classroom-focus* approach, the *cost-related* approach, and the ecological approach.

The reviews by Glass and Smith (1978), Robinson and Wittebols (1986), and Slavin (1989) summarize classroom-focus studies; this research examined the number of pupils in each classroom, the interactions between the teacher(s) in that classroom, and the outcomes that were realized by the pupils in that classroom. It provides the most direct and intensive view of the effects of a small class setting.

The cost-related approach examines the actual or potential costs of implementing small classes and weighs them against the benefits that may accrue. This approach is discussed in considerable detail in the next chapter of this paper.

The ecological approach views class size in historical or geopolitical perspectives. For example, Tomlinson (1988, 1989) examined the changes in median class size in the United States over several decades and related them to changes in standardized test scores. The analysis does not show performance benefits for smaller classes, and it ignores a multitude of intervening factors, including population shifts and both cultural and institutional changes over the same time period. Likewise, the

comparison of class sizes between countries introduces a number of confounding variables including national differences in educational expenditures, educational goals, teacher preparation, and student characteristics, to name a few. Class sizes also may vary dramatically within a country over time or among schools at one point in time (see Finn & Voelkl, 1994). Thus, ecological associations with pupil performance only obscure the effects of having a smaller or larger number of individuals in a particular class setting.

Class size is not pupil/teacher ratio. The analysis of pupil/teacher ratios is characteristic of the ecological approach and shares some of the same difficulties. Although the number of pupils can be compared to the number of teaching staff in a single school, the ratio obfuscates the workload faced by a teacher in one classroom, the amount of attention the teacher gives to any one pupil, and dynamics of a small or large class that may impact on pupil participation;[3] these interactions may be especially important for students at risk. At the same time, pupil/teacher ratios are often smaller in urban districts (because of Title I programs, special education programs and remedial teachers), while actual class sizes may be larger. One significant study (Boozer & Rouse, 1995) found that average class size--a more direct measure of classroom organization--was more important to academic achievement than the pupil/teacher ratio. Although several studies discussed in this paper did examine pupil/teacher ratios, the emphasis is on classroom-focus research.

Statewide Class-size Studies: PRIME TIME and STAR

Indiana's PRIME TIME. In 1984 the state of Indiana funded an initiative to reduce class sizes in grades 1 through 3 to an average of 18 pupils, or to 24 pupils if an instructional assistant was in the classroom. During the initial year, 286 of 303 districts participated to a greater or lesser extent. The main PRIME TIME intervention took place over 3 years, beginning with grade 1 in 1984, adding grade 2 in 1985, and grade 3 (or kindergarten, on option) in 1986.

The outcomes of PRIME TIME are summarized in numerous publications (e.g., Center for School Assessment, 1986; Chase, Mueller & Walden, 1986; Malloy & Gilman, 1989; McGiverin, Gilman, & Tillitski, 1989; Mueller, Chase, & Walden, 1988). In brief:

- Positive outcomes were found for small classes on such factors as time on task, individualized instruction, well-behaved classes, and teacher satisfaction; but
- The results for academic achievement were mixed--at times, small classes were found to have superior outcomes and, at times, the large classes performed better.

Project PRIME TIME is noteworthy because it demonstrates important principles for the research that followed, namely, the feasibility of a statewide class-size initiative and the need to conduct an intervention of this type over a period of years. Virtually all class-size research that preceded PRIME TIME was cross-sectional in nature. However, PRIME TIME was designed as a demonstration project and did not follow rigorous procedures needed for a thorough evaluation in that: no control was implemented to equalize or match smaller and larger classes at the outset; small classes may not have been kept small for the entire school day; different achievement tests were administered in different schools; and other local, state, and federal programs were functioning in some schools but not others simultaneously with the class-size intervention.

More unfortunately, PRIME TIME did not implement a single, well-defined, small-class intervention. While the average class size of 18 pupils was viewed as a target, actual class sizes ranged from 12 to 31; classes of 24 pupils with a teacher aide were considered to be small despite the number of pupils in the

classroom. As a result, the evaluations of PRIME TIME cannot be interpreted as confirming or refuting a class-size effect.

Tennessee's Project STAR. Project STAR, the only large-scale, controlled study of the effects of reduced class size, was conducted in 79 elementary schools in the state of Tennessee from 1985 to 1989. The design drew heavily upon previous research findings, namely, that any benefits of small classes are likely to be realized in the primary grades, that there may be different outcomes for students based on race or economic disadvantage, and that only substantial reductions in class size are likely to have noteworthy impact.

Within each participating school, children entering kindergarten were assigned at random to one of three class types: small (S) with an enrollment range of 13 to 17 pupils; regular (R) with an enrollment range of 22 to 26 pupils; or regular with a full-time teacher aide (RA) with 22 to 26 pupils. Teachers also were assigned at random to the class groups. Teachers in the STAR classrooms received no special instructions of any sort, and the duties of teacher aides were not prescribed but were left to the teacher's discretion.[4]

Classes remained the same type (S, R, or RA) for 4 years, until the pupils were in grade 3. A new teacher was assigned at random to the class each year. Standardized achievement tests (Stanford Achievement Tests, or SATs) were administered to all participating students at the end of each school year. Also, curriculum-based tests (Basic Skills First, or BSF) reflecting the state's instructional objectives in reading and mathematics were administered at the end of grades 1, 2, and 3. Finally, a measure of motivation and self-concept intended for young children also was administered to each pupil (Milchus, Farrah, & Reitz, 1968). In all, about 7,500 pupils in more than 300 classrooms participated in the 4-year longitudinal study.

Comments on the design. Before reviewing the outcomes of Project STAR, the particular strengths of this initiative should be underscored. The within-school design was an effective way to control for differences among school settings including, but not limited to, the economic status of the student body, per-pupil expenditures, and the manner in which schools were administered. The value of this type of design cannot be underestimated. The random assignment was monitored carefully by state- level evaluators. A large and diverse population of students was longitudinally tracked over the 4 year period, and the data were collected, cleaned, and collated with a high degree of care. Both norm-referenced and criterion-referenced achievement data were collected. The norm-referenced tests, based on item-response theory, permitted comparisons of achievement levels from one grade to the next. The design of STAR, together with its magnitude and the follow-up research conducted after the 4-year period, led Harvard's Frederick Mosteller to term Project STAR "[a] controlled experiment which is one of the most important educational investigations ever carried out" (1995, p. 113).

The primary results. The main analysis of STAR outcomes consisted of four cross-sectional analyses, one at the end of each school year.[5] The statistical methods were variations of common confirmatory procedures for evaluating experimental outcomes, for example, analysis of variance, multivariate analysis of variance, and analysis-of-covariance procedures (see Finn & Achilles, 1990). In addition to tests of significance, "effect size" measures were derived each year for all students and for white and minority students separately. The results were compiled into a Tennessee State Department of Education report (Word,*et al.* 1990).

Four primary results were reported consistently across the 4 years of analysis:

- Differences among the three class types were highly statistically significant for all sets of

achievement measures and for every measure individually. In every case, the significance was attributable to the superior performance of children in small classes, and not to classes with full-time teacher aides.

- With only minor exception, there was no significant interaction with school location [6] or sex of the pupil. A significant small-class advantage was found in inner-city, urban, suburban, and rural schools alike and the advantage of small classes was found both for males and females.
- In each year of the study, some of the benefits of small classes were found to be greater for minority students than for nonminorities, or greater for students attending inner-city schools.
- No differences were found among class types on the motivational scales.[7]

The results are given in the form of small-class effect sizes in Table 1.[8] Each effect size is the mean score for small classes minus the mean score of regular and teacher-aide classes [S - (R+A)/2] in standard deviation units. Since they all favor small classes, the researchers referred to the difference as the "small-class advantage." For the criterion-referenced Basic Skills First (BSF) tests, the difference is computed for the percentage of students exceeding the state's mastery criterion.

Table 1.
Small-class effect sizes, grades kindergarten (K) through 3, by skills, motivation, and self-concept data

Scale	Group	Grade Level			
		K	1	2	3
Word Study Skills	W	0.15	0.16	0.11	
	M	0.17	0.32	0.34	N/A
	ALL	**0.15**	**0.22**	**0.20**	
Reading	W	0.15	0.16	0.11	0.16[a]
	M	0.15	0.35	0.26	0.35[a]
	ALL	**0.18**	**0.22**	**0.19**	**0.25[a]**
Total Reading	W	-	0.17	0.13	0.17
	M	-	0.37	0.33	0.40
	ALL	**0.18**	**0.24**	**0.23**	**0.26**
Basic Skills First (BSF) Reading	W	N/A	4.8%	1.6%	4.0%
	M		17.3%	12.7%	9.3%
	ALL		**9.6%**	**6.9%**	**7.2%**
Total Mathematics	W	0.17	0.22	0.12	0.16
	M	0.08	0.31	0.35	0.30
	ALL	**0.15**	**0.27**	**0.20**	**0.23**
Basic Skills First (BSF) Mathematics	W	N/A	3.1%	1.2%	4.4%
	M		7.0%	9.9%	8.3%
	ALL		**5.9%**	**4.7%**	**6.7%**
Motivation	W	0.00	-0.02	-0.03	-0.01
	M	0.03	-0.01	0.07	0.11
	ALL	**0.01**	**0.00**	**0.01**	**0.00**

Self-Concept	W	0.10	0.07	0.00	-0.05
	M	0.10	0.05	0.03	0.04
	ALL	**0.11**	**0.7**	**0.02**	**0.02**

NOTE: The values for BSF Reading and BSF Mathematics represent differences in the percent passing (no standard deviation). All other values are mean differences: Small - (Regular + Aide)/2, divided by the standard deviation of the scale. Standard deviations computed for all students in regular classes, and all white (W) and minority (M) students separately.

[a]Total Language scale in grade 3 (not Reading).

In every instance, small classes outperformed the other class types; effect sizes for the total sample (*All* range from about 0.15σ in kindergarten to about 0.25σ in grades 1, 2, and 3.[9] And like the research that preceded STAR, the small-class advantage was consistently greater for minority students (most of whom were black) than for whites. In most comparisons, the impact on minorities was about twice as large as it was for white students. This resulted in a considerably reduced achievement gap. In reporting this effect, Finn and Achilles (1990) noted that the difference between minorities and whites in mastery rates on the grade 1 reading test was "reduced from 14.3 percent in regular classes to 4.1 percent in small classes" (p. 568).

Two additional points should be noted. First, the effect sizes in Table 1 show that small classes present up to a 1/4σ advantage compared to larger classes in every subject tested.[10] Although the researchers did not devise methods for computing the total impact on achievement, it is greater than any single difference would indicate. Second, the effect sizes in Table 1 actually underestimate the true small-class advantage. An unavoidable phenomenon during the 4-year project was the "drifting" of some classes out of the target size range, as students transferred into or out of a class or school. Preliminary indications are that the effect sizes would be substantially greater if out-of-range classes were removed from the data.[11]

In sum, due to the magnitude of the Project STAR longitudinal experiment, the design, and the care with which it was executed, the results are clear:

- This research leaves no doubt that small classes have an advantage over larger classes in student performance in the early primary grades.

At the same time, the research leaves behind a wealth of data that have only begun to be analyzed for what they can tell us.

The follow-up: the Lasting Benefits Study. After the positive STAR findings, Tennessee authorized a study to see how long the initial benefits of small classes would persist. Although all children were returned to regular-size classes in grade 4, the Lasting Benefits Study (LBS) continued to follow a significant portion of these pupils.[12] In the 1995 1996 school year, the majority of STAR students were in grade 10 and were still being tracked.

The grade 4 evaluation included standardized and criterion-referenced achievement tests plus a new measure of student engagement in learning activities, the Student Participation Questionnaire (SPQ) (Finn, Folger, & Cox, 1991). The SPQ is a 28-item scale on which each pupil is rated by his or her teacher. It yields reliable, valid measures of student "effort" that the student allots to learning, "initiative-taking" in the classroom, and "nonparticipatory" behavior (disruptive or inattentive-withdrawn behavior). The grade 4 results (Finn,*et al.* 1989) showed that, even after the small-class

intervention was disbanded:

- Students who had been in smaller classes had higher achievement in all academic areas compared to students in regular or teacher-aide classes;
- The small-class effect size (small to regular) ranged from 0.11σ in social studies to 0.16σ on the criterion-referenced mathematics test; and
- Pupils who had been in small classes were rated as expending more effort in the classroom, taking greater initiative with regard to learning activities, and displaying less disruptive or inattentive behavior compared to their peers who had been in regular-size classes.

Positive achievement results continued to be obtained in later grades. The median small to regular difference in grade 5 for the total sample was approximately 0.18σ ; in grade 6 it was approximately 0.16σ ; in grade 7 it was approximately 0.14σ 0. As in earlier grades, the differences were statistically significant on all norm-referenced and curriculum-based tests.[13]

The carry over effects are consistent with findings from other early interventions, for example, the Perry Preschool Project (Berrueta-Clement,*et al.* 1984). They raise the possibility that small classes in the early grades have significant long-term consequences for all students generally and that they may begin students at risk of educational failure on a positive trajectory that will increase their chances of school success through the years.

As of this writing, resources are not available to explore these data in any but the most cursory ways. The data base continues to grow, however. In grade 8, two teachers rated each student on the SPQ and each student completed a self-report "Identification with School" scale (Voelkl, 1996). Achievement test scores have been obtained for grades 8 and 9. In sum, STAR and the LBS have laid the groundwork for building an important data base for examining educational effects longitudinally. Its potential to address both basic and policy-relevant research issues is elaborated in a later section of this report.

Other STAR-related studies. Based on the positive findings of STAR and the LBS, Tennessee implemented *Project Challenge* in 17 of the state's poorest school districts, that is, districts with the lowest per capita income and highest percentages of pupils in the subsidized lunch program. Beginning in 1990, small classes (pupil to teacher ratio of 15:1) were introduced in all schools in these counties in the primary grades; grades 2 and 3 in 1990, grades 1 through 3 in 1991, and grades kindergarten through 3 in 1992 and later years. *Project Challenge* was not a controlled experiment as was Project STAR, but was a thorough effort to implement small classes in particular targeted districts.

The project was assessed through an analysis of district rankings on statewide achievement tests (Achilles, Nye, & Zaharias, 1995). Since Tennessee has 138 districts, a rank of 69 would be considered average. In terms of the mean rankings of the 17 Challenge districts, the results were:

- In grade 2 reading, the mean ranking improved from 99 in 1990 (among the lowest) to 94 in 1991, 87 in 1992, and 78 in 1993; and
- In grade 2 mathematics, the mean ranking improved from 85 in 1990, to 79 in 1991, to 60 in 1992, and 57 in 1993--that is, from performance below the state average in 1990 to performance above the average in 1992 and 1993.

It is also interesting to note that because of the staggered introduction of small classes, grade 2 students

in 1991 had been in small classes for just 1 year, whereas the grade 2 students in 1991 had been in small classes for 2 years (grades 1 and 2), and the 1992 and 1993 grade 2 students had been in small classes for 3 years (kindergarten through grade 2). That is:

- Each additional year in the small-class setting was accompanied by further improvement in reading and mathematics.

This study adds non-experimental evidence that small classes are beneficial in the primary grades. The data also indicated that in-grade retentions were reduced when small classes were implemented (Achilles, n.d.).

Two smaller studies of class size were conducted in North Carolina pursuant to STAR. In 1991 educators, citizens, and the school board in Burke County, North Carolina began a project to reduce the class size to 15 in grade 1, followed by grades 2 and 3 in subsequent years (Achilles, Harman, & Egelson, 1995; Egelson, Harman, & Achilles, 1996). And in a related effort, the principal of the Oak Hill elementary school in the Guilford County, North Carolina system restructured classes in grades kindergarten through 3 into a small-class format (15 students). The initiative was termed *Success Starts Small* (Achilles,*et al.* 1994; Kiser-Kling, 1995). Oak Hill school was fully Chapter 1 eligible, with 78 percent of its students in the subsidized lunch program. Matched comparison groups were used in both studies.

The results of both projects favored small classes in academic achievement small-class effect sizes were in the range 0.4σ to 0.6σ (Achilles,*et al.* 1994; Achilles, Harman, & Egelson, 1995) 0. Significantly, *Success Starts Small* included systematic comparisons of teaching behavior in small and regular classes:

- Teachers of small classes spent significantly more time on task and significantly less time on discipline or organizational matters compared with teachers of regular-size classes.[14]

Conclusions. Both Project STAR and the LBS provide compelling evidence that small classes in the primary grades are academically superior to regular-size classes. The findings were confirmed for every school subject tested. Teachers of small classes received no special instructions or training; the outcomes result from class size and from whatever perceptions and advantages accompany having substantially fewer students in a room with one teacher. This is not to say, of course, that the effects could not be accentuated if additional teacher preparation initiatives were provided.

A clear small-class advantage was found for inner-city, urban, suburban, and rural school for males and females; and for white and minority students alike. The few significant interactions found each year indicated greater small-class advantages for minority or inner-city students. Targeting small classes in particular schools or districts may provide the greatest benefits at a cost that is contained, although it may also mean denying the benefits to other students or schools.

These studies were based on research suggesting that small-class benefits are most likely to occur in the primary grades. The findings of Project STAR are limited to grades kindergarten through 3--no reasonable extrapolation beyond those grades can be made from these data. At the same time, the LBS results indicate clearly that the effects carry over into later years. The large, diverse database created through STAR, the LBS, and ongoing data collections offers the opportunity to answer a number of significant questions about the long-term effects of small classes on achievement, pupil engagement in school, and student behavior.

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[1] At the time of the Slavin analysis, Project STAR had not been completed.

[2] Slavin also commented that while teachers may change their behavior in small classes, the changes are so slight that they are unlikely to make important differences in student achievement. This issues is discussed more fully in a later section of this paper.

[3] Of the studies described in the next section, Project PRIME TIME manipulated pupil/teacher ratios but failed to find a significant impact on academic achievement. In contrast, Project STAR controlled the number of pupils in each classroom; this was accompanied by differences in student performance.

[4] There was a training component for some teachers in grade 2. The effects on student achievement were found to be negligible. The results reported here do not include classes taught by that subsample of teachers.

[5] Several longitudinal analyses have been completed as well, including a K-1 analysis (Finn & Achilles, 1990)and a K-2 analysis (Finn, *et al.*, 1990). Many important longitudinal analyses remain to be conducted.

[6] The exceptions did not contradict the finding of a small-class advantage. They indicated that, to some extent, the advantage was greater for students attending inner-city schools.

[7] One possible reason for the negative findings may lie in the difficulties in assessing noncognitive characteristics of young children. Of course it is also possible that small classes improved learning but did not affect pupils' motivation or self-concepts.

[8] Unpublished table obtained directly from the analyses.

[9] Although precise grade equivalents are not available, these differences correspond to an advantage of about .1 grade equivalents (or about 1 month)by the end of kindergarten, about 0.2 grade equivalents (or about 2 months) at the end of first grade, and somewhat more by the end of grade 2.

[10] Including several subtests not listed in Table 1.

[11] In the range 0.3* and upward (Zaharias, *et al.*, 1995).

[12] Each year (1990-1994) the number of students tested was between approximately 4200 and 6000.

[13] Later follow-ups through grade 11 are being conducted by H.P. Bain and J.B. Zaharias of HEROS, Inc. Preliminary results indicate that the positive effects of small classes persisted at least through grade 10.

[14] This finding is discussed further in the later section on instructional practice and student behavior.

-###-

[Acknowledgements] PREV UP NEXT [Assessing the Cost and Benefits of Smaller Classes]

CLASS SIZE REDUCTION PROJECT

FINAL REPORT

PREPARED FOR

Alaska Department of Education

PREPARED BY

Dr. Annmarie O'Brien

July 1996

INSTITUTE OF SOCIAL AND ECONOMIC RESEARCH
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EXECUTIVE SUMMARY

This report presents the final assessment of the *Elementary School Class Size Reduction Pilot Project* at four participating elementary schools: one in the Juneau School District and three in the Kenai Peninsula School District. The project was designed to assess the effectiveness of reduced class size—combined with other teaching interventions—on student achievement and attitude, school discipline, and parental involvement in education. Participating schools explored strategies to reduce class size and improve education without significantly adding to the cost of education.

This document includes a description of participating schools' progress toward achieving their goals and comparative data on students' academic achievement from Fall 1993 to Spring 1996. It also answers a series of research questions pertaining to the effectiveness of the *Elementary School Class Size Reduction Pilot Project* and includes a summary of the cost per classroom for reducing the pupil-teacher ratio and implementing the instructional changes. To make the evaluation, we used classroom observations; staff interviews; project coordinators' reports; teachers' portfolios and logs (daily and weekly records and schedules of instruction for reading, language arts, and math); and end-of-the-year surveys of parents, students, and teachers. To assess academic achievement, based on standardized assessments, we include a comparison of mathematics, reading, and language arts test results from Fall 1993 to Spring 1996.

While the focus of each participating school varied, all used multiple strategies to reduce the pupil-teacher ratio, including half-time co-teachers, parallel block scheduling, increased use of computer-assisted instruction, parent and community volunteers, flexible staff allocation, and collaborators who worked with the classroom teacher during reading, language arts, and mathematics instruction. Parents and teachers at all participating sites overwhelmingly agreed that periods of reduced pupil-teacher ratio during core instruction time increased academic achievement and improved the overall quality of education.

Significant findings about the effects of the *Elementary School Class Size Reduction Pilot Project* include:

- Parallel block scheduling was the most cost-effective approach to reducing class size and provided the most consistent small-group time.
- Student attitude toward learning and school was reported as positive over 90 percent of the time at all schools during the three years of the project.
- Classroom climate and behavior improved at all participating schools during periods of lower pupil-teacher ratio.
- Technology as a strategy to reduce class size and improve instruction was effective when the implementation process was supported by an on-site specialist and ongoing staff development.
- Academic achievement, as reported in teachers' weekly logs and parent surveys, improved as a result of reduced class size and instructional innovations.
- Teachers overwhelmingly reported that small group instruction and challenging learning experiences improved students' self-esteem and attitudes toward school.
- Parental involvement in their children's education improved at all schools. However, the lack of consistency limited the effectiveness of parent volunteers as a long-term strategy to reduce the pupil-teacher ratio and improve instruction.

While there were considerable similarities in the proposals, there were also some notable differences. The four schools targeted different grades for class reduction: Sites A and B, K-2; Site C, 3-5; and Site D, K-6. The methods of reducing class size also differed somewhat. Site A used half-time co-teachers in targeted classrooms. Site B used block scheduling, computer-assisted instruction, volunteers, and collaborators who worked with the classroom teachers to reduce PTR during core instruction time. Site C used parallel block scheduling, computer-assisted instruction, volunteers, and noncertified special program staff. Site D used parallel block scheduling, computer-assisted instruction, and volunteers.

There were also substantial differences in the emphasized instructional strategies and related staff development programs. [redacted] emphasized the development of thematic units and team-building skills. [redacted] focused on collaboration, team teaching, peer coaching, cooperative learning, and integrated instructional technology. [redacted] concentrated on effective small-group instructional techniques and the integration of technology. [redacted] stressed the development of instruction in reading and mathematics problem-solving skills and the integration of technology into the instructional program.

This study provides insight into the effectiveness of the site-specific strategies and innovations to reduce class size on student achievement, school discipline, teacher innovation, and parents' participation. Therefore, we will present the evaluation as case studies, one for each participating school.

EVALUATION

The focus of this evaluation is on an assessment of the *Elementary School Class Size Reduction Pilot Project* from a multi-participant perspective. Evaluation activities used to compile the data for the report include standardized, diagnostic, and norm-referenced achievement tests; classroom observations; staff interviews; project coordinators' reports; teachers' portfolios and logs (daily and weekly records and schedules of instruction for reading, language arts, and math as well as project impact on academic achievement, class behavior and climate, and teacher satisfaction); and end-of-the-year surveys from parents, students, and teachers. Evaluation activities completed during the duration of the project include:

- Iowa Test of Basic Skills (Fall 1993, Spring 1994, Spring 1995, Winter 1996)
- KeyMath (Fall 1994, Spring 1995, Fall 1995 [new students]), Spring 1996)
- Peabody Picture Vocabulary Test (Fall 1994, Spring 1995, Fall 1995 [new students], Spring 1996)
- Reports from principals and project coordinators
- Classroom observations
- Daily logs documenting the number of minutes of reduced pupil-teacher ratio time and accompanying instructional strategies
- Weekly classroom logs documenting the type of instruction used; level of parent participation; and a subjective assessment of classroom climate, student achievement and behavior, and teacher satisfaction
- End-of-the year surveys of parents (Spring 1994, 1995, 1996) and teachers (Spring 1994, 1995) on the perceived effectiveness of the project
- End-of-the-year surveys of student attitude toward school (Spring 1994, 1995, 1996)
- Weekly teachers' observation of project impact on at-risk students

The goal of the project was to examine class size as a general treatment to improve instruction and learning, not as a comparative study; therefore we will present the participating schools as Sites A, B, C, and D.

PROJECT OUTCOMES

This segment of the report answers seven research questions proposed by the Alaska Department of Education at the start of the *Elementary School Class Size Reduction Pilot Project.* In preparing this section, we used project documentation and evaluation activities completed between Fall 1993 and Spring 1996; those examined effects of the project on student academic achievement and attitude, school climate and discipline, teacher innovation, and parental involvement.

1. Did the program at Site A meet its class size goals?

Goal 1: Increasing student achievement as reflected in norm-referenced, criterion-referenced, and other forms of authentic assessment

> *We are seeing children who did not know how to tackle a story problem or know how to begin to think mathematically now go through the grids of cognitive guided problem solving. I attribute this to being able to meet with them at least three times per week in small groups and getting them talking. Some kids who were confused at first are leaping ahead and I do not think they could have made that progress had they not been tutored individually or divided into interest groups.*
> **(First-grade co-teachers)**

Refer to Research Question 5 for comparative data on norm-referenced and diagnostic achievement tests (Peabody Picture Vocabulary Test and KeyMath).

Student achievement as defined here means weekly assessments of students' academic performance using measures other than standardized tests. Individualized, informal, and frequent assessment strategies were carried out in classrooms with two teachers. These assessments allowed for immediate response and assistance to children learning the basic skills in reading, writing, and mathematics.

District portfolios—which include reading attitude surveys, self-reflection surveys, teacher narratives, reading continuum, writing continuum, reading samples, and writing samples—were used extensively for student assessment. Besides these district-wide assessments, participating classroom teachers used math homework results, math take-home records, home reading records, and science take-home checklists.

Classroom teachers' general assessments of the effects on academic achievement of reduced pupil-teacher ratio for the 1995-96 school year were 88 percent excellent and 12 percent good. For the 1994-95 school year these assessments were 60 percent excellent and 40 percent good. **Teachers reported that the students enrolled in the project for at least one full school year approached learning more confidently, exhibited high expectations for their academic performance, and were more independent and self-directed learners.**

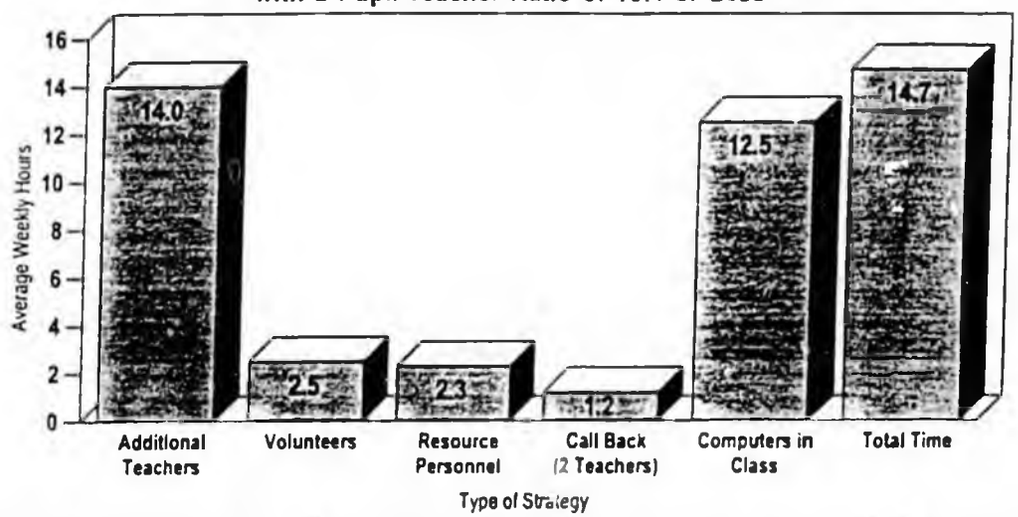
Parent surveys conducted at the end of the 1995-96 school year substantiated classroom teachers' reports of increases in academic achievement. Parents reported "strongly agreeing" 89 percent of the time that the reduced pupil-teacher ratio had a positive impact on their children's academic achievement. In a similar survey conducted at the end of the 1994-95 school year, 100 percent of parents "strongly agreed" that the reduced pupil-teacher ratio had a positive effect on learning.

All project teachers agreed that academic achievement had increased among the students in the project classes. They attributed this increase to consistent small group instruction made available by having two teachers in the classroom during core instruction time.

Goal 2: Increasing time engaged in learning as indicated by an engagement time summary

Data collected from the teachers' daily records show an average of 14.7 hours of available instruction time with a pupil-teacher ratio of 15:1 or less. Along with the co-teacher team, teachers used computers in the classroom, resource personnel, and volunteers to support and enhance the learning environment for the students. Two co-teacher teams used call-back time—a strategy where a few (3-5) students remained in the classroom after the normal school day and received additional assistance (see Figure 1).

Figure 1. Site A Average First and Second Grade Teacher Weekly Instruction Time with a Pupil-Teacher Ratio of 15:1 or Less



Note: Sometimes several strategies were used at the same time—so the sum of the strategies is greater than the total time shown with reduced PTR.

The average time with reduced PTR remained relatively consistent throughout the project. During the 1993-94 school year, teachers reported a total of 14 hours of reduced pupil-teacher ratio time (15:1 or less), and 14.7 hours during the 1994-95 school year.

Goal 3: Increasing the frequency of interaction between the student and teacher

> *Students are excited to learn something new because they know they will get the help they need to understand so they can approach the new task with a can-do type of attitude. One of us is always available to talk to kids about a problem they may have with a specific task.* **(First-grade teacher)**

> *It[co-teachers] is a wonderful idea! It allows the teachers to really get to know the children as individuals—their strengths and weaknesses—and at a very important time in their lives. What'a better way to have a positive attitude toward school! I am sorry to see the grant end.* **(Parent)**

The most significant and worthwhile feature of the co-teacher team was having time to work with individual students or very small groups on a consistent daily basis. Time on task— sustained, uninterrupted time students spent in productive learning activities—was often observed by the project evaluator. The co-teacher team encouraged the quality and frequency of this student-teacher interaction. Technology available in the classroom allowed the teachers the increased opportunity to individualize and enhance their instructional strategies to meet the needs of a broader range of learning styles.

Goal 4: Increasing students' positive attitudes and motivation to learn

This is the most important thing. If kids do not have a positive attitude about learning and thinking they can learn, they are not going to learn. The most important thing about the grant is that we are able to help with the children's attitude. (First-grade teacher)

At the end of each school year, all students attending classes participating in the project completed a survey asking for information on attitudes toward learning and school in general. The surveys were designed to show students' attitudes for the year under study, not to provide comparison from year to year; comparisons were made with students enrolled in non-grant classes. Student survey results consistently showed positive and favorable attitudes toward learning and school.

Table 1 shows students' responses to questions about their attitudes toward school and learning in 1995-96. The survey also asked students to assess their progress and to say whether they felt school was a safe place. Overall, as found in the 1993-94 and 1994-95 student surveys, favorable attitudes toward learning, school, and safety were the norm. In response to the question, "Do you like school?", 63 percent said always, 36 percent said sometimes, and 1 percent said never. To the question, "Do you like learning to do math at school?", 73 percent responded always, 21 percent sometimes, and 5 percent never. Students were also asked their favorite school activities. Twenty-seven percent cited mathematics and 14 percent reading. The one activity preferred above all others was sports and physical education, at 36 percent. Other preferred school activities included computer lab; arts and crafts; games; and music, drama, and dance.

Table 1. Site A Students' Perceptions About School, 1995-1996

	Always	Sometimes	Never	Don't Know	No Answer
Do you like school?	63%	36%	1%	0%	0%
Do you like reading at your school?	67%	28%	4%	0%	1%
Do you like doing math at your school?	73%	21%	5%	1%	0%
Do you feel your school is a safe place?	70%	2%	0%	28%	0%
Do you feel good about how you are doing at school?	64%	28%	6%	0%	2%
Do most of the kids in your class follow the rules?	23%	72%	1%	0%	4%
Number of students responding = 90					

Goal 5: Increasing parental involvement and improving the home-school communication loop

Parent participation and involvement in their children's education are valued and important components of academic success and achievement. *Elementary School Class Size Reduction Pilot Project* participants worked to involve parents in the everyday educational activities that assist a child's learning and build a positive perception of self and school. Staff engaged parents in their children's learning by encouraging them to assist with school-related activities and programs; read aloud to their children; listen to their children talk about the school day; volunteer for special events; and send their children to school fed and properly attired and with appropriate school materials. Teachers also involved parents in project-related objectives and kept them updated on the progress of the grant.

During the first year of the *Elementary School Class Size Reduction Pilot Project*, considerable attention was given to informing parents about the philosophy and goals of the grant. During year two, teachers worked on evening classes to share various educational methods and lessons for parents to use with their children at home. Throughout the final grant year, the teachers held monthly parent-child activity sessions during the noon hour. This in-school activity met with greater success than the evening sessions, because more working parents were able to take extended lunch hours to attend the sessions.

Table 2 shows the percentage of parents in 1995-96 who were aware of the project components and who felt the project had a positive impact on their children's education. A total of 89 percent reported the co-teacher as having a positive impact on their children's education. This response had remained fairly consistent throughout the three years of the project. However, parents' awareness about the effectiveness of staff development and changes in the way the curriculum was presented declined over the duration of the project. In the 1993-94 school year, 78 percent felt staff development had a positive impact and 86 percent felt the curriculum presentation had a positive impact. These ratings changed to 41 percent and 45 percent, respectively, for the 1994-95 school year, and 38 percent and 49 percent for the 1995-96 school year.

Table 2. Site A Parents' Awareness of and Involvement in the Project

Project Component	Percent Aware of Project Component	Percent of Those Aware of Project Who Feel Project Has Had a Positive Impact
Two teachers in the classroom	95%	89%
Staff development	49%	38%
Curriculum presentation	57%	49%
Parent Involvement		**Percent**
Participated in educational activities such as assisting child with homework, reading to child at home, listening to child read, helping with school-related assignments, and reading newsletters about class events and educational activities.		98%
Volunteered by assisting during field trips, working in the classroom, attending parent orientations and conferences, attending special events during the school day, or contributing to supplementary classroom supplies and materials		92%
Number of parents responding = 63		

Fifty-four percent of the parents responding to the survey had children in project classes before the start of the 1993-94 school year. Of that group, 84 percent felt the program offered to their children was better because of the *Elementary School Class Size Reduction Pilot Project* and 14 percent were undecided (see Table 3). This rating had increased 9 percent from the 1993-94 school year and decreased 4 percent from the 1994-95 school year.

Table 3. Site A Percentage of Parents with Children in the School Before the Start of the 1993-94 School Year Who Felt the Program was Better Because of the Grant

	Percent
Yes	84%
No	0%
Don't Know	14%
Number of parents responding = 34	

Parents' perceptions about the project at Site A were overwhelmingly positive. Ninety-eight percent of respondents said their children enjoyed coming to school, 97 percent knew how their children were doing at school, and 98 percent were pleased with the school's effort to communicate with them. A total of 73 percent felt that changes in the school program as a result of the grant improved their children's attitude toward school (see Table 4). These overall ratings remained consistent during the three years of project implementation.

Table 4. Site A Parents' Perceptions About the School

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	No Answer
My child enjoys coming to school.	71%	27%	0%	2%	0%	0%
The project has provided opportunities for me to get involved in my child's education.	51%	35%	14%	0%	0%	0%
Changes to the school program, as a result of the project, have improved my child's attitude toward school.	52%	21%	22%	3%	0%	2%
I feel I know how my child is doing at school.	62%	35%	3%	0%	0%	0%
I am pleased with the school's communication efforts.	60%	38%	2%	0%	0%	0%
Number of parents responding = 63						

Parent Comments About the Project

Throughout the three years of the project, positive comments of parents far exceeded negative comments. Negative comments generally referred to teachers' absences from the classroom for staff development and other project-related meetings.

The following statements are representative of parent comments about the *Elementary School Class Size Reduction Pilot Project.*

Positive

- We are so pleased with the class size pilot project and regret the thought that it may, or most likely will, end. We strongly believe that it has greatly influenced our child's attitude toward school. He has both a very positive feeling and attitude toward school. I cannot even remember when I had to talk him into going to school. He not only looks forward to going but is excited about learning. He was very fortunate to have been involved in this pilot program. It would be great if the program continued and expanded to include K-6th-grade. This would benefit so many, especially if overcrowding were a problem. As taxpayers we would be happy to support the extension of this program.
- We feel this has contributed greatly to our child's development.
- I felt the student-teacher ratio is important in that it determines the amount of direct attention each student gets in the classroom. My daughter seems to have thrived in the class size reduction project because of the additional attention she has received. She is a quiet student who otherwise may not have received much attention in a one-teacher environment.
- The 15:1 program was outstanding. Our child thrived in an environment enriched with two adults to nurture and care about her.

Negative

- The only complaint I have is the amount of substitutes used while teachers attend meetings. This is hard on the children.

Mixed

- My child has a very difficult time with transition and change, and has been negative about school since before kindergarten. I believe this program could be effective and probably is, but my child is still negative through no fault of the program.

Goal 6: Implementing a thematic curriculum designed to develop students' complete thinking skills

Our recommendation is to expect it [curriculum changes] all to take time. One cannot change overnight. Start trying new strategies; one year try to write out the lessons, then revamp them. **(Second-grade co-teachers)**

The process of implementing a thematic curriculum—an instructional approach that organizes the curriculum around a specific theme and integrates two or more subjects—requires long-term and consistent staff development and training. The co-teacher teams in the project at the close of the 1995-96 school year represented three distinctive phases of this process. Two sets of teaming partners had worked on thematic curriculum models since the 1993-94 school year. One teaming pair was involved with the curriculum changes since the 1994-95 school year and the fourth teaming pair, new to the project in 1995-96, was in the introductory phase of the changes. All participants acknowledged the importance of adequate training and time (at least three years) to understand and feel comfortable making the transition.

The co-teachers working on the first phase of implementing a thematic curriculum credited frequent interactions with other grant teachers, opportunities for observation, and staff development sessions for supporting their progress in using this approach to teaching.

The co-teachers working in the second phase of implementing the thematic curriculum reported that they still needed training and practice to sharpen their skills to successfully adjust to this type of teaching. They stressed the importance of commitment from administration, adequate planning time, and staff development to support this new approach. They were confident in this method of learning, and the recent special education endorsement of the thematic curriculum as a way to integrate special needs' students into the regular class program strengthened their commitment to this innovative approach to learning.

The co-teachers who worked on this model for three years reported being comfortable with the changes and adjusting all lessons to fit this curriculum model. They credited time for planning curriculum changes, support from administration, staff development, constant peer coaching, and interaction for their success. These co-teachers held staff development sessions on thematic curriculum for in-school and in-district staff and provided opportunities for non-project teachers to observe in their classrooms.

Goal 7: Providing extensive staff development and training to achieve the implementation and curriculum changes

I have learned so much from the people I work with. This has been the ultimate in-service. As teachers we are so isolated. Other than student teaching I have not spent any time watching others teach. Now, for the past three years, I had the opportunity to watch others teach. **(Second-grade teacher)**

I came in as a special education teacher. I have been exposed to so many wonderful opportunities and ideas I know I will never be the same teacher. The training, both formal and informal, has been such a gift to me these last two years. **(First-grade teacher)**

Staff Development

Research on the effectiveness of reduced class size indicates that smaller class size is ineffective if teachers continue to teach using strategies geared to whole-class instruction. A major grant objective for the Site A project included extensive staff development to achieve organizational and curriculum changes. Along with increasing their repertoire of effective teaching and learning strategies for small-group instruction, teachers were faced with the challenge of developing new skills for successfully changing from a traditional one-classroom, one-teacher model to a cooperative team approach to education. This new role required the teachers to develop a common philosophy of education, knowledge of teamwork, and effective communication skills.

During the 1994-95 school year, the co-teacher teams received training in the integration and implementation of a thematic curriculum model designed to develop students' critical thinking skills and different ways of learning techniques for assessing, validating, and evaluating what students learned; team-building skills and applied communication techniques; and ongoing training opportunities in relevant areas.

The focus of staff development for the final grant year included increasing project teachers' understanding and use of thematic curriculum in all subject areas following Gardner's *Theory of Intelligences*. The project supported workshops, conferences, and contracts with specialists to work with the staff development component.

A sample of seminars and workshops held to support project goals at Site A include the following:

Workshops/Seminars

- Team Building
- Goal Setting
- Grant Documentation
- Communication Building
- Student-led Conferences
- Thematic Curriculum Development
- Life Styles Inventory
- Transformation of Elementary Schools into a "Community Environment"
- Multiple Intelligences
- Computing for Educators
- *Early Reading and Writing Strategies*
- Multi-age Instruction
- In-service on Gardner's *Theory of Intelligences*
- District In-service: teachers presented thematic assessment and instruction for beginning readers

National and State Conferences

National Conference for Teachers in Mathematics

- National Conference for Teachers in English
- National Association of Education for Young Children
- 1994 Alaska Staff Development Network Summer Academy
- Alaska State Reading Conference
- Alaska State Math and Science Conference
- District Inservice: teachers presented thematic curriculum and integrating assessment and instruction for beginning readers

Staff Meetings

Project team participants met one-half day per month to plan and write topical units based on the selected thematic goals. Additionally, all four teams met one full day per month to discuss and evaluate progress toward grant-related objectives and to revise plans for implementation as needed.

2. What instructional innovation in reading and mathematics is Site A using along with class size reduction?

All classes in the project used a variety of teaching strategies throughout the school week. Teaching strategies documented in weekly logs and observed by the evaluator included guided practice, computer-assisted instruction, cooperative learning, whole- and small-group instruction, peer tutoring, learning centers, independent work, and cross-age tutoring. The last strategy provided younger students the opportunity to work one-on-one with students from the upper-grades.

4. What roles do parents, volunteers, tutors, and technology play in instruction?

Parent/Volunteer Involvement

While parent volunteers were not given major emphasis at Site A, a significant number of parents did volunteer in the classroom. Depending on teacher preferences and student needs, volunteer activities ranged from clerical duties to working with individual and small groups of students in the classroom.

Data collected from the teachers' weekly records show an average of 3.4 parents spending approximately 70 minutes volunteering in the classroom. This does not take into account special events where large numbers of parents were available for assistance for longer periods—but it does include reading to students; listening to students read; working with individuals and small groups; helping with special projects and reading, writing, and mathematics enrichment activities; participating in an at-home reading program; and other academic and general classroom support. During the 1994-95 school year, there was an increase of 4 parents spending the same amount of time in classrooms per week.

During the 10-week data collection period, the majority of volunteers received a rating of good to excellent for the quality of their work in the classroom.

Tutors

No title programs are available at this school site. Special service personnel were available to assist select children with Individual Educational Plans (IEPs). In some classrooms, the special service personnel worked with the assigned child in small groups. During this time, they focused most of their attention on the special needs child and indirectly assisted the other students in the group. In other classes, special service personnel remained relatively isolated from the class and provided assistance to the special needs child on a one-on-one basis.

Technology

New hardware and software were added to the project for the 1994-95 and 1995-96 school years. Although not a primary component of the project, and one that did not have an effect on the pupil-teacher ratio, technology use increased in these classrooms. Computer centers were used as instructional learning centers and provided skill and drill work and enrichment activities. Teachers report some at-risk students as being very responsive to learning with computers, and the teachers appreciate technology as an additional instructional aid.

5. How did the class size reduction and the instructional innovations affect measured language arts and mathematics achievement?

Comparative Data on Student Achievement

One of the principal goals of the *Elementary School Class Size Reduction Pilot Project* was to improve student learning in math and language arts. Since students presumably learn in virtually any school program, the relevant question is whether the rate of student learning under each school's project was higher than it would have been had the project changes not been made.

We cannot know how much students in the *Elementary School Class Size Reduction Pilot Project* would have learned if they had not been in a project classroom. Our best sources of comparison are students in other classrooms or other schools. Yet these students may also have benefited from other, unmeasured instructional innovations. Other students might also differ from project students in ways that cause them to learn at different rates, or they might begin their formal schooling at different levels of knowledge. Whatever comparison groups we use, then, will be imperfect. We think the best

comparison group to use is other students in the United States. We wanted to see if students in the *Elementary School Class Size Reduction Pilot Project* improved their level of academic achievement over time, relative to other students in the United States.

To compare the academic achievement of project students with U.S. students, we used individually administered norm-referenced and diagnostic tests for students in kindergarten, first, and second grade. The two tests used to determine academic achievement are:

Peabody Picture Vocabulary Test (PPVT)	These individually administered norm-referenced tests are designed primarily to measure a subject's receptive (hearing) vocabulary for Standard American English. The test provides an estimate of a student's verbal ability, and in this sense it is an achievement test since it shows the extent of English vocabulary acquisition.
KeyMath	These are individually administered diagnostic inventories of essential mathematics designed to provide a comprehensive assessment of a student's understanding of basic concepts and application of mathematics. Basic concepts assesses the foundation of knowledge upon which all of elementary mathematics is based. Applications assesses the use of knowledge and computational skills.

The Peabody Picture Vocabulary Test (PPVT) and KeyMath assessments were selected by consensus of the project coordinators, the project evaluator, and the Department of Education. Both tests are regarded as appropriate for providing a general overview of primary students' academic achievement in language and mathematics. The Iowa Test of Basic Skills (ITBS) was considered inappropriate for Site A, since the project did not go beyond the second grade.

The State of Alaska reports statewide and district testing results in terms of national percentile ranks. We used national percentile ranks and grade equivalent to measure the KeyMath results of project students relative to all U.S. students. We used percentile rank as a measure of academic achievement for students taking the PPVT. We tracked the math and language arts achievement of individual students in each project school. An analysis of academic growth as measured by these tests for all students and for at-risk students, where numbers of students are sufficient, are analyzed separately. At-risk students are identified as having increased probability for school failure or learning problems by reason of socio-economic factors (qualify for free or reduced-price lunch), special education certification, Chapter One (remedial services in reading and mathematics), or English as a Second Language.
A description of these methods of reporting test results follows.

National Percentile Rank	Indicating the percentage of students taking the test nationally who scored lower on the test than the individual student.
Grade Equivalent	Indicating the year and month of schooling of students nationally that corresponds with the student's test performance. By comparing the student's actual grade level (e.g. 4.2 years) with the grade equivalent (e.g. 4.6 years) it is possible to tell if the student is learning at a faster, or slower, or similar rate as students in the U.S. as a whole.

Five classroom teachers and four part-time co-teachers with approximately 125 students participated in the project to reduce the pupil-teacher ratio and implement the instructional changes during the 1993-95 school years. Four classroom teachers and four co-teachers with approximately 100 students

participated in the project during the 1995-96 school year. Students in kindergarten, first, and second grades were given individually administered norm-referenced and diagnostic tests in the Fall of 1994 and Spring of 1995 and 1996. Classroom teachers administered and scored the tests and ISER performed the analysis of these test results. Grade cohort represents the year of school the student was in during the 1993-94 school year. Thus, in the 1995-96 school year, the kindergarten cohort students were in the second grade.

Test results should be interpreted with caution. The period of time between administration of pre- and post-tests for the KeyMath and PPVT is 18 months, a relatively short period to draw conclusions about the impact of the project.

National percentile rank, an average for students taking the test nationally, increased for kindergarten, first, and second graders at Site A in Spring 1995. The national percentile rank for the kindergarten cohort increased 31 percent for basic concepts and 34 percent for applications from Fall 1994 to Spring 1996. (See Table 6.)

Table 6. Site A KeyMath National Percentile All Students

Key Math			NATIONAL PERCENTILE					
			Basic Concepts			Applications		
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95	Spring 96	Fall 94	Spring 95	Spring 96
Site A	K	46	56		87	58		92
	1	53	49	89		61	93	
	2	26	58	82		65	92	

Table 7 shows the National Percentile Rank for at-risk students in kindergarten, first, and second grade at Site A. Results show an increase in the percentile rank for all three grades from Fall 1994 to Spring 1995. The number of students remaining in the at-risk cohort for the 1995-96 school year was insufficient to include in the final analysis of academic achievement.

Table 7. Site A KeyMath National Percentile At-Risk Students

Key Math			NATIONAL PERCENTILE			
			Basic Concepts		Applications	
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95	Fall 94	Spring 95
Site A	K	8	46	64	32	55
	1	12	13	63	27	80
	2	10	62	86	67	92

All students at Site A demonstrated an increase in grade equivalent. The mean change for the kindergarten cohort from Fall 1994 to Spring 1996 in basic concepts was two years, four months; the mean change from Fall 1994 to Spring 1995 for the first grade cohort, one year, seven months; and for the second grade cohort, one year, six months. In applications the mean change for the kindergarten cohort from Fall 1994 to Spring 1996 was two years; seven months. The mean change from Fall 1994 to Spring 1995 for the first grade cohort was, one year, seven months; and for the second grade cohort, two years, one month. (See Table 8.)

Table 8. Site A KeyMath Grade Equivalent All Students

Key Math			GRADE EQUIVALENT							
			Basic Concepts				Applications			
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95	Spring 96	Mean Change	Fall 94	Spring 95	Spring 96	Mean Change
Site A	K	43	.3		2.8	2.4	.1		2.9	2.7
	1	45	1.2	2.9		1.7	1.3	3.0		1.7
	2	21	2.1	3.8		1.6	2.5	4.6		2.1

At-risk students in all participating grades at Site A increased an average of one year, one month in grade level on basic concepts and one year, four months on applications from Fall 1994 to Spring 1995. The number of students remaining in the at-risk cohort for the 1995-96 school year was insufficient to include in the final analysis of academic achievement. (See Table 9.)

Table 9. Change in Grade Equivalent, Site A KeyMath At-Risk Students, Fall 1994-Spring 1995

Key Math		GRADE EQUIVALENT	
		Basic Concepts	Applications
School	No. Students Tested	Mean Change	Mean Change
Site A	43	1.1	1.4

Table 10 shows the National Percentile Rank of KeyMath test results for kindergarten, first, and second grade cohorts. Results show the percentile rank has increased for all three grades. For the kindergarten cohort the percentile rank increased 32 points from Fall 1994 to Spring 1996.

Table 10. Site A PPVT Percentile Rank All Students

PPVT			PERCENTILE RANK		
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95	Spring 96
Site A	K	46	45		77
	1	52	52	68	
	2	26	42	62	

All at-risk students at Site A demonstrated an increase in national percentile rank from Fall 1994 to Spring 1995. The number of students remaining in the at-risk cohort for the 1995-96 school year was insufficient to include in the final analysis of academic achievement. (See Table 11.)

Table 11. Site A PPVT Percentile Rank At- Risk Students

PPVT			PERCENTILE RANK	
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95
Site A	K	9	16	34
	1	11	17	22
	2	10	34	62

We made the following assumptions in calculating the mean program cost per classroom for Site A:

- The cost of hiring a part-time grant administrator was considered a project and not a program cost.
- Once the program was established, staff development would occur only as new staff was hired. The project had a 40% turnover rate during its three years of operation. Therefore, those expenditures providing for staff development—substitutes/temporaries, professional/technical services, and travel—were calculated at a 40% rate.
- Capital equipment or computer purchases were assumed to have a use-life of eight years.

SUMMARY

Teachers' weekly records reporting on students' academic achievement and behavior, classroom climate, and teacher satisfaction with the project since the start of the 1993-94 school year describe the positive benefits of having an additional teacher in the classroom during core instruction time and the accompanying curriculum changes.

All participating teachers reported being very satisfied with the support provided by the grant and encouraged by the behavior and academic outcomes observed in the students. Class behavior during periods of instruction with one teacher and with two teachers was rated as good to excellent, and class climate was rated as excellent during periods of both one-teacher and two-teacher sessions. Academic achievement was reported as excellent during periods of reduced class size. Parents reported being pleased with the project, believing their children are receiving a quality education, and seeing the changes as benefiting their children's reading, language arts, and mathematics skills.

Two of the strategies used to achieve the *Elementary School Class Size Reduction Pilot Project*—lowering the pupil teacher ratio and changing the organization and delivery of instruction—were successful at this site. The third strategy—creating highly trained co-teacher teams with broadened expertise and perspective—proved to be problematic due to frequent staffing changes.

Teachers feel that teaming partners cannot be appointed but instead must be teachers interested in making a commitment to changing their approach to teaching. Teachers assigned to a teaming partner without subsequent consideration could be problematic, and contract requirements, personnel issues, and personal issues need to be considered in designing a formal selection process.

Major benefits of the project over the past three years were opportunities for professional development; increased parent support and involvement in their children's education; accelerated attention to potentially disruptive behaviors; increased student-teacher contact time and time on task; and more in-depth instruction, assessment, and evaluation for education practices and student needs. Negative consequences of the project included the amount of teacher time away from the class for professional development, extra planning time associated with the change, the potential for mismatch of teaming partners, and internal personnel problems associated with unequal distribution of resources.

The original goal of the project—to change the one-class, one-room, one-teacher model into a collaborative teaching arrangement with two professionals sharing the responsibilities of the classroom—proved to be an effective and rewarding approach to educational innovation.

Additional responsibilities of the volunteer coordinator included:

- Working with the community, assisting with short-term family needs
- Establishing a child-care sharing network among parents
- Setting up a *Parent Room* so parents, not working in the classroom, could take younger siblings to the school
- Providing weekly reports of school news to the local newspaper

PROJECT OUTCOMES

This segment of the report answers seven research questions proposed by the Alaska Department of Education at the start of the *Elementary School Class Size Reduction Pilot Project.* In preparing this section we used project documentation and evaluation activities completed between Fall 1993 and Spring 1996; they show outcomes of the project on student academic achievement and attitude, school climate and discipline, teacher innovation, and parent involvement.

1. Did the program at Site B meet its class size goals?

Goal 1: Increase the use of teachers working in teams to facilitate classroom grouping and facility sharing

For sure, this has worked at this school. Teachers work together with class grouping, sharing material, lessons, and much professional expertise. This has been a positive aspect of the grant for this school. While this has been present before, the grant has encouraged a lot more of it. **(Second-grade teacher)**

It has been invaluable for me as a teacher to watch someone teach and have someone watch me teach and give me feedback. **(Second-grade teacher)**

The team approach to education was evident in sharing of facilities and instructional resources and in meetings at grade levels to plan and coordinate school and district curriculum criteria and effectively use available materials to support the classroom activities. Classroom teachers had the option of team teaching or using parallel block scheduling (split specials) to provide for periods of reduced PTR during reading, mathematics, and language arts instruction. The teachers electing the teaming approach sent their whole class to the specials (gym, library, and music) while they went to another classroom to reduce PTR during core instruction time.

At the kindergarten level, the classes were either self-contained, using a team-teaching approach to reduced PTR, or split, using the block scheduling model. Both teaching situations also used call-back time (where each student remains more than one hour per week after regular dismissal time for additional assistance and enrichment on reading and math), special service personnel, and volunteers to support conditions for small-group instruction. The team approach to education carried over in the relationship classroom teachers developed with the special service and support personnel. The attention to planning and sharing resources so that the special needs students received services in the classroom helped to avoid labeling and enabled the teacher to have another professional in the class during core instruction time. However, in some cases the pull-out approach to special needs students was applied, especially if the child required a more restricted learning environment.

The collaborators and special service personnel worked well together but were often overwhelmed with the additional planning time necessary to coordinate lessons with the classroom teacher. To maintain this highly effective use of staff expertise after the grant and to reduce the planning time, a cluster of

special needs students will be placed in a few rooms, thereby enabling the teachers to coordinate lessons more effectively.

Goal 2: Using collaborators to work with teachers or teams of teachers to directly reduce the pupil-teacher ratio (PTR) during critical instruction periods

I taught kindergarten two of the three years of the grant, so I had only one year of collaborators. It was a dynamic time. While the collaborator was in the room we also had parents helping with the centers. During this time we did small reading groups 4 days per week for 1 hour per day. It was a highly effective use of class time. **(Kindergarten teacher)**

The collaborator model, floating teachers, is great. They are there every day, they develop that important relationship with the children, and they are able to assess the students' progress and make necessary changes as needed. **(Second-grade teacher)**

Classroom teachers in the first and second grades unanimously agreed that the collaborator/teacher model was an effective way to reduce the pupil-teacher ratio. The benefit of having the same teacher in the room on a regularly scheduled basis, with coordinated lesson plans, was invaluable for the regular classroom teacher, who was able to share instruction strategies and assessments of children's progress. The teachers appreciated the second perspective, especially coming from experienced, familiar, and highly respected colleagues.

Planning time was the most significant disadvantage of the strategy. To be truly effective, the collaborator felt she had to cooperatively plan with the classroom teacher on a weekly basis. For the collaborator, this was a scheduling nightmare, and more often than not planning took place long after the normal school day and on weekends. If the planning time did not happen and the collaborator used pre-planned lessons from the teacher, the opportunity for collegial interaction was missing and the integrity of the strategy was compromised.

Some benefits reported by the classroom teachers of having collaborators in the classroom include:

- Mixing the groups (ability, random, mixed) throughout the year allowed students to help and learn from each other
- Using more developmentally appropriate, hands-on activities with students
- Increasing student integration of arts in the curriculum by having a collaborator, the music teacher, work with students on literature, drama, writing, and reading in small groups to develop language and writing skills
- Increasing the interaction of teachers in and across-grade levels

Goal 3: Implementing parallel block scheduling to reduce pupil-teacher ratio during reading, writing, and mathematics

PBS has been a lifesaver. It will be the one thing I will miss most after the grant. I have six children with ADHD in this class and there is no way I can handle difficult situations unless I separate these students. I do not know if this is a unique class but the number of children with high needs seem to be increasing. Out of 25 students in the class, 17 are on free or reduced-price lunch. **(Second-grade teacher)**

The most effective thing we did in the whole grant. This was a tried and true strategy; day in and day out it gave us a consistent period of small group time. This has been particularly important this year because so many of the kindergarten students have special needs and are very low in language skills. **(Kindergarten teacher)**

Parallel Block Scheduling (PBS) allowed teachers to work with half of their students while the other half received instruction from specialists in music, physical education, library, or computers. The ratio of students to instructors (12:1) was further reduced (6:1) by using collaborators, volunteers, and special service personnel, who were available on a regular basis to assist teachers during this instruction time. The music, physical education, and library teachers did not directly benefit from the project. However, while they were essential in creating opportunities to schedule the split sessions, they expressed concerns over teaching the combined classes—including adjusting to different groups of children, classes not arriving at the same time, and difficulty in maintaining continuity in more structured lessons. Those who teach special subjects agreed that split classes were very helpful to the classroom teachers and to the overall academic achievement of the students. They said they planned to continue with such classes and to explore alternate schedules.

The teachers felt the time with one-half the class or teaming with a second teacher was invaluable for the academic and social needs of these primary students. While they considered PBS the best strategy of the project, they saw the remaining problem as the extra time commitment and accompanying scheduling problems necessary to make it work effectively.

PBS is the one strategy teachers felt could be implemented at any school—but it would require staff commitment and a coordinated class schedule. At this site, extra lunch-duty aides allowed teachers the planning time required under contract. While this time was not sufficient, it did alleviate major scheduling problems.

Goal 4: Increasing the use of parents volunteers in the classroom

They are very important. To have gotten the kids in my class to where they are now academically could not have happened without the parents. The students' self-esteem is great when they see their parents working in the classroom. I see the volunteer component benefiting both parents and children. (Kindergarten teacher)

The volunteer program will be successful as long as someone is around to coordinate it, someone with the personality to get people involved. (First-grade teacher)

The major focus of the volunteer program was developing a training program for parents and community members and making connections to assist with recruiting individuals from the education and business community. Some early, unanticipated successes were connections made with the local college and high school. Tapping these two community resources benefited the school and students alike. Their attendance was more consistent since they were required to attend the volunteer session, and the classroom experience broadened their understanding of careers in education.

The volunteer program at Site B demonstrated what a well-coordinated program can accomplish. Their results showed that if a school wants to increase parent participation, it must be willing to welcome parents and community members and prepare them for their new role in education. Also, the school must be cognizant of the fact that parent-teacher conflicts will surface from time to time.

Data collected from the teachers' weekly logs showed an average of 4 parent or community volunteers spending 70 minutes per week working in the classroom. This does not take into account special events or general and clerical classroom support but includes small group instruction in language arts, mathematics, reading and writing; supervising whole-class and small-group work; tutoring; assisting in the computer centers; publishing student work and assisting with weekly newsletters; cooking; and supervising learning centers. During the 1994-95 school year, an average of 6 parent and community volunteers per week spent an average of 60 minutes volunteering in the classroom.

During the data collection period, volunteers overwhelmingly received a rating of excellent for the quality of their work in the classroom.

Goal 5: Using computers to individualize learning and reduce the pupil-teacher ratio

The first year was not effective. We are just now getting started. I do not know enough about computers myself and initially questioned whether we should be using them in the primary grades, but the kids love them and the technology specialist has done a magnificent job. (Kindergarten teacher)

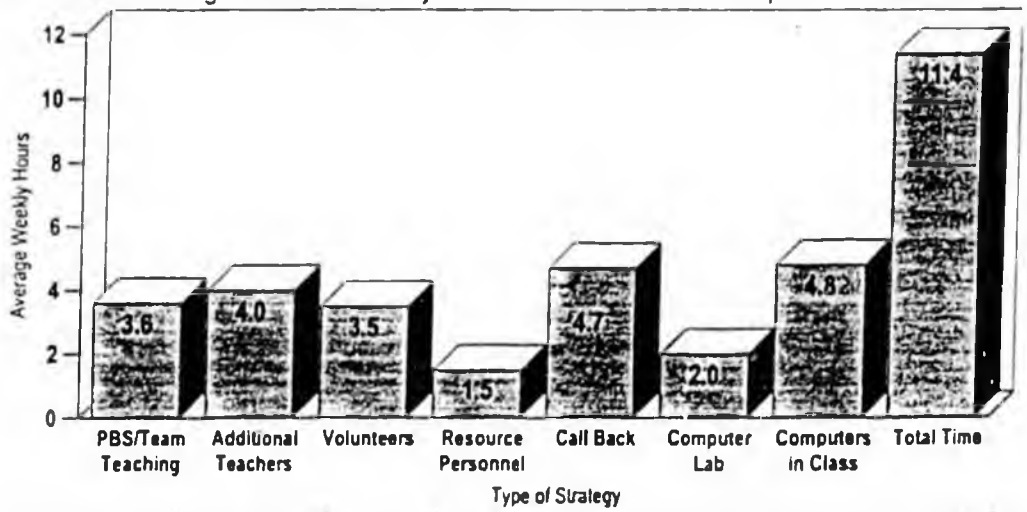
Technology was a secondary component of the project at Site B during the 1993-94 school year. Seven new computers were available for classroom use on a rotating basis. Due to the limited numbers, scheduling concerns, and many teachers' unfamiliarity with computer use, success was constrained. At the start of the 1994-95 school year each teacher received one new computer for his or her classroom, additional age-appropriate software was available for use, and a computer lab aide was hired. Still, this component of the grant was not a preference among the majority of teachers. Progress was slow and many teachers did not hold increased use of technology as a high priority for the primary grades.

In the final grant year, the staff decided to attend to this component of the grant. A classroom teacher took on the role of technology specialist, set up a new computer lab, and provided additional parallel block time for the classroom teachers. Once a month the technology specialist required the classroom teachers to accompany their classes to the lab so they would have the opportunity to see what the students were learning and to observe first hand how to use technology with young students. The component was very successful in the 1995-96 year. The technology specialist designed a curriculum for the school and provided many formal and informal in-service training sessions for teachers on the use of technology. While still in the early stages of increasing technology across the curriculum, the staff at Site B made tremendous progress with technology in the final grant year.

Reducing the Pupil-Teacher Ratio

Data collected from the teachers' daily records show an average of 11.4 hours of available instruction time with a pupil-teacher ratio of 15:1 or less during the 1995-96 school year. This represents an increase of 2.3 hours from the 1994-95 school year. Besides the extra teachers in the classroom (collaborators and special service personnel), teachers at Site B used call-back time (kindergarten only), computers in the classroom, computer lab, and volunteers to support and enhance the learning environment for the students (see Figure 4).

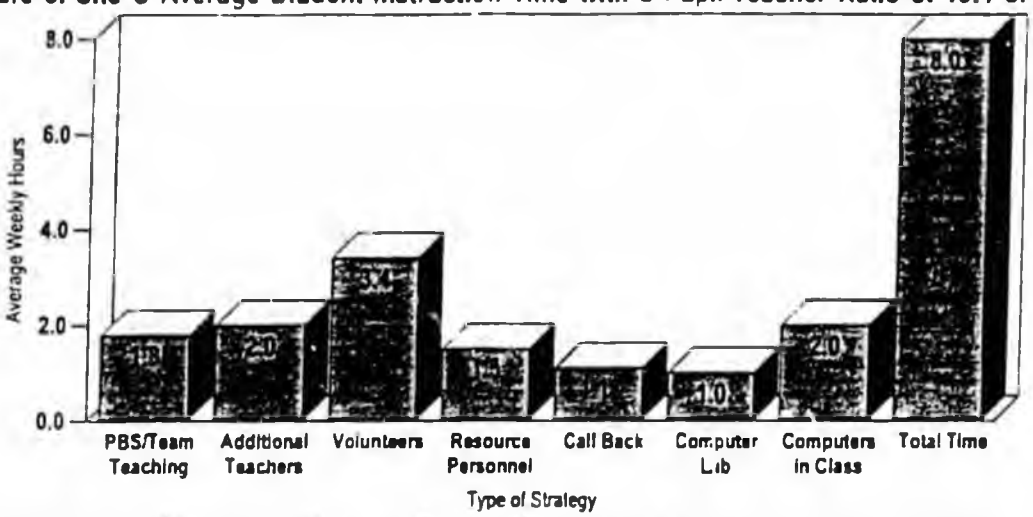
Figure 4. Site B Average Teacher Weekly Instruction Time with a Pupil-Teacher Ratio of 15:1 or Less



Note: There are times when multiple strategies are taking place. As a result, the sum of the strategies is greater than the total time shown with reduced PTR.

The teachers' daily records allow us to make an estimate of time the average student spent in reduced size classes in 1995-96. As Figure 5 shows, an average student at Site B had approximately 8 hours per week of small-group instruction time.

Figure 5. Site C Average Student Instruction Time with a Pupil-Teacher Ratio of 15:1 or Less



Note: There are times when multiple strategies are taking place. As a result, the sum of the strategies is greater than the total time shown with reduced PTR.

Goal 6: Improving home-school communication

> *The home-school link has been a strong part of [this school's] grant. More parents are in the building, and they [appear to be] more comfortable working and visiting in the school. We have in-service training on parent meetings to help create and build that relationship.* (First-grade teacher)

> *If letters do not get home parents now call to find out what happened. The parents feel much freer to walk into the building and start helping the teacher. It appears so many know what is going on in the school. While I always sent home a newsletter, I never had parents calling to ask if their child did not bring it home or if something in the letter was not clear. I know they are interested in what is going on in their child's classroom.* (Second-grade teacher)

The parent volunteer coordinator credits the openness and receptive nature of the teaching staff and the training component as most significant factors in improving home-school communication. The benefits were far-reaching as parents who participated in the school became its advocates in the community and students' self-esteem increased as they watched their parents working with their teachers. Teachers and administrators must recognize that parents can initially be reluctant or even fearful about coming into a school and will appreciate the offer of training and a welcoming reception.

Table 15 shows the percentage of parents who were aware of the project components and who felt the project had a positive impact on their children's education. A total of 87 percent reported the computer-assisted instruction as having a positive impact on their children's education, followed by 70 percent for the volunteers and 63 percent for team teaching. Fifty percent reported assisting their children's teacher with school activities. These figures remained relatively consistent throughout the grant. The major change was in the area of computer use where, for the 1994-95 school year, only 55 percent were aware of computer use at school and 58 percent felt computers had a positive impact on the school. The increase in student use this final grant year was a major reason for this change.

Table 15. Site B Parents' Awareness of and Involvement in the Project

Project Component	Percent Aware of Project Component	Percent of Those Aware of Project Who Feel Project Has Had Positive Impact
Team teaching	73%	63%
Collaborators with teachers	57%	46%
Split specials	59%	58%
Volunteers	80%	70%
Computer-assisted instruction	92%	87%
Parent Involvement		**Percent**
Volunteered to work with students in the classroom		42%
Assisted child's teachers and/or participated in PTA-related activities		50%
Received Volunteer Training		22%
Feel comfortable in role as volunteer.		94%
Number of parents responding = 143		

Thirty-six percent of the parents responding to the survey had children attend Site B before the start of the *Elementary School Class Size Reduction Pilot Project*. Of this group, 59 percent felt that the program offered to their child was better in 1995-96 because of the project; 35 percent were undecided (see Table 16).

Table16. Site B Percent of Parents with Child in a Non-Grant Class During the 1993-94 School Year Who Feel the Program is Better Because of the Grant

	Percent
Yes	59%
No	1%
Don't Know	35%
Number of parents responding = 52	

Parent Comments

The following is a representative list of parents' comments on the *Elementary School Class Size Reduction Pilot Project*:

Positive

- Anything that brings the teacher/pupil ratio closer to one is a benefit to the kids.
- It is my opinion that smaller class size benefits both the teacher and student academically, psychologically, and emotionally.
- I have been very pleased with the project impact. My child is able to read at his own speed and can progress as quickly or slowly as he is able. This is due solely to having an adult listen to him individually every day. That would not be possible without the project.
- My child is very excited about school and I feel this is due to the programs [Site B] has with the grant. I feel the volunteer coordinator is extremely effective and important. She has made it possible to get parent volunteers to come in and become involved at their child's school. I feel this is a very important part of a child's academic career. To have their parents involved and knowing what is going on at school is a huge advantage. I am impressed with [Site B]!

- I feel it is a good program. The children are less easily distracted and respond positively to the special attention time provided them. I am sorry this is the last year of the project.
- Splitting the classes into smaller groups whenever possible is very beneficial to the kids. I love being able to assist in the classroom. The computer time and Internet for the kids are great! This school needs an art class all year long!
- As a former teacher, I have been in quite a few elementary schools. Site B definitely stands out as the best I have ever seen. The use of collaborators, volunteers, and split specials really benefits the children. Smaller class size as well as more adults per child assures all children will receive the attention and instruction they need. Site B is #1 in my book!
- I have enjoyed the opportunity to help in my child's class. The training set me at ease and the teachers are very encouraging to the parents.

Negative

- I do not get this class size project? Class sizes have not decreased at all! I see an increase. As for all this class size project all I see is a greater need for volunteers. The way classrooms are working it seems too much is going on for one teacher to teach.

Parent Survey Results

Parents described their perceptions about Site B as positive. Ninety-six percent of respondents said their children enjoy school; 98 percent knew how their children were doing at school; 94 percent were pleased with the school's effort to communicate with them; 75 percent felt the project provided opportunities for them to be involved in their children's education; and 60 percent said the changes made in the school program as a result of the grant improved their children's attitude toward school (Table 17). For all three years of the project, more than 90 percent of parents agreed with the statements, "My child enjoys coming to school," "I know how my child is doing at school," and "I am pleased with the school's communication efforts."

Table 17. Site B Parents' Perceptions About the School

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree	No Answer
My child enjoys coming to school.	62%	34%	3%	0%	0%	1%
The project has provided opportunities for me to get involved in my child's education.	41%	34%	18%	3%	3%	1%
Changes to the school program, as a result of the project, have improved my child's attitude toward school.	32%	28%	34%	1%	1%	4%
I feel I know how my child is doing at school.	64%	34%	1%	0%	1%	0%
I am pleased with the school's communication efforts.	55%	39%	5%	1%	0%	0%
Number of parents responding = 143						

Goal 7: Provide training in the arts for students, staff, and parents.

The initial plan called for a collaborator/arts and humanities coordinator. This coordinator would have been scheduled 4 days per week to work with all kindergarten teachers during language arts, reading, and mathematics instruction time and one day per week planning the arts/humanities curriculum. This goal was dropped after the first year due to budgetary restrictions. However, the commitment to the arts and humanities remained strong with this group of teachers, and they continued to promote this component of the grant.

During the 1994-95 and 1995-96 school years, staff development opportunities were available to assist teachers with integrating arts and humanities into the everyday curriculum. Teachers who attended conferences, often at their own expense, shared the training and ideas informally and during staff development days. Two examples of training sessions they attended include celebration of culture (a week-long multicultural event) and an Orff music institute promoting an instructional methodology emphasizing the integration of music, language arts, mathematics, and movement for primary students. The music te her at this site was the primary force behind this methodology and served as a formal and informal resource for staff.

The humanities' coordinator joined the staff as a part-time kindergarten teacher in 1995-96 and, like the music teacher, served as an informal resource person promoting the integration of the arts throughout the curriculum.

2. What instructional innovations in reading and mathematics are schools using along with class size reduction?

Instructional innovation at Site B emphasized increased use of developmentally appropriate experiences for small groups and one-on-one instruction when needed. Learning centers increased and were most frequently staffed by volunteers in the classroom. Teachers reported that without additional adult assistance, the centers were not as effective. With adult assistance they were able to integrate the subject areas and include more complex lessons requiring critical thinking skills.

Many teachers improved their approaches to reading—for example, the book immersion program, in which students were divided into three groups and the teacher rotated around the groups and listened to each child read one book. The children then took turns reading to the other students in their group. By the end of the week, the had all read aloud a minimum of six to seven books, and teachers reported they understand what they read. The teachers could not have effectively accomplished this strategy with the whole class.

All classes in the project used a variety of teaching strategies throughout the day. Teaching strategie documented in weekly logs and observed by the evaluator included guided practice, team-teaching, computer-assisted instruction, cooperative learning, whole- and small-group instruction, peer tutoring, learning centers, and independent work (see Table 18).

All participants emphasized small group instruction, often with a PTR of 6:1 or less. Data from teachers' weekly logs show the strategies used and the number of weeks they were used (Table 18).

Training video tapes were made available for parents to check out and view at home. Weekly newsletters were also produced for volunteers. Monthly meetings were scheduled so all volunteers could get together.

During the final grant year, volunteer training was available for new community members and parents wanting to work with students. The parent volunteer coordinator organized room representatives for all classroom teachers. These parents assisted with planning classroom events and scheduling volunteers. All volunteers attended a training session before they worked in the school. Administrators and teachers felt this requirement improved the overall performance of volunteers and helped acquaint parents with the rules and culture of the school.

4. What roles do parents, volunteers, tutors, and technology play in instruction?

Parents and Community Volunteers: (Refer to Question 1, Goal 4)

Tutors: (Refer to Question 1, Goal 1)

Technology: (Refer to Question 1, Goal 5)

5. How do the class size reduction and the instructional innovations affect measured language arts and mathematics achievement?

Comparative Data on Student Achievement

One of the principal goals of the *Elementary School Class Size Reduction Pilot Project* was improving student learning in math and language arts. Since students presumably learn in virtually any school program, the relevant question is whether the rate of student learning under each school's project is higher than it would have been, had the project changes not been made.

We cannot know how much students in the *Elementary School Class Size Reduction Pilot Project* would have learned, had they not been in project classrooms. Our best sources of comparison are students in other classrooms or other schools. Yet these students may benefit from other, unmeasured instructional innovations. Other students might also differ from project students in ways that cause them to learn at different rates, or they might begin their formal schooling at different levels of knowledge. Whatever comparison groups we use, then, will be imperfect. We think the best comparison group to use is other students in the United States. We wanted to see if students in the *Elementary School Class Size Reduction Pilot Project* improved their level of academic achievement over time, relative to other students in the United States.

To compare the academic achievement of project students with all U.S. students, we used tests of achievement that are applied nationally for students in second grade and individually administered norm-referenced and diagnostic tests for students in kindergarten and first grade. The three tests used to determine academic achievement include:

Iowa Tests of Basic Skills (ITBS)	These multiple choice tests are the most widely used measures of academic achievement in math and language arts. It is possible to compare individual student scores with the distribution of scores nationally.
Peabody Picture Vocabulary Test (PPVT)	These individually administered norm-referenced tests are designed primarily to measure a subject's receptive (hearing) vocabulary for Standard American English. The test provides an estimate of a student's verbal ability, and in this sense it is an achievement test since it shows the extent of English vocabulary acquisition.

KeyMath — These are individually administered diagnostic inventories of essential mathematics designed to provide a comprehensive assessment of a student's understanding of basic concepts and application of mathematics. Basic concepts assesses the foundation of knowledge on which elementary mathematics is based. Applications assesses the use of knowledge and computational skills.

The Iowa Tests of Basic Skills is a measure of student achievement. The major advantage of the Iowa Test of Basic Skills is that it is the most widely used measure of academic achievement in language arts and mathematics. With these multiple choice tests, it is possible to compare individual student's scores with the distribution of scores nationally. However, the ITBS was administered only to second graders; it was considered inappropriate for kindergartners and first graders.

The Peabody Picture Vocabulary Test (PPVT) and KeyMath assessments were selected by consensus of the project coordinators, the project evaluator, and the Department of Education. Both tests are regarded as appropriate for providing a general overview of primary students' academic achievement in language and mathematics.

To provide a baseline measure of student achievement, we worked with the school district to arrange for project students in second grade to take the Iowa Test of Basic Skills (Form K) in October 1993 and another version of the test in April 1994 and 1995 and Winter 1996. The producers of the test, Riverside Publishing, scored the results and provided data tapes for analysis. This report provides a comparison of achievement of the students who took the Fall 1993 tests and Winter 1996 tests.

Students in kindergarten and first grade were given individually administered norm-referenced and diagnostic tests in the Fall of 1994 and Spring of 1995 and 1996. Classroom teachers administered and scored the tests and ISER performed the analysis of these test results.

The State of Alaska reports statewide and district testing results in terms of national percentile ranks. We used national percentile ranks and grade equivalent to measure the ITBS and KeyMath results of project students relative to all U.S. students. We used percentile rank as a measure of academic achievement for students taking the PPVT. We tracked the math and language arts achievement of individual students in each project school. An analysis of academic growth as measured by these tests for all students—and at-risk students, where numbers of students were sufficient—were analyzed separately. [At-risk students are those identified as having increased probability for school failure or learning problems by reason of socio-economic factors (qualify for free or reduced-price lunch), special education certification, Chapter One (remedial services in reading and mathematics), or English as a Second Language.] A description of these methods of reporting test results follows.

National Percentile Rank — Indicating the percentage of students taking the test nationally who scored lower on the test than the individual student.

Grade Equivalent — Indicating the year and month of schooling of students nationally that corresponds with the student's test performance. By comparing the student's actual grade level (e.g., 4.2 years) with the grade equivalent (e.g., 4.6 years) it is possible to tell if the student is learning faster or slower than students in the U.S. as a whole.

All kindergarten, first, and second grade students at Site B participated in the *Elementary School Class Size Reduction Pilot Project.* Students in kindergarten and first grade were tested using Peabody Picture Vocabulary Test (PPVT) and KeyMath assessments in Fall 1994 and Spring 1995. These same students were given the Iowa Test of Basic Skills (ITBS) in the Spring of 1996, when they reached

second grade—but we have no additional ITBS scores to allow an analysis of changes over time for those students.

Second grade students were tested using the Iowa Test of Basic Skills (ITBS) in Fall 1993 and Spring 1994, 1995, and 1996. Grade cohort represents the year of school the student was in during the 1993-94 school year. Thus, in the 1995-96 school year, the second grade cohort students were in the fourth grade.

Test results should be interpreted with caution. The period of time between administration of pre- and post-tests for the KeyMath and PPVT is 18 months and for the ITBS 28 months—relatively short periods to use in assessing the impacts of the project.

National percentile rank, an average for students taking the test nationally, increased for kindergarten and first grade students. Students in the kindergarten and first grade cohorts were not given either KeyMath or PPVT in the Spring of 1996; instead they took the ITBS in Spring of 1996—so we have no comparative data (Table 19).

Table 19. Site B KeyMath National Percentile All Students

Key Math			NATIONAL PERCENTILE			
			Basic Concepts		Applications	
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95	Fall 94	Spring 95
Site B	K	129	45	59	46	57
	1	156	43	78	43	71

Table 20 shows the national percentile rank for at-risk students in kindergarten and first grade at Site B. Results show an increase in the percentile rank for both grades from Fall 1994 to Spring 1995.

Table 20. Site B KeyMath National Percentile At-Risk Students

Key Math			NATIONAL PERCENTILE			
			Basic Concepts		Applications	
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95	Fall 94	Spring 95
Site B	K	46	32	47	35	46
	1	59	28	64	31	62

All students at Site B demonstrated an increase in grade equivalent. The mean change in scores on basic concepts for kindergarten students was eight months and for first grade students the change was one year, six months. On applications the mean change for kindergarten students was six months and for first grade students one year, five months. (See Table 21.)

Table 21. Site B KeyMath Grade Equivalent All Students

Key Math			GRADE EQUIVALENT					
			Basic Concepts			Applications		
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95	Mean Change	Fall 94	Spring 95	Mean Change
Site B	K	111	.3	1.0	.8	.1	.8	.6
	1	126	[illegible]	2.4	1.6	.7	2.3	1.5

At-risk students in kindergarten and first grade at Site B increased an average of one year in grade level on basic concepts and one year, one month on applications. (See Table 22.)

Table 22. Site B KeyMath Grade Equivalent At-Risk Students

Key Math		GRADE EQUIVALENT	
		Basic Concepts	Applications
School	No. Students Tested	Mean Change	Mean Change
Site B	111	1.0	1.1

Table 23 shows the national percentile rank of PPVT test results for kindergarten and first grade. The percentile rank increased for both grades.

Table 23. Site B PPVT Percentile Rank All Students

PPVT			PERCENTILE RANK	
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95
Site B	K	126	29	54
	1	150	56	60

At-risk students in kindergarten demonstrated an increase in national percentile rank, and first grade students maintained the same percentile rank from Fall 1994 to Spring 1995. (See Table 24.)

Table 24. Site B PPVT Percentile Rank At-Risk Students

PPVT			PERCENTILE RANK	
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95
Site B	K	40	14	34
	1	63	40	40

On average, national percentile rank for the second grade cohort at Site B increased 6 points in mathematics, 17 points in reading, and 8 points in language arts from Fall 1993 to Winter 1996. (See Table 25.)

Table 25. Site B ITBS National Percentile Rank

ITBS			NATIONAL PERCENTILES					
			Math		Reading		Language Arts	
School	Grade Cohort	No. Students Tested	Fall '93	Winter '96	Fall '93	Winter '96	Fall '93	Winter '96
Site B	2	58	41	47	30	47	31	39

Table 26 shows the national percentile rank for at-risk students in second grade at Site B. Scores decreased in percentile rank in mathematics, and increased in percentile rank in reading and language arts, from Fall 1993 to Winter 1996.

Table 26. Site B ITBS National Percentile Rank At-Risk Students

ITBS		NATIONAL PERCENTILE					
		Math		Reading		Language Arts	
School	No. Students Tested	Fall 93	Winter 96	Fall 93	Winter 96	Fall '93	Winter 96
Site B	17	40	31	22	32	26	29

The second grade cohort at Site B demonstrated a mean increase in mathematics of two years, six months in grade equivalent from Fall 1993 to Winter 1996. (See Table 27.)

Table 27. Site B ITBS Grade Equivalent Mean Change All Students Math

School	Grade Cohort	No. Students Tested	Fall '93	Winter '96	Mean Change Fall 93-Winter 96
Site B	2	58	2.1	4.6	2.6

The second grade cohort at Site B demonstrated a mean increase in reading of two years, five months in grade equivalent from Fall 1993 to Winter 1996. (See Table 28.)

Table 28. Site B ITBS Grade Equivalent Mean Change All Students Reading

School	Grade Cohort	No. Students Tested	Fall '93	Winter '96	Mean Change Fall 93-Winter 96
Site B	2	58	2.1	4.5	2.5

The second grade cohort at Site B demonstrated a mean increase in language arts of two years, four months in grade equivalent from Fall 1993 to Winter 1996. (See Table 29.)

Table 29. Site B ITBS Grade Equivalent Mean Change All Students Language Arts

School	Grade Cohort	No. Students Tested	Fall '93	Winter '96	Mean Change Fall 93-Winter 96
Site B	2	58	1.8	4.1	2.4

The at-risk second grade cohort at Site B showed an average increase in grade equivalent of two years, one month in mathematics, reading, and language arts from Fall 1993 to Winter 1996. (See Table 30.)

Table 30. Site B ITBS Grade Equivalent Mean Change At-Risk Students

ITBS		GRADE EQUIVALENTS		
School	No. Students Tested	Math Mean Change Fall 93-Winter 96	Reading Mean Change Fall 93-Winter 96	Language Arts Mean Change Fall 93-Winter 96
Site B	17	2.1	2.1	2.1

We made the following assumptions in calculating the mean program cost per classroom for Site B:

- Support staff and extra-duty compensation expenditures were used to perform grant administrative tasks and therefore were considered project and not program costs.
- An estimated 75 percent of staff development was used to develop a vision of the project. Therefore, those expenditures providing for staff development—substitutes, professional/technical services, travel, and other expenses—were calculated at a 25 percent rate.
- Capital supplies and capital equipment purchases (computer purchases) were assumed to have a use-life of eight years.

SUMMARY

The staff at Site B successfully implemented all their initial project goals. Their commitment to supporting a developmentally appropriate learning environment, assessing teaching strategies and approaches to learning, and providing a quality education for all the students unified this conscientious staff. Dialogue among staff, administration and parents flourished from the initial planning phase of the grant, when approaches to learning were evaluated and researched and priorities were assessed. The opportunity to reflect, critique, and defend existing educational practices contributed to a positive learning environment throughout the three years of the grant.

The staff at Site B valued the educational leadership, support, and vision from their principal. They appreciated her ability to share the leadership necessary to make the project work over the past three years. This administrative support, professional commitment to improving education, and increased community involvement supported the staff's and parents' commitment to the overall goals of the grant.

The three years of the grant were not, however, trouble-free. Some drawbacks included the stringent time constraints with tightly established schedules, shortage of space for the small groups, lack of adequate planning time, excessive paperwork required to document progress, and the overall additional time commitment necessary to make the whole process fall together. Compromises to the initial grant proposal were made along the way, resulting from conflicts between priorities and budgets. All modifications were made with considerable debate and involvement of staff.

The positive benefits of the grant outweighed the negative ones. Student gains in academic achievement, improved behavior and attitude, opportunities for improving existing technology, training, and additional teachers/collaborators were all welcome additions to the school. The staff at Site B appreciated the opportunity to demonstrate to the State of Alaska what can be accomplished with additional funds to support a well-planned, research-based, all-inclusive school improvement plan.

- An additional multimedia station was set up—with three computers, a scanner, a digital video camera, a color printer, and a laser disk player and a video camcorder which students could use to import and export video images to and from the computers.
- *Portfolio Assessment Toolkit* , software for the creation of student electronic portfolios, was available to the students.
- Thirty-two Alpha Smarts (portable word processors) were purchased.
- An additional Apple IIe/GS lab with Apple II computers was set up.

Staff Development

The focus of staff development for the 1995-96 school year continued to be technology. The opportunities for staff development provided the teachers with the skills to integrate technology into their daily lessons. The technology coordinator provided on-site and frequent training to teachers and students. A math assessment workshop, language arts assessment, Rubric training, and Glasser's (Quality Schools Programs) were also part of the staff development sessions.

PROJECT OUTCOMES

This segment of the report answers seven research questions proposed by the Alaska Department of Education at the start of the *Elementary School Class Size Reduction Pilot Project.* In preparing this section, we used project documentation and evaluation activities completed between Fall 1993 and Spring 1996; those examined student academic achievement and attitude, school climate and discipline, teacher innovation, and parental involvement.

1. Did the program at Site C meet its class size goals?

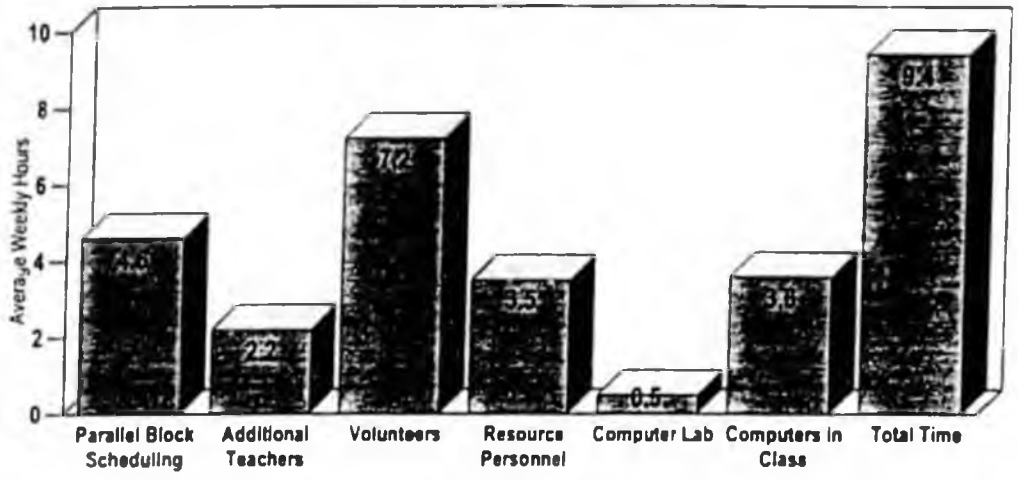
Goal 1: Lowering the PTR to improve academic achievement in math and language arts by adapting instructional practices, integrating technology with the curriculum, and implementing parallel block scheduling.

Yes, I feel like I did a very good job. I did a better job this year than the first two years. This year I am team teaching and we do computer lab splits during which time we have parents who come in to work in the computer lab or in the room. This increases our lower PTR time. (Fourth-grade teacher)

All teachers at Site C successfully reduced PTR during language arts and mathematics instruction time. In addition to improving instructional strategies to meet the needs of small groups of students and integrating technology into the curriculum, teachers used special service personnel, extra teachers (specialists), and volunteers to help lower the PTR. During the 1993-94 school year the average weekly PTR time was 7.6 hours, and for the 1994-95 school year it increased to 9 hours. During the final grant year teachers reported a weekly average of 9.4 hours with a PTR of 15:1 or less. (See Figure 9.)

Parallel block scheduling was a method of reducing the PTR during language arts and mathematics instruction time. Teachers preferring to keep their whole class together were able to team teach with a grade-level partner. Advantages of the parallel block scheduling included improved classroom behavior, increased student participation, and frequent assessment of students' progress. However, many teachers felt the half-hour block of reduced class time was too short and scheduling too restrictive.

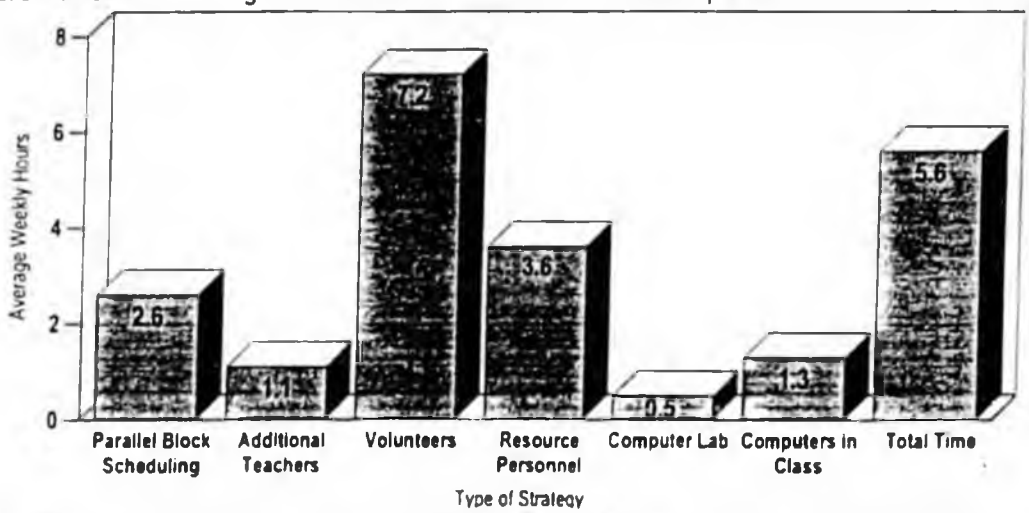
Figure 9. Site C Average First and Second-grade Teacher Weekly Instruction Time with a Pupil-Teacher Ratio of 15:1 or Less



Note: There are times when multiple strategies are taking place. As a result, the sum of the strategies is greater than the total time shown with reduced PTR. Volunteer time includes in-class and out-of-class time.

The teachers' daily records allow us to estimate the time the average student spent in reduced size classes. As Figure 10 shows, the average student had approximately 5.6 hours per week of small-group instruction time during the 1995-96 year.

Figure 10. Site C Average Student Instruction Time with a Pupil-Teacher Ratio of 15:1 or Less



Note: There are times when multiple strategies are taking place. As a result, the sum of the strategies is greater than the total time shown with reduced PTR. Volunteer time includes in-class and out-of-class time

The attention to changing instructional practices to better meet the needs of small groups of students at Site C were impressive. The extensive staff development training and peer interaction improved the instructional strategies of all staff members. Time commitment necessary to effectively plan with partners, accommodate volunteers, and increase small-group instruction was considerable.

Goal 2: Organizing and maintaining a volunteer program

Training is very important for volunteers and without the coordinator the program has had difficulties. There must be someone in charge to make the volunteer group feel cohesive. **(Fifth-grade teacher)**

I was involved in an excellent training class last year. I am delighted with the school's willingness to train and use parent volunteers. The computers give kids a great introduction to modern technology. **(Parent volunteer)**

The initial goals of establishing a well-trained and reliable volunteer force to assist the classroom teacher and lower the PTR were not met. While volunteering was extensive across the grades and volunteers were well trained, they were not reliable. However, many staff members continued to use volunteers in their classrooms; others preferred to have them assist in non-instructional areas.

The volunteer coordinator position was a critical component of the project at Site C. While the number of volunteers working in classrooms increased the final year, distribution among classes was uneven, a condition attributed to the lack of a coordinator. Some classroom teachers were more successful at recruiting than others. Favorable recruiting sites were the high school, with students participating in "work release" programs, and the college, with students interested in education; getting high school and college volunteers required extensive coordination.

A fifteen-hour volunteer training course was offered through Kenai Peninsula College during the first two years of the grant. While one hundred parents and community members attended sessions, only a few took the class for credit. Mini-training sessions were offered throughout the school year by the teachers and included strategies for working with small groups and using school equipment, as well as an overview of the philosophy and discipline policy of the school. Individual teachers reported training each new set of parents coming to work in their classrooms.

The final grant year the training sessions were dropped due to lack of participation. Staff at Site C found that many volunteers had attended extensive volunteer training at Site B (a kindergarten through second-grade district school) and did not need to repeat the sessions. Teachers appreciated the opportunity to work with volunteers and acknowledged the importance of parent involvement with their children's classroom. However, they did not recommend volunteers as a reliable and consistent way to reduce the pupil-teacher ratio.

Data collected from the teachers' weekly logs show an average of 4 parents or community volunteers spending 70 minutes per week volunteering in the classroom. This does not take into account special events where large numbers of parents were available for longer periods of time but does include individual and small group instruction in mathematics, writing, reading, language arts; editing; creative writing; general clerical assistance; reading aloud to students; computer lab assistance; guided practice; and assessment.

During the data collection period, volunteers overwhelmingly received a rating of excellent for the quality of their performance in the classroom.

Goal 3: Improving student performance as measured on ITBS scores, teachers' evaluations, portfolios, and other measures

I don't know. From a personal standpoint and looking at the students' portfolios, I believe the quality has improved. Students get more help, more immediate feedback and are more excited about learning in general. Overall this whole experience has improved their attitude toward school. **(Third-grade teacher)**

(Refer to Research Question 5.)

Using authentic assessment (observations, teacher-made tests, portfolios), the majority of teachers reported a significant improvement in academic achievement and quality of student work. Teachers report that attention to individual students needs, small groups, increased technology, and increased opportunities for classroom participation benefited the students' academic achievement. Yet, they were not confident that these gains would show up on the standardized test results. For the 1994-95 school year, teachers reported academic achievement as a result of reduced class size to be good 56 percent of the time and excellent 36 percent of the time and for the 1995-96 school year, good 62 percent of the time and excellent 37 percent of the time.

Goal 4: Improving student attitude and behavior

Attitude and behavior improved 100 percent. The self-esteem program, "Lion's Quest," has helped. The kids are receptive about the program and are learning to work well in small groups. I believe the program has improved their attitude toward each other, toward the school, and toward what we are doing regarding the overall school behavior program. (Fifth-grade teacher)

The counselor has been excellent; she has been able to take kids out of the classroom and work with them in small groups. It will be our loss if we lose her. When we have a student in crisis, and they are not able to learn because of the crisis, I cannot help the child and ignore the rest of the class. The counselor provided critical support for these students. (Fourth-grade teacher)

All students attending the third, fourth, and fifth-grade classes at Site C completed a survey on their perception of school and learning at the end of the 1993-94, 1994-95, and 1995-96 school years. The survey asked for information on attitude toward learning and school. While student mobility rates (moving in and out of the school) restrict comparisons, survey results showed students in participating classes having positive and favorable attitudes toward school. Table 35 shows students' responses to questions about their attitudes toward school and learning.

Asked if they liked school, 36 percent of the students responded "always," and 57 percent responded "sometimes." The responses about whether they liked reading and math were positive. Ninety-seven percent of students reported feeling school is a safe place, and only 3 percent reported not feeling good about how they were doing at school.

Table 35. Site C Students' Perceptions About School

	Always	Sometimes	Never	Don't Know	No Answer
Do you like school?	36%	57%	7%	0%	0%
Do you like reading at your school?	38%	54%	8%	0%	0%
Do you like doing math at your school?	51%	39%	8%	0%	0%
Do you feel your school is a safe place?	61%	36%	3%	0%	0%
Do you feel good about how you are doing at school?	54%	43%	3%	0%	0%
Do most of the kids in your class follow the rules?	16%	81%	3%	0%	0%
Number of students responding=379					

Students were also asked to describe their favorite school activity. Of all students responding, 26 percent said physical education and sports; 20 percent said mathematics; and 13 percent said arts and crafts. Other activities in order of preference included computer lab, reading, music, drama and dance, science, and spelling and writing.

All teachers reported a favorable discipline and classroom climate during periods of reduced class size. Few opportunities for disrupting classes exist when students are actively engaged in learning. Site C adopted a school-based philosophy fostering student accountability for behavior. This philosophy

extended to parents working in the building, the administrator, the teachers, and everyone in the school community. This school-wide approach toward discipline, the principal's involvement in the daily activities of all students, and the school counselor all made significant contributions to the overall improvement of school climate.

Goal 5: Increasing and promoting the creative use of technology to enhance existing instructional practices

As we near the end of the grant, it is clear to this writer that Site C is a vastly different school than it was three years ago. Technology use is ubiquitous and becoming more and more 'invisible.' By that I mean that students and teachers are thinking less about how to use different technologies, they are just using them when appropriate. Many teaching styles are evolving toward a more student-centered approach. Site C is a dynamic, exciting place in which to teach and learn. I hope I get to stay next year! (Technology Specialist)

Progress during the last two years of the grant in the area of technology was extensive, and at the close of the final grant year it was a natural part of the students' and teachers' workday. Besides the extensive technology available in the classrooms, all students were required to train on keyboard at least 15 to 20 minutes, four days per week.

The technology coordinator— a half time position supported by the district office since the second year of the grant— was a critical component for success. Without this position, the technology would not have been as effective and perhaps would have failed. The on-going support, availability of weekly training sessions, and consistent on-site expertise available to students and teachers kept the project going smoothly. The most important lesson learned regarding technology is that a school must have a specialist on staff to support all the components—training, equipment and programs. Without this constant assistance, technology can be overwhelming.

At the close of the 1995-96 school year, staff and students were proud of their accomplishments. After three years, teachers who initially protested the use of technology in the classroom could not imagine teaching without using technology. By the end of the project, Site C could access the Internet from all classrooms and had begun work on their World Wide Web home page.

2. What instructional innovation in reading and mathematics did schools use along with class size reduction?

I do more cooperative teaching instead of using texts and worksheets. I am able to individualize the math program this year and I can easily follow a student's progress. (Fifth-grade teacher)

This week I attempted to do a math lesson with all 26 students. We are all so used to working in small groups that everyone—parents, students and I—were finding it hard to adjust. Instead of helping 5 students in a small group, I was overwhelmed by all of them. Now that we are in our routine of small group time, it's very difficult to go back to the large groups. (Fourth-grade teacher)

All classes in the project used a variety of teaching strategies throughout the day. Teaching strategies documented in weekly logs and observed by the evaluator include guided practice, team-teaching, computer-assisted instruction, cooperative learning, whole- and small-group instruction, peer tutoring, learning centers, and independent work. All participants emphasize small-group instruction, often with a PTR of 6:1 or less. Data collected for teachers' weekly logs showed strategies used and the number of weeks they were used in the classroom (Table 36).

office, and library). The volunteers operated a "parents' room" with a lending library that included materials to support and sponsor programs that enhance teaching and parenting practices.

A five-week training course was offered to volunteers through the local college. During the second and third year of the grant, five sessions were spread out among monthly meetings. Parent training sessions covered topics on classroom management, working with computers, questioning techniques, cooperative learning strategies, and small-group strategies on math and reading. Volunteer meetings were coordinated through the PTA volunteer coordinator, and classroom teachers were encouraged to recruit their volunteers to attend the monthly mini-lessons.

4. What roles do parents, volunteers, tutors, and technology play in instruction?

Parent/Volunteers (Refer to Research Question 1, Goal 2)

Tutors

The special education tutors, including special service teachers and Chapter 1 aides, assisted the special needs children either in the classroom or in "pull-out" situations, where they were removed from the classroom and taught in small groups with other special needs students. This extended use of resource personnel served to assist the classroom teacher in lowering the PTR and to assist the special needs child in the classroom with his or her peers. The tutors were accountable to the regular classroom teacher and become involved in team teaching by working with regular as well as special education students. While they were able to assist with small-group instruction in the classroom, their main focus was attending to the students qualifying for special services.

During the 1993-94 school year, the special service personnel provided for an average of 3.6 hours per week of reduced PTR time for the classroom teacher. Reduced PTR time was 2.5 hours for the 1994-95 school year and 3.6 hours in 1995-96.

Technology (Refer to Question 1, Goal 5)

5. How did the class size reduction and the instructional innovations affect measured language arts and mathematics achievement?

Comparative Data on Student Achievement

One of the principal goals of the *Elementary School Class Size Reduction Pilot Project* was improving student learning in math and language arts. Since students presumably learn in virtually any school program, the relevant question is whether the rate of student learning under each school's project is higher than it would have been had the project changes not been made.

We cannot know how much students in the *Elementary School Class Size Reduction Pilot Project* would have learned, had they not been in a project classroom. Our best sources of comparison are students in other classrooms or other schools. Yet these students may benefit from other, unmeasured instructional innovations. Other students might also differ from project students in ways that cause them to learn at different rates, or they may begin their formal schooling at different levels of knowledge. Whatever comparison groups we use, then, will be imperfect. We think the best comparison group to use is other students in the United States. We wanted to see if students in the *Elementary School Class Size Reduction Pilot Project* improved their level of academic achievement over time, relative to other students in the United States.

To compare the academic achievement of project students with all U.S. students, we used the Iowa Tests of Basic Skills (ITBS) for students in grades three through five. These multiple choice tests are the most widely used measures of academic achievement in math and language arts. It is possible to compare individual student scores with the distribution of scores nationally.

To provide a baseline measure of student achievement, we worked with the school district to arrange for project students in grades 3-5 to take the Iowa Test of Basic Skills (Form K) in October 1993 and another version of the test in April 1994 and 1995 and Winter 1996. The producers of the test, Riverside Publishing, scored the results and provided data tapes for analysis. This report provides a comparison of achievement of the students who took the Fall 1993 tests and Winter 1996 tests.

The State of Alaska reports statewide and district testing results in terms of national percentile ranks. We used national percentile ranks and grade equivalent to measure the ITBS test results of project students relative to all U.S. students. We tracked the math and language arts achievement of individual students in each project school. We analyzed academic growth as measured by these tests for all students, and—where numbers of students were sufficient—for at-risk students. At-risk students are identified as having increased probability for school failure or learning problems by reason of socio-economic factors (qualify for free or reduced-price lunch), special education certification, Chapter One (remedial services in reading and mathematics), or English as a Second Language. A description of these methods of reporting test results follows.

National Percentile Rank	Indicating the percentage of students taking the test nationally who scored lower on the test than the individual student.
Grade Equivalent	Indicating the year and month of schooling of students nationally that corresponds with the student's test performance. By comparing the student's actual grade level (e.g., 4.2 years) with the grade equivalent (e.g., 4.6 years) it is possible to tell if the student is learning at a faster or slower rate than students in the U.S. as a whole.

All third, fourth, and fifth grade students in Site C participated in the *Elementary School Class Size Reduction Pilot Project.* Students in grade three took the ITBS in Fall 1993, Spring 1994, Spring 1995, and Winter 1996. Students in grade four took the ITBS test in Fall 1993 and Spring 1995. Students in grade five took the ITBS test in Fall 1993 and Spring 1994. Fourth grade students took state administered tests in Spring 1994. Students who had been in fifth grade at the start of the project were no longer attending school at Site C in Spring 1995. Grade cohort represents the year of school the student was in during the 1993-94 school year. Thus, in the 1995-96 school year, the original third grade cohort students were in the fifth grade.

Test results should be interpreted with caution. The period of time between administration of pre- and post-tests for the ITBS test is 28 months, a relatively short period on which to base conclusions about the impact of the project.

Table 37 shows the national percentile rank of students at Site C. On average, students in the third grade cohort increased their percentile rank in math and language arts and decreased their percentile rank by one percent in reading from Fall 1993 to Winter 1996. Fourth grade students increased the percentile rank in all subjects tested from Fall 1993 to Spring 1995; and fifth grade students increased their percentile rank in math, reading, and language arts from Fall 1993 to Spring 1994.

Table 37. Site C ITBS National Percentile All-Students

ITBS School	Grade Cohort	No. Students Tested	NATIONAL PERCENTILES Math Fall 93	Math Spring 94	Math Spring 95	Math Winter 96	Reading Fall 93	Reading Spring 94	Reading Spring 95	Reading Winter 96	Language Arts Fall 93	Language Arts Spring 94	Language Arts Spring 95	Language Arts Winter 96
Site C	3	112	47				58			57	42			49
	4	121	53		55		54		58		39		46	
	5	122	53	61			56	63			45	51		

Table 38 shows the national percentile rank for the at-risk student at Site C. Results showed no change in percentile rank for math and language arts and a decrease in percentile rank for reading from Fall 1993 to Winter 1996.

Table 38. Site C ITBS National Percentile At-Risk Students

ITBS School	No. Students Tested	NATIONAL PERCENTILES Math Fall 93	Math Winter 96	Reading Fall 93	Reading Winter 96	Language Arts Fall 93	Language Arts Winter 96
Site C	26	34	34	36	29	24	24

On average, students at Site C demonstrated an increase in grade equivalent in math. The third grade cohort increased two years, seven months from Fall 199_ to Winter 1996; fourth grade students increased two years from Fall 1993 to Spring 1995; and the fifth grade cohort increased one year, three months from Fall 1993 to Spring 1994. (See Table 39.)

Table 39. Site C ITBS Grade Equivalent Mean Change All Students Math

School	Grade Cohort	No. Students Tested	Fall 93	Spring 94	Spring 95	Winter 96	Mean Change Fall 93-Spring 94	Mean Change Fall 93-Spring 95	Mean Change Fall 93-Winter 96
Site C	3	112	3.2			5.9			2.7
	4	121	4.4		6.4			2.0	
	5	122	5.5	6.8			1.3		

On average, students at Site C demonstrated an increase in grade equivalent in reading. The third grade cohort increased two years, six months from Fall 1993 to Winter 96; and the fourth grade cohort increased two years from Fall 1993 to Spring 1995. (See Table 40.)

Table 40. Site C ITBS Grade Equivalent Mean Change All Students Reading

School	Grade Cohort	No. Students Tested	Fall 93	Spring 94	Spring 95	Winter 96	Mean Change Fall 93-Spring 95	Mean Change Fall 93-Winter-96
Site C	3	112	3.6			6.2		2.6
	4	121	4.5		6.5		2.0	
	5	122	5.7	6.8				

On average, students at Site C demonstrated an increase in grade equivalent in language arts. The third grade cohort increased two years, eight months from Fall 1993 to Winter 1996; the fourth grade cohort increased two years, two months from Fall 1993 to Spring 1995; and the fifth grade cohort increased one year, two months from Fall 1993 to Spring 1994. (See Table 41.)

Table 41. Site C ITBS Grade Equivalent Mean Change All Students Language Arts

School	Grade Cohort	No. Students Tested	Fall 93	Spring 94	Spring 95	Winter 96	Mean Change Fall 93-Spring 94	Mean Change Fall 93-Spring 95	Mean Change Fall 93-Winter 96
Site C	3	112	3.0			5.9			2.8
	4	121	3.9		6.1			2.2	
	5	122	6.5	6.5			1.2		

At-risk students at Site C demonstrated an increase in grade equivalent. The mean change from Fall 1993 to Winter 1996 for students in math was two years, four months, and in reading and language arts one year, nine months. (See Table 42.)

Table 42. Site C ITBS Grade Equivalent Mean Change At-Risk Students

ITBS School	No. Students Tested	GRADE EQUIVALENTS Math Mean Change Fall 93-Winter 96	Reading Mean Change Fall 93-Winter 96	Language Arts Mean Change Fall 93-Winter 96
Site C	26	2.4	1.9	1.9

6. How are parental involvement, teacher satisfaction, and student attendance and behavior affected by the class size reduction and associated instructional innovations?

Parental Involvement

Parents of students attending Site C have been involved with the grant since the initial planning stage. They were kept informed of grant activities through routine and frequent home-school communication and through the PTA. Surveys were conducted at the end of each grant year to assess parents' awareness of and involvement in the project, parents' opinions regarding the grant's effect on the school program, and parents' perceptions about the school.

Table 43 shows the percentage of parents who were aware of the project components and who felt the project had a positive impact on their children's education. Sixty-six percent reported the computer-assisted instruction had a positive impact on their children's education, followed by 59 percent who felt volunteers had a positive impact and 51 percent who thought parallel block scheduling had. Fifty-two percent reported assisting teachers with school activities, and 29 percent reported working with students in the classroom.

student learning above the national average. If the change in grade equivalent occurred over a time period of 1.9 (one year and nine months), this would indicate achieved student learning below the national average. Finally, if a 1.8 change in grade equivalent occurred over a time period of 1.8 months, this indicates achieved student learning equal to the national average.

The study then compared the mean change in grade equivalent on the Iowa Tests of Basic Skills (ITBS) to the project's estimated mean program cost per classroom. The following table displays the mean change in grade equivalent in mathematics, reading, and language arts for a third grade cohort that participated in Site C's *Elementary Class Size Reduction Pilot Project* from Fall 1993 to Winter 1996.

Table 48. Site C Mean Change in Grade Equivalent

Discipline	Time Period	Grade Equivalent	Number of Classrooms in Project	Mean Program Cost Per Classroom
Mathematics	2.4	2.7	18	$5,883
Reading	2.4	2.6	18	$5,883
Language Arts	2.4	2.8	18	$5,883

Estimated Mean Program Cost per Classroom

Site C's mean program cost per classroom was estimated by: (1) differentiating program costs from project costs, and (2) allocating capital expenditure costs over the use-life of the investment. The purpose for differentiating between program and project costs was to identify *ongoing* costs, or costs that will continue to be present as the program continues, from *startup* or grant imposed costs. Program costs were defined as those costs necessary to the ongoing operation of Site C's Class Size Reduction Project. Under this definition, items such as administrative costs imposed by the grant or startup costs associated with designing the program were not included in calculating the annual program cost. Second, capital expenditures, such as purchasing computers, were spread out over the use-life of the investment in order to avoid overestimating annual program costs.

We made the following assumptions in calculating the mean program cost per classroom for Site C:

- Support staff were hired to perform grant administrative tasks and therefore were considered a project and not a program cost.
- An estimated 75 percent of staff development was used to develop a vision of the project. Therefore, those expenditures providing for staff development—substitutes/temporaries, professional/technical services, travel, stipends, postage, telephone, supplies, and other purchased services—were calculated at a 25 percent rate.
- Capital equipment purchases (computer purchases) were assumed to have a use-life of eight years.

SUMMARY

Elementary School Class Size Reduction Pilot Project at Site C was successfully implemented according to the original proposal. Concurrent scheduling changes, staff development, and increased personnel assisting in the classroom created a difficult and frustrating first year for the majority of teachers. They learned that they had attempted to do too much too soon. The second and third year of the grant allowed for improvements and revisions that enabled the staff to adjust to the most significant features of the grant—scheduling changes, new instructional practices, and technology.

The addition of a half-time technology specialist for the 1994-95 and 1995-96 school years provided the staff with much-needed assistance in integrating new technology into the curriculum. Staff members, representing a wide range of computer literacy (from no skills to very skilled, needed more than after-school sessions and occasional classes to get started. The additional training sessions offered to all teachers twice per month before school were a welcome opportunity to upgrade and level out the staffs' computer skills. Focusing staff development on technology also eased the tension and frustration of staff who were required, during the first year, to implement and adapt to schedule changes, teaching strategies conducive to small group instruction, and a new self-esteem program.

The major concerns that faced the staff were the increased planning time necessary to implement the changes, training to change their approach to teaching, working with the additional personnel in the classroom, and changing schedules to accommodate reduced PTR time. After a difficult start-up year, the staff bonded together and made revisions to support manageable change. The focus of staff development, the additional support for technology, and a more supportive principal encouraged the staff. At the close of the final grant year, the teachers were able to look back with pride on the changes and improvements in the school and in the way they teach and interact with staff and students. The highlights of the project include an increased satisfaction with teaching; improved attitude, academic achievement and behavior of the students; and creation of a team-work environment that changed the isolation of traditional classroom teaching.

The staff at Site C experienced a challenging and rewarding three years; they were satisfied that they had three years of increased opportunities to work with small groups of students. Project success was also encouraged by the improved community and parent perceptions of the school. Parents were pleased with the education their children were receiving and supported the changes made by the staff at Site C. The improved community perception, increased parental involvement, and improved educational atmosphere all served to increase teachers' willingness to change and become "partners in enthusiastic life-long learning."

All classroom teachers had six intensive training days in technology to be taken during the project. The administration encouraged teams of teachers (6 to 10 at a time) to attend training followed by an assimilation day as a group to determine how the training would be integrated into the curriculum. Regularly scheduled in-service days were used to provide teachers with the opportunity to share the information and make recommendations to the entire staff.

At the beginning of the 1995-96 school year, a questionnaire was sent to all parents asking in what ways they would be interested in participating at the school. The information went through an intense follow-through process and each parent was contacted, and options for matching needs with interests were discussed. This resulted in a schedule for parent volunteers to work each day in the lunchroom, in their children's classrooms, in other classrooms with the large numbers of students, in the office, in the computer lab, or in the library. Volunteers with young children were able to leave them in a toddler room run by parents and supported by the PTA.

Parents were presented information about volunteer involvement during a kindergarten pre-registration day held in the spring. As an increased incentive to encourage involvement, school personnel called parents of all incoming kindergarten students and parents new to Site D. To maintain continuity in the volunteer program, the volunteer coordinator trained a new parent to resume these responsibilities for the coming school year.

PROJECT OUTCOMES

This segment of the report answers seven research questions proposed by the Alaska Department of Education at the start of the *Elementary School Class Size Reduction Pilot Project.* In preparing this section we used project documentation and evaluation activities completed between Fall 1993 and Spring 1996; they examine student academic achievement and attitude, school climate and discipline, teacher innovation, and parental involvement.

1. Did the program at Site D meet its class size goals?

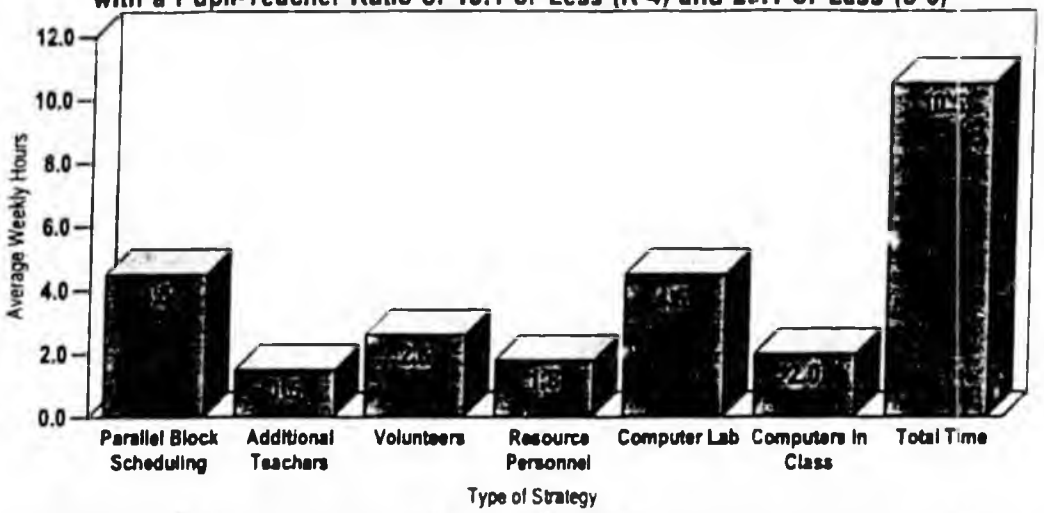
Goal 1: Reducing class sizes in reading and mathematics, focusing on the primary-grades

> *The primary-grades get the extra teachers, the librarian, and the music teacher; we are hoping we can keep this setup next year.* (First-grade Teacher)

All project participants agreed this goal was met. The attention to small-group time at the primary level, often with groups of 6:1 or less with the help of parent volunteers and special service and support personnel, was evident during every site visit made by the evaluator during 1995-96. Primary teachers agreed that the small-group time allowed them to attend to individual students on a very personal level as well as to engage the students in project-oriented activities requiring a significant degree of sophistication. With small groups the coordination of supplies for various activities can more easily be accommodated, and productive use of class time with frequent and substantive student-teacher interactions increased.

Data collected from the teachers' daily records show that in 1995-96 teachers had an average of 10.5 hours per week of substantive interaction time with a pupil-teacher ratio (PTR) of 15:1 or less for grades 1 through 4 and 20:1 or less for grades 5 and 6. In addition to computer labs and parallel block time, additional teachers, computers in class, and volunteers helped the classroom teachers further reduce the PTR to accommodate groups of 6:1 or less (see Figure 13). For the 1993-94 school year, the weekly time with reduced class size was 9.5 hours; for the 1994-95 school year, 13.3 hours. The drop in 1995-96 time occurred because the intermediate-grade teachers kept their whole classes for one day a week.

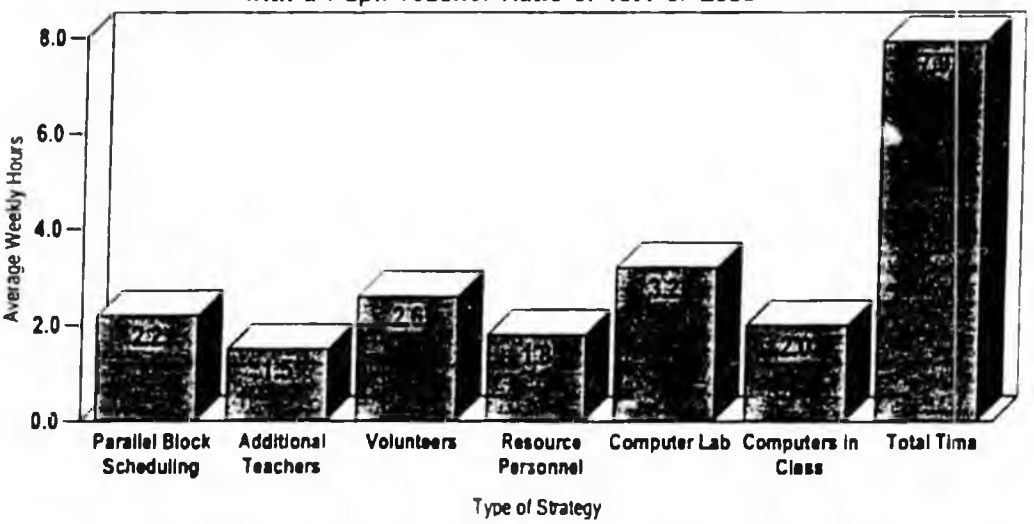
Figure 13. Site D Average Teacher Weekly Instruction Time with a Pupil-Teacher Ratio of 15:1 or Less (K-4) and 20:1 or Less (5-6)



Note: There are times when multiple strategies are taking place. As a result, the sum of the strategies is greater than the total time shown with reduced PTR.

The teachers' daily records allow us to make an estimate of time the average student spent in smaller classes. As Figure 14 shows, for an average student this translates into approximately 7.9 hours per week of available small-group instruction time.

Figure 14. Site D Average Student Instruction Time with a Pupil-Teacher Ratio of 15:1 or Less



Note: There are times when multiple strategies are taking place. As a result, the sum of the strategies is greater than the total time shown with reduced PTR.

Kindergarten

At the kindergarten level the overlapping extended day allowed one kindergarten class to have two hours of reduced class size time. This schedule, developed by the teachers and supported by the kindergarten parents, had been implemented at the school before the grant. These classroom teachers developed this no-cost approach to reducing class size and benefited from project-related activities including the computer lab, computer in the classroom, staff development, and parent volunteer training.

Under this arrangement in 1995-96, the first half of the class attended school from 8:50 a.m. to 1:20 p.m., and the second half attended from 10:50 a.m. to 3:20 p.m. Each child attended school for 4.5 hours—but for 2 of those hours, only approximately 12 students were in each group. The overlapping time block of 1.5 hours when all students were present included large-group special activities such as physical education, music, library, and computers as well as lunch and recess. Table 49 shows a sample of the daily kindergarten schedule.

Table 49. Site D Kindergarten Schedule

24 students 8:50 - 10:50	24 students 10:50 - 1:20	12 students - 1:20-3:20
Language Arts, Science, Social Studies, Art, Math	Story time, Special (music, P.E.), Lunch/recess, Computer, Centers	Language Arts, Science, Social Studies, Art, Math

Table 50 shows a sample of a multi-grade (kindergarten and first grade) schedule in 1995-96. First-grade students attended for the entire day—6.5 hours—and kindergarten students attended for 4.5 hours. This class configuration, set up at the beginning of the year, accommodated the grade-level mix of new students and increased the opportunity for Site D to implement the multi-grade approach to learning. Other split classes at this site included a first/second grade and second/third grade combination.

Table 50. Kindergarten and First Multi-grade Class Schedule

(A.M.)

8:50 - 10:20	10:20 - 10:50	10:50- 11:20	11:20- 11:50	11:50-12:20	12:20-12:50
Kdg & 1st	Kdg	Kdg & 1st	Kdg & 1st	Kdg & 1st	Kdg & 1st
Science	1st -specials	whole group	lunch	1st-grade-recess Kdg -computer lab	Special services 1st-grade -L. A. Kdg-math

(P.M.)

12:50-1:20	1:20	1:20-1:50	1:50-2:10	2:15-2:45	2:45-3:15
1st- math		1st	1st	1st	1st
Kdg- specials	Kdg dismissal	reading	recess	reading w/ extra teacher	computer lab **3:20 dismissal**

Goal 2: Improving students' ITBS scores in reading, language arts, and mathematics

(Refer to Research Question 5).

Goal 3: Increasing the use of nonstandard testing (including observations and other measures) in reading, writing, and mathematics

There are more opportunities to do in-depth assessment when the groups are smaller. I do more math assessment using story problems to observe students' critical thinking skills. I couldn't do this with a whole class. I need to see what strategies the child uses. If they're right I reinforce them and if they are wrong I correct them and move on. **(First-grade teacher)**

Examples of nonstandard testing and authentic assessments include observations, teacher-prepared performance tests, and student portfolios. While authentic assessments are not new to Site D, teachers consistently report on the increased opportunity to conduct in-depth, authentic assessments as a result of the *Elementary School Class Size Reduction Pilot Project.* Sharing perspectives on student performance and planning lessons according to the students' needs have been major benefits of the

increased collaboration between special service personnel, volunteers, and grade-level teachers. This shared perspective allows for more insightful and in-depth assessment of students performance.

Teachers report the need to understand the thought process, particularly of the primary students, in order to see what strategies they are using. To accomplish this requires uninterrupted, focused time with a single child or in very small groups (3-4) of children. Teachers at the intermediate level also need these very small groups for assessment. As a result of reduced PTR, teachers were able to increase the use of analytical writing assessments, drama, and math projects along with the ongoing strategy of observing and monitoring students' understanding of tasks.

Goal 4: Improving students' attitudes toward reading, writing, and mathematics

My class has 3 students with a tradition of spending a lot of time in the principal's office. They are not reformed, but they have had a wonderful year. They have some trouble with transition time, but in class they are challenged, working hard, and on-task. They certainly do better during periods of reduced PTR time. They need and like the recognition they get in small groups. **(Fourth-grade teacher)**

In small groups the students are more confident, especially the quiet students. I see student attitude toward learning change and also I see parent expectations change. They expect their children to be successful in school. **(Third-grade teacher)**

Student Survey Results

All students attending kindergarten through sixth-grades at Site D completed a survey on their perception of school and learning at the end of the 1993-94, 1994-95, and 1995-96 school years. The survey asked for information on attitudes toward learning and school. While student mobility rates (moving in and out of the school) restrict comparisons, survey results showed students in participating classes having positive and favorable attitudes toward school during all years of the project.

Asked if they like school, 51 percent of the students in 1995-96 responded "always" and 43 percent "sometimes." The responses about whether they liked reading and math were positive. Ninety-six percent of the students reported feeling school is a safe place, and only 3 percent reported not feeling good about how they were doing at school. Overall, as in the 1993-94 and 1994-95 survey results, students reported favorable attitudes toward learning, school, and safety (see Table 51).

Students were also asked to describe their favorite school activity. Of all students responding, 33 percent said physical education and sports were favorites; 15 percent; music, drama, and dance; and 9 percent, computer lab. Other favorite activities in order of preference included arts and crafts, mathematics, reading, and social/Alaska studies.

Table 51. Site D Students' Perceptions About School

	Always	Sometimes	Never	Don't Know	No Answer
Do you like school?	51%	43%	6%	0%	0%
Do you like reading at your school?	55%	40%	5%	0%	0%
Do you like doing math at your school?	53%	41%	6%	0%	0%
Do you feel your school is a safe place?	72%	24%	4%	0%	0%
Do you feel good about how you are doing at school?	62%	34%	3%	0%	1%
Do most of the kids in your class follow the rules?	28%	68%	3%	0%	1%
Number of students responding = 292					

Teachers reported the increased use of technology across the curriculum as having a positive influence on students' attitude toward learning. They reported it as one area where few instructions are necessary and students are always eager to work on projects through to completion. The opportunity to individualize the instruction, along with the mastery over the network system, excites the students. Writing in particular showed a dramatic improvement with the use of computers, according to the teachers. The increased frequency of writing and the ease of revising and editing all improved the students' writing skills.

Goal 5: Improving the attendance of students with poor attendance

> *We stress to the parents that we do have our small group time and getting to school on time is important. For the child whose attendance is a problem, the principal calls the parent or guardians to inquire about the child and to remind them of the importance of consistent attendance.* **(First-grade teacher)**

Attendance as an indicator of project impact has been a problem for all schools involved in the *Elementary School Class Size Reduction Pilot Project.* Since attendance is the responsibility of the parents more than the students, assessment of project impact on this area is questionable. Teachers reported illness and the tendency of families in this community to vacation in winter as significantly influencing the reported average absence rate of 9 students per week, per class. For students with chronic attendance problems, the principal contacts the home to discuss the situation and to remind parents of the importance of their children's regular attendance.

Goal 6: Improving the behavior of students with behavior problems

> *Behavior has improved immensely. I think the students have the opportunity and the tools, particularly with technology, to apply themselves to their area of interest. The loss of privileges, especially computer time, is really important and one they don't risk losing.* **(QUEST/technology specialist)**

> *The changes have definitely improved behavior. Small groups make it easier to keep the children involved and distractions a minimum. The chances for success are greater when the teacher can have groups of 2 or 3 rather than 26, with 13 students engaged and 13 distracted, confused, and unfocused.* **(First-grade teacher)**

In this study the following definitions are used to describe classroom climate, behavior, and academic achievement from the teacher's perspective. *Classroom climate* means the general physical and interpersonal atmosphere in the classroom and takes into account the students' behavior and involvement in the assigned learning tasks. *Class behavior* means any student response to a stimulus—whether an internal thought or impulse or an external intrusion. *Academic achievement* means weekly assessment of students' academic performance, using measures other than standardized tests.

Teachers rated class climate as excellent 69 percent of the time in 1995-95 and class behavior as excellent 53 percent of the time during periods of reduced class size. Academic achievement as a result of reduced PTR was reported as excellent 77 percent of the time and good 23 percent of the time. Ninety-five percent of the classroom teachers reported being very satisfied with reduced PTR (see Table 52). These figures remained relatively consistent throughout the three years of the grant, with teacher satisfaction reported higher during the final year.

Table 52. Site D Teacher Rating of Class Climate and Class Behavior During Whole-Class and Reduced PTR time, Overall Rating of Academic Achievement as a Result of Lower PTR, and Teacher Satisfaction with Lower PTR

Weekly Class Description	Poor	Fair	Good	Excellent
Class climate with reduced PTR	0%	0%	31%	69%
Class climate whole class	0%	16%	64%	20%
Class behavior with reduced PTR	0%	1%	46%	53%
Class behavior whole class	1%	27%	59%	13%
Academic achievement as a result of reduced PTR	0%	0%	23%	77%
Teacher satisfaction with Reduced PTR	Very Satisfied 95%	Somewhat Satisfied 5%		Not Satisfied 0%

Teachers and administrators admit that small classes are no panacea for troubled and disruptive students. However, behavior is substantially improved in class, and the quality of student-teacher interaction time is enhanced. All teachers agreed that keeping students on-task (uninterrupted time spent on productive learning activities) and engaged in learning, with sufficient attention to meet their individual needs, goes a long way toward improving behavior. Statements made by parents, observations of the evaluator, and behavior records kept by the principal all support these findings. The reports on behavior are exclusively for in-class behavior and do not represent students' behavior during recess, lunch, or on the bus before or after school.

The kids like the attention, even in the sixth-grade. One child came in new to the school very frustrated and withdrawn. While he still has trouble with academics, he participates and works hard. **(Sixth-grade teacher)**

Goal 7: Increasing the use of technology to enhance programs and provide enrichment opportunity

Computers are like a pencil to these students: another tool for learning **(First-grade teacher)**

Teachers unanimously agreed in 1995-96 that technology had been integrated into the overall curriculum and provided abundant enrichment opportunities. As Site D ended its third year of immersion in technology, the skill and comfort level with computer use among the students and teachers were dramatically higher than in the 1993-94 school year. Several teachers had no prior experience with computers and, lacking familiarity, initially resisted using them for instruction. As the project progressed and staff development opportunities were made available, attitudes toward computers changed. Also, a weekly computer night, staffed voluntarily by a teacher and aide, provided parents the opportunity to familiarize themselves with the existing technology. Students, with their unreserved approach to technology, became pragmatic resources for staff as well as for newly enrolled students.

The following statements are samples of classroom teachers' descriptions of their increased use of technology:

- My class has done electronic portfolios, HyperStudio, state research projects, and each made a tri-fold brochure for their state on HyperStudio. We have been integrating technology with every area of the curriculum using the lab and computers in the classroom. If there has been a positive change in the students' attitude toward school, it's been due to the use of technology. When we talk about a project, the kids can't wait to be left alone to get going on it. **(Fourth-grade teacher)**
- It is an understatement to say "yes." I was originally shy of the undertaking, but now I am so excited about it all. We can work on the programs and I am on the road to accomplishing so many things. The grant and technology helps me get over the feeling that I didn't have to know it all before we got started. **(Sixth-grade teacher)**

- Opportunities for use in kindergarten are so varied; we use it more here than in other grades. I have 6 computers in my room, and I use them for language and math enrichment and reinforcement. Just knowing how to operate the computers gives the students tremendous confidence. At this age kids are either hesitant to use the computer or they are just going to hit at the keyboard and assume things will come out right. Here they learn specific features of the computer and how to log on, select fonts, and pull up their own disks. At this time of the year, spring, they may ask to go to the bathroom during computer time but not for help with the computer. **(Kindergarten teacher)**
- With the help of parent volunteers, the students are publishing the stories they write. They usually begin a story outline in the lab, and back in the classroom they begin the writing. These kids know how to navigate the technology; they have the language to figure it out and feel very comfortable with it all. For the kids coming in new to the school, I see a big difference in their approach to computers, but they catch up so fast when they help each other. The computer definitely augments the range of learning style in the classroom. **(First-grade teacher)**
- We have had invaluable technology training. Without our training the kids couldn't do half of what they do. While some kids know far more than I know, the learning has a chain reaction, and the teacher is a critical part of it all. Here, the kids love the alpha smarts; they use them for notes, chapter reviews, and typing their own essays. It is just overwhelming. **(Third-grade teacher)**
- The classroom teacher has a very difficult time matching the needs of a broad range of students. With technology, the students who are advancing fast have the opportunity to extend themselves and go on. The students who are struggling to meet the criteria within the regular classroom, with inclusion as a model, have the opportunity to use the computer as a tool, especially when their fine motor ability is so poor. They can type their papers, and they look just as good as anybody else's. In math, with mastery development, math fast track, and drill and practice, basic memorization of math facts have to be in place. The computer is a patient teacher who goes over and over these facts with the child, providing instant feedback and enough entertainment so they don't get bored. **(QUEST/technology specialist)**

Goal 8: Training teachers in strategies for improving instruction

Staff Development

Staff development was an integral part of Site D's strategy for improving student achievement, attitude, and behavior and for increasing parental involvement and participation in their children's education. A comprehensive training component was in place for parents and teachers to increase and improve their understanding and implementation of changing educational practices.

The following is a sample of training sessions staff members at Site D participated in since the 1993-94 school year.

Introductory Training

- Total quality management
- Grant requirements
- Successful team building
- Technology (ClarisWorks)
- Technology (curriculum for computer labs)
- Language arts software, network programs, and CD-ROMS
- Language arts thematic and interdisciplinary integrated instruction
- Technology and mastery math
- Technology authentic assessment in language arts
- Language arts curriculum and software review
- Small group strategies
- Language arts literature circles and technology (CD-ROM)
- Technology (UACN, E-Mail, Internet)

District In-Service

- Technology: Preparing Young Americans for the 21st Century
- School Goals: Assessment techniques, collaboration, and technology
- Development of portfolio standards throughout the school
- Development of grade-level standards for word processing
- Electronic portfolio assessment

Teachers' In-Service training

- Language arts curriculum design
- Cooperative learning
- Reading, writing, and math integration
- Alaska reading conference
- Integrating technology into the curriculum
- Reading recovery
- Apple computers of tomorrow
- Technology integration
- Cooperative learning follow-up
- MECC software demonstration
- Peakview Elementary School in Colorado: an Education and Technology Model School
- Young children and literacy
- Early childhood education and motor development
- Technology planning
- Lego Dacto Technology workshop
- Visit to Idaho technology schools
- Electronic portfolio training
- Technology and Learning Conference in Atlanta
- Alaska State Math and Science Conference

Principal's In-service Training

- Total quality management
- Manager's role as coach
- New schools of thought
- Rigorous and relevant curriculum
- Introductory and on-going training for Hyper Studio
- Alpha Smart training
- Technology tips provided by staff (on-going)
- Training on use of spreadsheets
- *Skills for Excellence* in- service
- Several teachers attended Alaska State Technology Conference. The principal and "technology specialist" presented: *One Solution—Three-Year Technology Plan*
- Visual Math training for 4th through 6th-grade teachers
- All-day grant training with K-3 teachers
- Nancy Norman on math assessment
- Mary Laycock on math manipulatives for use in the classroom
- Intervention skills for at-risk students

Other District training opportunities

- NWREL Partnerships in Learning conference in Seattle
- NWREL Alternative Assessment workshop in Portland.

›rs

'he special education tutors, including special service teachers and Chapter One aides, assisted the ›ecial needs children either in the classroom or in "pull out" situations, where they were removed 'om the classroom and taught in small groups with other special needs students. This extended use of :source personnel helped the classroom teachers reduce the PTR and assist special needs children in assrooms with their peers. The tutors were accountable to the regular classroom teacher and became volved in team teaching by working with regular as well as special education students. While they ere able to assist with small-group instruction in the classroom, their main focus was attending to the udents qualifying for the special services.

nology

efer to Question 1, Goal 7)

›w did the class size reduction and the instructional innovation affect measured 'anguage arts d mathematics achievement?

›arative Data on Student Achievement

e of the principal goals of the *Elementary School Class Size Reduction Pilot Project* was to improve dent learning in math and language arts. Since students presumably learn in virtually any school gram, the relevant question is whether the rate of student learning under each school's project was her than it would have been had the project changes not been made.

cannot know how much students in the *Elementary School Class Size Reduction Pilot Project* ıld have learned had they not been in a project classroom. Our best sources of comparison are lents in other classrooms or other schools. Yet these students may benefit from other, unmeasured ructional innovations. Other students may also differ from project students in ways that cause them :arn at different rates, or they may begin their formal schooling at different levels of knowledge. ıatever comparison groups we use, then, will be imperfect. We think the best comparison group to ıs that composed of other students in the United States. We wanted to see if students in the *nentary School Class Size Reduction Pilot Project* improved their level of academic achievement · time, relative to other students in the United States.

ompare the academic achievement of project students with U.S. students, we used tests of :vement that are applied nationally for students in second through sixth grades and individually inistered norm-referenced and diagnostic tests for students in kindergarten and first grade. The : tests used to determine academic achievement are:

:owa Tests of Basic Skills ITBS)	These multiple choice tests are the most widely used measures of academic achievement in math and language arts. It is possible to compare individual student scores with the distribution of scores nationally.
'eabody Picture 'ocabulary Test (PPVT)	These individually administered norm-referenced tests are are designed primarily to measure a subject's receptive (hearing) vocabulary for Standard American English. The test provides an estimate of a student's verbal ability, and in this sense it is an achievement test since it shows the extent of English vocabulary acquisition.

KeyMath — These are individually administered diagnostic inventories of essential mathematics designed to provide a comprehensive assessment of a student's understanding of basic concepts and application of mathematics. Basic concepts assesses the foundation of knowledge upon which all of elementary mathematics is based. Applications assesses the use of knowledge and computational skills.

The Iowa Tests of Basic Skills is a measure of student achievement. The major advantage of the Iowa Test of Basic Skills is that it is the most widely used measure of academic achievement in language arts and mathematics. With these multiple choice tests, it is possible to compare individual student's scores with the distribution of scores nationally.

The Peabody Picture Vocabulary Test (PPVT) and KeyMath assessments were selected by consensus of the project coordinators, the project evaluator, and the Department of Education. Both tests are regarded as appropriate for providing a general overview of primary students' academic achievement in language and mathematics.

To provide a baseline measure of student achievement, we worked with the school district to arrange for project students in grades 2-6 to take the Iowa Test of Basic Skills (Form K) in October 1993 and another version of the test in April 1994 and 1995 and Winter 1996. The producers of the test, Riverside Publishing, scored the results and provided data tapes for analysis. Students in kindergarten and first grades at Site D were given individually administered norm-referenced and diagnostic tests in the Fall of 1994 and Spring of 1995 and 1996. Classroom teachers administered and scored the tests and ISER performed the analysis of these test results.

The State of Alaska reports statewide and district testing results in terms of national percentile ranks. We used national percentile ranks and grade equivalent to measure the ITBS and KeyMath results of project students relative to all U.S. students. We used percentile rank as a measure of academic achievement for students taking the PPVT. We tracked the math and language arts achievement of individual students in each project school. An analysis of academic growth as measured by these tests for all students and for at-risk students, where numbers of students are sufficient, are analyzed separately. At-risk students are identified as having increased probability for school failure or learning problems by reason of socio-economic factors (qualify for free or reduced-price lunch), special education certification, Chapter One (remedial services in reading and mathematics), or English as a Second Language. A description of these methods of reporting test results follows.

National Percentile Rank — Indicating the percentage of students taking the test nationally who scored lower on the test than the individual student.

Grade Equivalent — Indicating the year and month of schooling of students nationally that corresponds with the student's test performance. By comparing the student's actual grade level (e.g. 4.2 years) with the grade equivalent (e.g. 4.6 years) it is possible to tell if the student is learning at a faster, or slower, or similar rate as students in the U.S. as a whole.

Test results should be interpreted with caution. The period of time between administration of pre- and post-tests for the KeyMath and PPVT was 18 months and for the ITBS 28 months—relatively short periods on which to base conclusions about the impact of the project.

All students in kindergarten through sixth grade at Site D participated in *the Elementary School Class Size Reduction Pilot Project.* Students in kindergarten and first grade were tested using PPVT and KeyMath assessments in Fall 1994, Spring 1995. These same cohorts were given the ITBS in the

Table 60 shows an increase in grade equivalent of eight months on basic concepts and six months on applications for at-risk students.

Table 60. Site D KeyMath Grade Equivalent At-Risk Students

KeyMath		GRADE EQUIVALENT	
		Basic Concepts	Applications
School	No. Students Tested	Mean Change	Mean Change
Site D	31	.8	.6

Table 61 shows the national percentile rank of PPVT test results for kindergarten and first grade students. Results show the percentile rank increased for both grades.

Table 61. Site D PPVT Percentile Rank All Students

PPVT			PERCENTILE RANK	
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95
Site D	K	47	48	55
	1	52	53	59

At-risk students in kindergarten and first grade demonstrated an increase in national percentile rank. (See Table 62.)

Table 62. Site D PPVT Percentile Rank At-Risk Students

PPVT			PERCENTILE RANK	
School	Grade Cohort	No. Students Tested	Fall 94	Spring 95
Site D	K	25	28	39
	1	17	28	43

On average, national percentile rank for the second, third and fourth grade cohorts increased in all areas from Fall 1993 to Winter 1996. The fourth grade cohort increased 20 points in math, 25 points in reading and 28 points in language arts. (See Table 63.)

Table 63. Site D ITBS National Percentile All Students

ITBS			NATIONAL PERCENTILES								
			Math			Reading			Language Arts		
School	Grade Cohort	No. Students Tested	Fall '93	Spring '95	Winter '96	Fall '93	Spring '95	Winter '96	Fall '93	Spring '95	Winter '95
Site D	2	32	71		76	54		67	58		63
	3	34	56		67	55		73	47		66
	4	38	65		85	51		76	44		72
	5	32	53	70		52	62		47	65	

Table 64 shows the national percentile rank of at-risk students for all students at Site D. On average, the national percentile rank from Fall 1993 to Winter 1996 increased 21 points in math and language arts and 12 points in reading.

Table 64. Site D ITBS National Percentile At-Risk Students

ITBS		NATIONAL PERCENTILES					
		Math		Reading		Language Arts	
School	No. Students Tested	Fall 93	Winter 96	Fall 93	Winter 96	Fall 93	Winter 96
Site D	24	39	60	29	41	29	50

Students at Site D demonstrated an increase in math grade equivalent. The mean change from Fall 1993 to Winter 1996 for the second grade cohort, was three years, six months; the third grade cohort, three years, two months; and the fourth grade cohort, three years, one month. (See Table 65.)

Table 65. Site D ITBS Grade Equivalent Mean Change All Students Math

School	Grade Cohort	No. Students Tested	Fall '93	Spring '95	Winter '96	Mean Change Fall 93-Spring 95	Mean Change Fall 93-Winter 96
Site D	2	32	2.7		5.9		3.6
	3	34	3.5		6.6		3.2
	4	38	4.9		9.6		3.1
	5	32	5.6	8.7		3.1	

Students at Site D demonstrated an increase in reading grade equivalent. The mean change from Fall 1993 to Winter 1996 for the second grade cohort was two years, nine months; the third grade cohort, three years, four months; and the fourth grade cohort, three years, nine months. (See Table 66.)

Table 66. Site D ITBS Grade Equivalent Mean Change All Students Reading

School	Grade Cohort	No. Students Tested	Fall '93	Spring '95	Winter '96	Mean Change Fall 93-Spring 95	Mean Change Fall 93-Winter 96
Site D	2	32	2.7		5.5		2.9
	3	34	3.6		7.0		3.4
	4	38	4.4		8.5		3.1
	5	32	5.6	7.6		2.0	

Students at Site D demonstrated an increase in language arts grade equivalent. The mean change from Fall 1993 to Winter 1996 for the second grade cohort, was two years, nine months; third grade cohort, three years, six months; and the fourth grade cohort, four years, seven months. (See Table 67.)

Table 67. Site D ITBS Grade Equivalent Mean Change All Students Language Arts

School	Grade Cohort	No. Students Tested	Fall '93	Spring '95	Winter '96	Mean Change Fall 93-Spring 95	Mean Change Fall 93-Winter 96
Site D	2	32	2.5		5.3		2.9
	3	34	3.4		7.0		3.6
	4	38	4.1		8.9		4.7
	5	32	5.4	8.5		3.1	

At-risk students at Site D showed an average increase in grade equivalent. The mean change from Fall 1993 to Winter 1996 in math was three years, one month; in reading, two years, four months; and in language arts, two years, nine months.

Table 68. Site D ITBS Grade Equivalent Mean Change At-Risk Students

ITBS School	No. Students Tested	GRADE EQUIVALENTS Math Mean Change Fall 93-Winter 96	Reading Mean Change Fall 93-Winter 96	Language Arts Mean Change Fall 93-Winter 96
Site D	24	3.1	2.4	2.9

6. How are parent involvement, teacher satisfaction, and student attendance affected by the class size reduction and associated innovations?

Parent Involvement: (Refer to Research Question 4)

Teacher Satisfaction and Student Attendance: (Refer to Research Question 1, Goals 5 and 6)

7. How can this project be replicated at other elementary sites?

The following statements are recommendations from parents, teachers, and support personnel to elementary schools considering implementing strategies that allow for periods of reduced pupil-teacher ratio without significantly adding to the cost of education:

- Technology works to individualize and improve instruction, but a school must make a long-term commitment supported by sufficient funds for equipment, training, and maintenance.
- Invest in quality technology training and invite parents to participate in the training.
- Let loose of traditional teaching practices. Encourage and support teacher interaction within the school, within the district, and at other schools working toward implementing innovative instructional practices.
- In order to let go of traditional teaching practices, teachers need to see new methods in action. They should visit schools, observe in classrooms, and talk to teachers about how they worked through their changes.
- Use specialists in the classroom at the primary level (resource personnel, music teacher, librarian etc.).
- Make a long-term commitment to change.
- Look closely at parallel block scheduling; this idea alone is terrific and the small-group time is invaluable.
- Implement varied grouping in the classroom environment.
- Use study buddies (older students working with younger students); this works great for both age groups.
- The role of the principal is critical. If the principal is not an instructional leader in authority and academics and well-respected, any change will be difficult.

- An estimated 75% of teacher training expenditures were used to startup the program. Once the program was established only 25% of these funds would be required. Therefore, teacher training was calculated at a 25% rate.
- Administration/clerical expenditures were used to perform grant administrative tasks and therefore were considered project and program costs.
- During the first two fiscal years specialized and/or interactive teaching aids were purchased. They were considered startup expenses. Therefore, the expenditures for supplies during the last fiscal year was used in calculating annual program supply costs.
- Capital equipment purchases (computer purchases) were assumed to have a use-life of eight years.

SUMMARY

Site D successfully implemented all of its proposed strategies and met all of its goals under the *Elementary School Class Size Reduction Pilot Project*. End-of-the-year evaluations and interviews with parents, teachers, and students reported increased academic achievement, improved attitude and behavior, teacher innovation, and parent involvement. The most significant features at Site D were parallel block scheduling and increased technology. Teacher innovation followed in importance as the periods of reduced class size and staff development provided the critical supports to successfully implement changes in teaching and learning.

The extensive involvement of staff and parents at every stage of the grant, starting from the development of a vision for the school improvement plan to the numerous committees set up to deal with conflicts and controversies, assured a shared ownership and responsibility for project outcomes. Teachers credit the instructional leadership from the principal and the increase in professional interactions with staff as significant contributors to overall satisfaction with the project.

Some concerns reported throughout the three years of the grant included increased length of the school day for teachers, increased amount of planning time and general paperwork, a lack of flexibility in daily class schedules, and the community perception of disproportionate funding among district schools. These concerns were secondary in comparison to the benefits teachers and parents observed over the three years of the grant, including increased computer literacy for parents, teachers, and students; occasions to debate and review educational practices; decrease in discipline problems in the classroom; improved creativity and collaboration; and opportunities to get to know parents and students on a more personal level.

Communication and documentation of the grant implementation at Site D have been extensive, with all teachers reporting "thinking logs" to the principal. These logs described the impact and outcomes of changes in their classrooms. The reports, summarized and distributed weekly among all faculty and staff, served to bond the participants, encourage self-evaluation, and improve the grant to better meet individual and group needs.

The staff at Site D successfully met their initial class size goals. They are proud of their accomplishments and, with the support of the community and parents, are working to make the transition to pre-grant funding and redistribute existing resources to maintain some of the more critical and cost-effective approaches to improving instruction.