THE STATE OF TENNESSEE'S
STUDENT/TEACHER ACHIEVEMENT RATIO (STAR)
PROJECT

TECHNICAL REPORT

1985 - 1990

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DEDICATION

This project is dedicated to the Kindergarten through Third Grade teachers of the State of Tennessee. A stellar star among these teachers was the late Peggy Douglas Nabors. Her genial temperament, her love for children, her persistent claim that small classes are in the best interest of children everywhere, and her gracious good-will in expending her energies in classes too large have given inspiration and hope to the writers of this project -- hope that the information contained within these pages will make a positive difference in the educational future of Tennessee's children.

Helen Pate-Bain

FOREWORD

This report presents the results of Tennessee's four-year longitudinal class-size project: Student Teacher Achievement Ratio (STAR). This longitudinal study analyzes student achievement and development in three class types: small classes (13-17 students per teacher), regular classes (22-25 students per teacher) and regular classes (22-25) with a full-time teacher aide.* Project STAR followed students from kindergarten (K) through grade 3, starting in 1985-86 with K and ending in 1988-89 with third grade.

Project researchers collected and analyzed data to answer questions mandated by the legislation and other questions of interest to the project. The primary data analysis was conducted each year by Dr. Jeremy Finn, consultant to Project STAR.

The complete archive report including copies of all instruments is available at the State Department of Education and the state archives. A magnetic data tape is also available.

*Although in the fall of 1989 the Tennessee State Department of Education, in order to avoid confusion, changed the term teacher aide to instructional assistant, the term aide will be used throughout this report.

I. BACKGROUND AND PURPOSE

A. Background

By the start of his second term, Governor Lamar Alexander had established education as a top priority. In the spring of 1984, the Tennessee State Legislature adopted comprehensive education reform called the Better Schools Program. Although the media gave most attention to the career ladder for teachers, the Tennessee Center for Excellence program provided higher education with a means to work toward improving education in Tennessee. The Tennessee State University (TSU) Center for the Teaching of Basic Skills to Economically and Educationally Disadvantaged began a modest program on the effects of small class size in one Metro Nashville school. The director of that project, Dr. Helen Bain, encouraged the legislature to adopt a reduced class size program statewide. One model for what might be done in Tennessee was a program in Indiana, Project Prime Time, which studied reduced class size in grades K-2.

In the spring of 1985, information about the Indiana and the TSU studies was shared with the Tennessee State Board of Education Chairman and staff and the members of the House and Senate Education Committees. Steve Cobb, a member of the Tennessee House of Representatives, became interested in the issue of the optimum class size in the early elementary grades. The literature, particularly the Glass Meta-Analysis (1982), suggests that class size must be reduced to about 15 to 1 to have a noticeable effect on student achievement. Glass' analysis has been criticized because the type of school and student characteristics in small classes are unrepresentative of the average public school student, and some of the "small classes" were tutoring groups (Educational Research Service, 1980). Because the research results were not conclusive and because the cost of a major reduction in class size would be very large, Representative Cobb wanted the state to conduct a well-designed study of class size before investing in a costly new program. With legislation, House Bill (HB) 544 (see Appendix A), passed in May, 1985, the Tennessee Legislature authorized and funded a major policy study to consider the effects of class size on students in primary (K-3) grades. There was an appropriation of $3,000,000 for the first year of the four-year study.

B. Legislation

In the last ten years there has been some reduction in the average class size in Tennessee. According to the **Tennessee Rules, Regulations, and Minimum Standards** (0520-1-3-.04, p. 28), the student/teacher ratio shall not exceed 25 students per teacher in grades K-3. The average class size in Tennessee in 1985-86 was 22.3 in kindergarten and 23.5 in grade one, not including resource teachers, librarians, and other professional personnel who are often counted in the staff/student ratios. Because reduction of class size is costly, HB 544 calls for a study of the "effects of a reduced pupil-teacher ratio on the achievement of students in public school." The legislation established demonstration centers to be operated by local boards of education throughout the state and in sites described as inner city, urban, suburban, and rural. It was specified that demonstration small classes would have no more than 17 and no fewer than 13 students, and that a variety of models could be "authorized to study and measure the relative effects of providing planning time to teachers, staff development programs..., teacher aides,..." etc. (HB 544).

Section 49-3-405 of the bill explains the purposes of the legislation which include "measuring differences in **achievement** and **development** of pupils in demonstration center classes" (emphasis added). Further, the project evaluation must "encompass the goals established by the General Assembly in section 49-5-5023," Tennessee's Comprehensive Education Reform Act.

C. Background on Class Size

Probably few issues in education have been studied as often as class size, yet few studies have produced satisfactory or consistent results; many have reviewed class-size reductions from 40 to 30, or 30 to 25. There have been few major, controlled class-size studies. There have been even fewer that explored the 1:15 range suggested by Glass, et al. (1978). Before HB 544 and during the study, educators reviewed and summarized the research and continued to collect evidence on the effects of class size. Project STAR personnel built upon the prior research and developed several research summaries for the legislature and for STAR (e.g., Keenan; Doncaster; Bain; Achilles and Moore). Appendix B contains summary reviews of literature and research relating to class size.

D. Organization to Conduct the Study

The Tennessee State Department of Education organized to conduct the legislated study of reduced student/teacher ratio and adopted the name STAR, an acronym for Student/ Teacher Achievement Ratio. The Department employed Elizabeth Word, an experienced elementary principal, as project director and asked personnel from four universities (Memphis State University, Tennessee State University, the University of Tennessee at Knoxville, and Vanderbilt University) to develop the study design, plan the research, analyze the data, and prepare periodic reports of progress for the State Board of Education and the legislature. The State Department of Education retained management and budget control of the project, and the universities had both an advisory and an operational role. Responsibilities for direct contact with the 79 STAR schools (1985-86) were divided among the universities. Personnel from each university supplied assigned schools with information, collected data, and observed testing and other activities. The project director contacted all schools directly concerning administrative and fiscal matters and some research issues.

Thus, the organization to conduct the study consisted of a consortium of persons from the Tennessee State Department of Education, STAR staff, the four universities, and a representative each from the State Board of Education and the State Superintendents' Association. The term "consortium" refers to the total group that guided project activities.

The project was implemented rapidly through a cooperative effort of the consortium. Since the legislation passed in May and schools started in August, key policy, design and operational decisions had to be made very quickly.

The State paid salary costs for the extra teachers required to reduce class size and the project teacher aides and provided modest contracts to each of the four universities in the consortium. Major costs, about 2.5 of the 3 million dollars per year, were for additional teachers and aides in the project. During the third year of the study it was decided to have a follow-up year to collect information about the persistence of STAR achievement gains and to complete the data analysis. Funding for an additional year was requested and the legislature approved $389,500 for this purpose. Annual budgets for the five years are shown in Table I-1. During the first year, major immediate concerns were the development of a design for the overall project, procedures for assignment of students, details necessary for data collection, general operating procedures, etc.

TABLE I-1

Project STAR Expenditures 1985 Through 1990

	1985-86	1986-87	1987-88	1988-89	1989-90
Appropriation	$3,000,000	$3,005,000	$3,009,200	$3,213,446	$ 389,500
Personnel and Benefits	71,500	110,142	120,765	88,948	91,400
Travel	2,600	6,266	6,850	4,885	2,093
Printing	200	444	644	59	1,000
Communication and Shipping	1,900	4,926	4,645	2,093	5,600
Maintenance	600	65	572	215	-0-
Professional Services	146,200	268,733	608,249	443,463	280,000
Supplies	3,300	3,505	5,740	5,116	4,700
Rentals and Insurance	4,100	1,606	2,126	1,046	4,800
Teacher and Aide Salaries	2,181,400	2,578,904	2,229,468	2,690,107	-0-
Total Expenditures	**$2,411,800**	**$2,974,591**	**$2,979,059**	**$3,235,932**	**$ 389,500**

E. Questions to be Answered by the Demonstration and Study

1. Information from the Legislation

The legislation initiating Project STAR specified some basic questions and issues which the project should answer. The primary question came from the legislation's purpose, "...to study the effects of a reduced pupil-teacher ratio on the achievement of students in public school...." The project was "to make a longitudinal study of the relative effects of reduced pupil-teacher ratio on the achievement of pupils." The legislation specified that the small class size in the demonstration would be between 13 and 17 students for students in kindergarten in 1985-86; for these same students in the first grades (1986-87); for these same students in the second grade (1987-88); and in 1988-89 for these same students in the third grade.

The legislation required that participating schools represent different geographic regions and different kinds of communities (i.e., rural, urban, suburban, and inner city) and suggested that the study should also assess "relative effects" of reduced pupil-teacher ratio in varying school environments. The legislation permitted study of such things as teacher planning time, staff development for teachers, the use of teacher aides, the use of teachers with different levels of experience, and the differential effects of small classes on students from various socioeconomic backgrounds.

2. Questions Required by the Legislation

a. What are the effects of a reduced pupil-teacher ratio (13-17 to 1) on the achievement (normed and criterion tests) and development (self-concept, attendance, etc.) of students in public elementary school, grades K-3? Systematic comparisons are made of test performance among students in small classes, in regular classes, and in regular classes with a full-time teacher aide.

b. Is there a cumulative effect of being in a small class over an extended time as compared with a one-year effect for students in a small class for one year?

c. Does a training program designed to help teachers take maximum advantage of small classes or to use aides effectively improve student performance as compared with teachers who have no special preparation for their altered conditions? Do differences in teacher behavior attributable to staff development increase student learning?

3. Questions Suggested by the Legislation or by Previous Research

a. In which grade is the biggest effect for students in a small class evident?

b. What are the effects on student performance of a full-time aide in a regular class as compared with a regular class without an aide, or a regular class with a part-time aide? How does the performance of students with an aide (where the adult/pupil ratio is lower than in a small class) compare with student performance in small classes? Do certain patterns of use of aides have more effect than others? For example, does use of an aide in direct instruction have more effect than if the aide is used primarily in administration and clerical duties?

c. What are the various cost factors associated with class size reduction and the use of teacher aides?

d. Do teachers modify their teaching when they have small classes or when they have aides? If so, how do they change?

e. Is there a differential effect of small classes or classes with an aide on students from varying Socioeconomic Status (SES) backgrounds?

f. What teacher characteristics are associated with classes that have high achievement?

g. What other factors are associated with high-achieving classes?

h. What are the residual effects of small classes after the end of the project? (This would require follow-up that is not currently planned or funded.)

In July and August, 1985, there were several meetings in which the Commissioner of Education, staff members from the State Department of Education, the Executive Director of the State Board of Education, Representative Steve Cobb, and Senator Douglas Henry discussed the project design and the priorities for data collection. Based on this information, the design in the next section was developed, and a report was made to the State Board of Education at its October, 1985, meeting. During the year, consortium members and members of an external project advisory committee continued to refine the research design, questions and processes.

F. Sample Selection

The project timeline (legislation in May, director appointed in July, schools opened in August) required the consortium to decide upon a design and get students placed quickly. The first task, even while the design was being developed, was to identify school districts and schools to participate in the study. The ideal would have been that all school districts would opt to participate and that all choices (select districts to participate from among all districts in the state, then select schools, teachers, students, etc.) be made randomly.

1. Selection of Project Schools

The legislation specified that the project should include "inner city, suburban, urban, and rural schools" to assess the effects of class size in different school locations. No existing designation of schools used the categories specified above, so the consortium developed designations using various criteria.

Inner-city and **suburban** schools were all located in metropolitan areas. Schools that had more than half of their students on free or reduced cost lunch (indicative of a low-income family background) were tentatively defined as **inner city.** Schools in the outlying areas of metropolitan cities were classified as **suburban.**

In non-metropolitan areas, schools were classified as **urban** or **rural** depending on the location of the school. If located in a town of over 2,500 and serving primarily an urban population (the census definition of urban), the school was classified as **urban.** All other schools were classified as **rural.** All classifications were checked with local school officials to see if they agreed with the designation of their school. The application of these rules led to the classification of schools shown in Table I-2.

In kindergarten there were 17 inner-city schools and 16 suburban schools drawn from four metropolitan areas: Knoxville, Nashville, Memphis, and Chattanooga. Fifteen of the 17 inner-city schools were located in Memphis. There were 8 urban schools that serve non-metropolitan cities and large towns (for example, Manchester and Maryville). There were 38 rural schools.

Schools were spread across the state, not clustered in one section. The Commissioner of Education invited all Tennessee school systems to participate and sent guidelines for participation to each local system. These guidelines indicated that the state would cover additional costs for project teachers and teacher aides, but that local systems would furnish any additional classroom space needed. The project schools would not receive any special considerations other than class size--the students would use the regular district or school curriculum, supplies, texts, etc. There should be no major changes in process, organization, etc, other than class sizes. Schools should plan to remain in the project for four years; the project would start in kindergarten in 1985-86 and follow students successively through grades one, two and three.

TABLE I-2

Project STAR Schools by School Type
Kindergarten Through Grade 3 (1985-1989)

	Kindergarten	Grade 1	Grade 2	Grade 3
Inner City	17	15	15	15
Suburban	16	15	15	15
Rural	38	38	38	38
Urban	8	8	7	7
Total	**79**	**76**	**75**	**75**

All participating teachers had to be certified for the grade level they were teaching. Schools had to agree to the random assignment of teachers and students to the different class conditions. Initially, 180 schools in about 50 of the state's 141 school systems expressed interest in participating. Only about 100 schools had enough students in kindergarten (a minimum of 57) to meet the size criterion for participation. The size criterion was necessary because the project utilized a "within-school" design. The final selection of schools was based on (a) including at least one school from each district that had volunteered and (b) including enough schools from all four school types and all three regions of the state to permit comparisons between school types, as specified in the legislation. After discussion and negotiation, 79 schools in 42 systems became participants in the first year. The goal was to have approximately 100 small, 100 regular, and 100 regular with aide classes. This objective was met. In the 1985-86 year, the project had 128 small classes (approximately 1,900 students), 101 regular classes, (approximately 2,300 students), and 99 regular classes with teacher aides (approximately 2,200 students).

2. Selection of Comparison Schools

In addition to the project schools, information was needed about the performance of a comparable group of students whose teachers were carrying out the regular school program in average-size classes. Sometimes an experiment in a school will affect all students and all teachers. The use of a comparison group helped researchers to identify such effects. The superintendent of each system having project schools was asked if non-STAR elementary schools would administer the same tests used in STAR schools to provide comparison scores. Seventeen systems identified 39 possible comparison schools. Twenty-two schools with 51 regular classes and approximately 1,100 students became a comparison group. The 22 comparison schools, drawn from 17 STAR school systems, administered the same tests that the project schools administered. Comparison schools allowed STAR researchers to check on the possibility that project schools were influenced by the Hawthorne Effect.

G. Project Schools and Statewide Averages

Since selection of STAR districts was not random, it was important to see how the STAR districts compared to the averages for non-STAR systems on some key variables. The average system size of STAR schools was larger than the size for non-STAR groups since Memphis, Nashville and Knoxville--the largest systems in the state--participated. Project STAR schools were larger than the state average since small schools were excluded by the nature of design.

Researchers collected information on the project schools' expenditures per pupil, pupil/teacher ratios, teacher education levels, and student test achievement and compared these with statewide averages to check the representativeness of the STAR sample. Project STAR systems were similar to the statewide system average on most variables (Table I-3) except system size.

The 1985-86 data show that regular kindergarten classes in STAR schools were slightly, less than one student, larger than the statewide class size in kindergarten. Resource measures, including teacher salaries, per-pupil expenditures, and teacher preparation were available at the system level but not at the individual school level. Project STAR systems include Metro Nashville and Memphis which spend substantially more than the state average per pupil and pay their teachers higher salaries than the state average. The STAR system per-pupil expenditures were about 6 percent higher than the state average, and teacher salaries were about 3 percent higher. (See Table I-3.)

TABLE I-3

Teacher Salaries, Per-Pupil Expenditures, and Teacher-Pupil Ratios State Average and Project STAR School Systems Average

Item	STAR Average	State Average
Per-Pupil Expenditure (1986-87)	$ 2,724	$ 2,561
Average Teacher Salary	$ 23,168	$ 22,627
Average System Size	8,462	4,202
Teacher-Pupil Ratio Kindergarten (1985-86)	22.7*	22.3
Percent of Teachers with Master's Degree or Higher (System Figures)	42	40

*Based on regular-sized STAR classes

Note: Project STAR systems are weighted by the number of students or teachers from each system who are participating in the project.

A comparison of test scores for grade-two students in project schools, the comparison schools, and the statewide average (see Table I-4) indicated that project schools had scores lower than the state average and the average of the comparison schools. These differences reflect the higher proportion of inner-city schools in STAR; students in inner-city schools scored 10 to 12 points lower on the average than students in suburban schools. Differences in scores among urban, rural, and suburban schools were smaller. The comparison schools did not include any inner-city schools. STAR schools in the same systems with comparison schools scored slightly (not significantly) higher than the comparison schools.

TABLE I-4

Reading and Math Scaled Scores, Stanford Achievement Test
Project STAR, Grade 2 (Spring 1986)
Selected Comparisons

	Math	Reading
State Average for 2nd Grade	572	582
All Project STAR Schools	566	578
Comparison Schools	577	587
STAR Schools (Same Systems as Comparison Schools)	579	590

H. Data Collection Plan and Data Base

A major first-year task was to plan and implement a comprehensive data collection plan for the first and subsequent years. The design and data formats allowed researchers to follow individual students for four years. Subjects were assigned individual identification numbers. Data were collected for students, teachers, principals, teacher aides, schools, and systems (see section II-E). Each child in the appropriate grade in comparison schools received an identification number and information was collected about race, sex, age, free or reduced lunch (one indicator of socioeconomic status), and test scores.

In seeking information about why a small class might affect student learning, researchers collected data about how teachers teach, about student-teacher interactions, etc. Data were also collected on factors that might affect the results: the number and distribution of special education children, pull-out programs, and adults other than the teacher who participate in the instructional program. Appendix C contains a list of instruments and copies of the data collection forms as well as descriptions of the standardized tests.

I. General Operating Guidelines

Two general guidelines helped project personnel with operational decisions.

1. Participation in STAR would not cause any child to receive fewer services than if the child/school did not participate. (Participation in STAR would not put any child "at risk" in any way.)

2. STAR would not dictate changes (e.g., curriculum, materials, schedule) to the school; STAR efforts would work within the regular school framework (with the exceptions of student and teacher assignment, ability grouping across classes, testing, etc.) as much as possible. STAR would minimize disruptions to the school's regular routine. Schools would maintain the random assignments, and basic instruction would be carried out primarily in the classes to which students were assigned.

J. Teacher Orientation

Orientation sessions were conducted for teachers at 20 schools entering the project in kindergarten. The orientation idea was later refined and used for all principals and all teachers entering the project. The person conducting the orientation described the project, its purposes and processes, and answered questions. The orientation process for new teachers entering the project at each grade level was also expanded after the first year and made more comprehensive.

K. The Advisory Committee and External Assistance

Two nationally recognized experts on class-size research and measurement served as an external review and advisory committee. They were Dr. Doris Ryan of the Ontario Institute for Studies in Education and later at St. Johns University, New Brunswick, who has extensive experience in the conduct of class-size studies, and Dr. Roy Forbes of East Carolina University (and later at the University of North Carolina, Greensboro) and former director of the National Assessment of Educational Progress. Several researchers from Memphis State University, Tennessee State University, the University of Tennessee, Knoxville and Vanderbilt University reviewed the project's design and the work plans and suggested ways to improve the design. As a result of their suggestions, the comparison schools were added to the design. The consultants reacted favorably to the within-school design and the study plans. Dr. Jeremy Finn, a nationally acclaimed educational statistician from the State University of New York at Buffalo, assumed responsibility for primary analyses of class-size effects for each year of the project.

L. Scope of Project STAR

The STAR data base is extremely large and there have been and will continue to be many opportunities for different and expanded analyses using all or different portions of the data. The analyses could employ different methods or statistics and even different basic designs (e.g., using student level vs. class level data). The heart of the STAR Final Report is built around class-level data as analyzed by the external consultant, Dr. Jeremy Finn.

Numerous papers have been developed and presented at national, regional, and state meetings and conferences. Some articles based on STAR data and concepts have been disseminated. These and other detailed papers and reports are available from Tennessee's Assistant Commissioner of Curriculum and Instruction, Project STAR, Tennessee State Department of Education, Cordell Hull Building, Nashville, Tennessee 37243-0379.

II. STUDY DESIGN

A. Introduction

The STAR design had to provide answers for questions required by the legislation, meet requirements for a longitudinal study, review one-year or cross-sectional effects of the treatment, and answer questions of interest. Two key design decisions were to have a within-school design and random assignment of both teachers and students to class types. STAR was a randomized experiment conducted In situ. The control-group design was Campbell and Stanley (1963) Design Number 6, a randomized experiment employing post-test analysis only. The primary analysis was built on post-test only design. Additional analyses employed other analytic models.

B. Choice of Within-School Design

Because of potentially large differences between schools (i.e., school effects) in such items as resources, teachers and students, the consortium chose a within-school design. A within-school design reduced major sources of possible variation in student achievement attributable to school effects. This decision required that each school have sufficient enrollment in each grade (at least 57 students) to provide at least one small (13-17 enrollment), one regular (22-25), and one regular with a full-time aide (22-25) class. In schools with larger enrollments, additional classes were established. This design assured that there would be the same kinds of students, curriculum, principal, policy, schedule, expenditures, etc., for each class type by school and avoided the problem of control groups that were not motivated to attend carefully to project needs since they probably would gain nothing by remaining in the project. In the within-school design the control classes participated fully in all testing, etc., since it was part of the project. An entire project school might do better than expected due to project participation (the halo or Hawthorne effect). Reciprocally, it was also possible that competition could occur within the school whereby the control teacher(s) would work extra hard (the John Henry effect).

After initial selection of participating systems, the choice of schools within systems was partly a function of school size. Grade-level enrollment determined the number of classes of each type established in each school. For example, the 79 schools selected to participate in Project STAR (kindergarten) provided enough classes (small, regular, regular w/aide) to meet the design estimate of approximately 100 classes of each type.

C. Selection into the Three Conditions

The 79 project elementary schools selected in the first year served rural, urban, suburban and inner-city students. The within-school design required each participating school to have three or more classes. Larger schools had more classes distributed among the three class types. Table II-1 shows the design configurations for establishing classes in schools of various sizes. A student in a small class in kindergarten remained in the small class for grades one, two and three, to assist the measurement of cumulative effect of the class type. In kindergarten (1985-1986), there were 128 small classes, 101 regular classes, and 99 regular classes with full-time teacher aides. Approximately 6,500 students participated in Project STAR in kindergarten.

TABLE II-1

Plan for Distribution of Students and Classes in Within-School Design: Project STAR (1985-1986)

Design Type	Enrollment (ADM)	Classes (N)	Class Types	Extra Room Needed
One	57-67	(3)	S,R,R/A	No
Two	68-78	(4)	S,S,R,R/A	Yes
Three	79-92	(4)	S,R,R/A,R/A or S,R,R,R/A	No
Four	93-109	(5)	S,S,R,R,R/A or S,S,R,R/A,R/A	Yes
Five	110-134	(6)	S,S,R,R,R/A,R/A	Yes
Six	135+	(7+)	Individually Designed	Yes

S=Small Class (1:13-17);R=Regular Class (1:22-25);
R/A=Regular Class with a Full-time Teacher Aide (1:22-25)

The plan described in Table II-1 was used to govern the selection of class condition throughout the study. Once assigned to a class type a student was to remain in the assigned class type as long as he/she was in the project. Due primarily to teacher-identified discipline problems and some parent complaints, the STAR consortium had to revise this procedure after the kindergarten year. Since there were no differences on any measure for students in regular and regular with aide classes, students who had been in these class types in kindergarten were reassigned randomly within the two class types for first grade. The external advisory committee informed STAR that this interchanging could create problems in conducting longitudinal analysis. Therefore, first grade was the only grade in which students in regular and regular with aide classes were permitted to interchange. No further changes were made after first grade. Table II-2 lists STAR schools and systems and shows the location designation and class type design for kindergarten through third grade. Figure II-1 shows how the participating schools were distributed across the state. Table II-3 shows the number of schools and students by location for each year of the study.

D. Modifications in Study Design

In a large-scale field project some changes occur that cannot be anticipated. Schools may drop out of the project; classes will gain or lose students; and in some cases these changes will make a class too small or too large for the design. The researchers took these possibilities into consideration by over designing the project. A power test at the beginning of the project indicated that it would be possible to detect a small achievement difference (3% or more) with only 80 classes of each type, or a total of 240 classes, rather than the 329 that actually participated. At the end of kindergarten, 34 classes had either too many or too few students for

the original design (e.g., a small class may have ended up with 12 students rather than staying within the 13-17 range). Data were analyzed both including and excluding the 34 classes and results of both analyses were substantially the same. Oversampling was necessary because of the expected attrition of students and schools over the project's four years.

TABLE II-2

Project STAR Systems, Schools, and Designs Kindergarten through Third Grade (1985-1989)

		Design			
System	School	Kindergarten	1st Grade	2nd Grade	3rd Grade
		SRA	SRA	SRA	SRA
Bedford	Thomas Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Bledsoe	Pikeville Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Blount	Bungalow Elem.	1-1-1	Withdrawn	Withdrawn	Withdrawn
Blount	Midsettlements	1-1-1	2-1-1	2-1-1	2-1-1
Blount	Rockford Elem	1-1-1	2-1-1	2-1-1	2-1-1
Chester	East Chester Elem.	2-2-1	2-2-2	2-2-2	3-1-2
Claiborne	Ellen Myers Elem.	2-1-1	1-1-2	1-1-2	1-1-2
Claiborne	Tazewell (TNT) Elem.	2-2-2	2-2-2	2-1-2	2-1-2
Clay	Celina Elem.	2-1-1	2-1-1	2-1-1	2-1-1
Coffee	North Coffee Elem.	1-1-1	1-1-1	2-1-1	2-1-1
Cumberland	Homestead Elem.	1-1-1	1-1-1	2-1-1	2-1-1
Cumberland	Crossville Elem.	2-1-2	2-1-2	2-1-2	2-1-2
Davidson	Rosebank Elem.	1-1-1	2-1-1	2-1-1	2-1-1
Davidson	Hattie Cotton Elem.	1-1-1	2-2-1	2-1-1	2-1-1
Davidson	Cole Elem.	3-2-2	3-5-4	3-4-4	3-2-4
Davidson	Andrew Jackson Elem.	1-1-1	2-2-1	3-1-1	3-1-1
Decatur	Parsons Elem.	2-1-1	1-1-2	1-1-2	2-0-2
Dyer	Newbern Elem.	1-1-1	1-2-1	1-2-1	1-2-1
Fentress	York Elem.	2-1-1	2-1-1	2-1-1	2-1-1
Hamilton	Daisy Elem.	2-1-1	1-1-2	1-1-2	1-1-2
Hamilton	Ganns-Mid Valley	2-1-1	1-2-1	1-2-1	1-2-1
Hamilton	Soddy Elem.	1-1-1	2-1-1	2-1-1	2-1-1
Hancock	Hancock Central Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Hardin	Parris South Elem.	2-1-1	2-2-1	2-2-1	3-1-1
Hardin	Savannah North Elem.	1-1-1	1-1-1	2-1-1	3-0-1
Humphreys	Waverly Elem.	2-2-2	3-2-2	3-2-2	3-2-2
Jefferson	Jefferson Elem.	2-2-1	2-2-1	2-2-1	2-2-1
Jefferson	White Pine Elem.	1-1-1	1-1-1	2-1-1	2-1-1
Knoxville	Alice Bell Elem.	1-1-1	2-1-1	2-1-1	2-1-1
Knoxville	Bearden Elem.	2-1-1	Withdrawn	Withdrawn	Withdrawn
Knoxville	Rocky Hill Elem.	2-1-1	1-1-1	2-1-1	2-1-1
Knoxville	Sara Moore Greene	2-1-1	1-1-1	2-1-2	2-1-2
Knoxville	Green Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Lawrence	South Lawrence Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Lawrence	Lawrenceburg Elem.	2-1-1	2-1-1	2-1-1	2-1-1

TABLE II-2 Cont.

System	School	Kindergarten	1st Grade	2nd Grade	3rd Grade
		SRA	SRA	SRA	SRA
Lenoir	Lenoir City Elem.	2-1-2	2-1-2	2-1-2	2-1-2
Lewis	Lewis County Elem.	2-2-2	2-2-2	2-2-2	3-2-2
Macon	Enon Kindergarten	2-2-1	Kindergarten	Only	
Macon	Fairlane Elem. 1-3		2-2-2	2-2-2	2-2-2
Manchester	College Street Elem.	1-1-1	1-1-1	2-0-1	2-0-1
Marion	South Pittsburg Elem.	2-1-1	2-1-1	2-1-1	2-1-1
Maryville	John Sevier Elem.	2-1-1	1-1-2	1-1-2	1-1-2
Maury	Mt. Pleasant Elem.	2-2-1	2-2-2	2-1-2	2-1-2
Maury	Spring Hill Elem.	2-1-1	2-1-1	2-1-1	2-1-1
McNairy	Selmer Elem.	2-2-2	2-2-2	2-2-2	2-2-2
Memphis	Caldwell Elem.	2-1-2	2-2-2	2-2-2	2-2-2
Memphis	Cummings Elem.	2-1-2	2-2-2	2-2-2	1-1-1
Memphis	Double Tree Elem.	1-1-2	2-2-2	2-1-2	2-1-2
Memphis	Douglas Elem. Sch.	1-1-1	2-1-1	2-1-1	1-1-1
Memphis	Florida Elem. Sch.	1-1-1	1-2-1	1-1-1	1-1-1
Memphis	Goodlett Elem. Sch.	1-1-2	2-1-2	1-1-2	1-1-2
Memphis	Gordon Elem. Sch.	1-2-1	1-2-1	1-2-1	1-2-1
Memphis	Hanley Elem. Sch.	2-3-2	3-2-2	3-2-2	3-2-2
Memphis	A. B. Hill Elem. Sch.	2-1-2	2-2-2	2-2-2	2-1-2
Memphis	Kansas Elem. Sch.	1-1-1	1-1-1	1-1-1	2-0-1
Memphis	Larose Elem. Sch.	2-1-2	2-2-2	3-2-2	2-2-2
Memphis	Lester Demo. Sch.	4-3-2	2-2-2	2-1-2	2-1-2
Memphis	Lincoln Elem. Sch.	1-1-1	1-1-1	1-1-1	1-1-1
Memphis	Orleans Elem. Sch.	2-1-1	2-1-1	2-1-1	2-0-1
Memphis	Raineshaven Elem.	2-1-1	2-1-2	2-1-2	2-1-2
Memphis	Raleigh-Bartlett	2-1-1	1-2-1	2-1-1	2-1-1
Memphis	Riverview Elem.	2-3-2	2-3-2	2-2-3	2-2-2
Memphis	Snowden Elem.	2-1-1	Withdrawn	Withdrawn	Withdrawn
Memphis	Westside Elem.	1-1-1	2-1-1	2-1-1	2-1-1
Memphis	Whitehaven Elem.	2-2-1	2-2-1	1-3-1	1-3-1
Montgomery	Montgomery Central	1-2-1	2-1-1	2-1-1	2-1-1
Obion	South Fulton Elem.	2-1-1	1-1-2	1-1-2	1-1-2
Perry	Linden Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Pickett	Pickett Co. Elem.	1-1-1	1-1-1	1-2-1	1-2-1
Rhea	Spring City Elem.	2-1-2	2-2-2	2-1-2	2-1-2
Trenton	Trenton Elem.	2-1-2	2-2-2	Withdrawn	Withdrawn
Trousdale	Trousdale Co. Elem.	1-2-1	1-2-1	2-2-1	3-1-1
Tullahoma	East Lincoln Elem.	2-1-1	1-1-1	2-0-1	2-0-1
Unicoi	Unicoi Elem.	1-1-1	1-1-1	1-1-1	1-1-1
Washington	Jonesborough Elem.	3-2-2	3-2-2	3-2-2	3-2-2
Washington	Boones Creek Elem.	2-2-1	2-2-1	2-2-1	2-2-1
Wayne	Collinwood Elem.	1-1-1	2-1-1	2-1-1	2-1-1
White	Findlay Elem.	1-2-1	2-2-1	2-1-1	2-1-1
Williamson	W. P. Scales Elem.	2-1-1	2-1-1	2-2-1	2-2-1
Wilson	Lakeview Elem.	2-1-2	2-1-2	2-2-2	2-2-2

Figure II - 1

Distribution of Schools Participating in

Project STAR

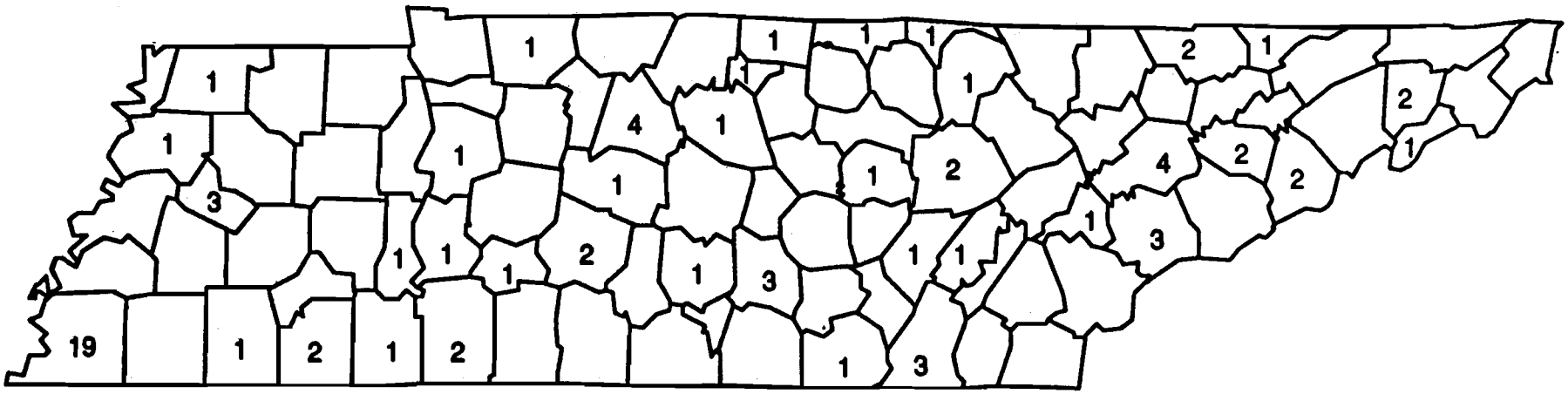


TABLE II-3

Number of Schools and Students by Location Kindergarten through Third Grade (1985-1989)

	Kindergarten (1985-86)		Grade 1 (1986-87)		Grade 2 (1987-88)		Grade 3 (1988-89)	
Location	Students	Schools	Students	Schools	Students	Schools	Students	Schools
Rural	2918	39	3240	38	3168	38	3239	38
Urban	568	8	686	8	482	7	506	7
Suburban	1414	16	1589	15	1711	15	1722	15
Inner City	1428	17	1380	15	1485	15	1336	15
Total	**6328**	**79**	**6835**	**76**	**6846**	**75**	**6804**	**75**

E. Data Collection Instruments

Project personnel collected information (data) about student achievement and development and about variables other than class size that might affect achievement. This included collecting information about instructional processes to try to understand how reduced class size effects and reduced student-adult ratio effects occurred. These effects were examined over time in relation to students, teachers and teacher aides. The impact of reduced class size and reduced student-adult ratio was assessed through multiple measures of student achievement and development and process measures such as activity logs, classroom observation, etc.

1. Tests

a. Stanford Achievement Test (SAT)

Students were tested each spring on the dates specified by the state. In each grade, the appropriate level of SAT was administered to all project STAR students and to students in 21 comparison schools. The norm-referenced SATs cover reading, math, spelling, listening, and in the higher grades science and social science, and provide subscores for both reading and math (The Psychological Corporation, Harcourt Brace Jovanovich, Inc., 1985).

b. Tennessee's Basic Skills First Test (BSF)

The State developed Basic Skills Criterion Tests for the third, sixth and eighth grades in reading and math in 1984. Because the SAT does not cover all of the curriculum taught, and the curriculum does not cover everything that is tested, Project STAR contracted with the State Testing Service to develop STAR Criterion Tests in reading and math to cover BSF learning objectives in grades one and two. These tests were similar to the already developed third grade test. The BSF learning objectives were the criteria tested. The untimed tests consist of multiple choice items, four items per objective, and are designed so that they can be administered in about an hour. (Tennessee Department of Education, 1987).

c. Self-Concept and Motivation Inventory

In addition to the SAT and BSF tests, students completed a self-concept and motivation inventory, the SCAMIN (Person-O-Metrics, Inc., 1967,1968). The SCAMIN asks students to indicate pictorially their response to 24 situations. For example what "face" (i.e. happy, sad, indifferent, etc.) would the student wear if he/she "had to tell his/her parents they lost their coat." The SCAMIN was selected because it is group administered, has forms appropriate for grades K-3, measures elements of self-concept of concern to this project, and requires no special training for administration. While it has only moderate reliability for the early grades, the SCAMIN is useful for comparing groups, such as small classes with regular classes (Davis and Johnston, et al.).

2. Additional Data Collection Instruments

Appendix C includes a copy of each of the following STAR data collection instruments:

a. School and System Profile- In order to get an overall picture of each school, principals completed this form which asked for such variables as school enrollment, average daily attendance, average daily membership, Chapter I eligibility, the percentage of students on free lunch, the percentage of students bussed, a breakdown of students by race and total expenditure per student.

b. Principal Profile- provided demographics on the individual principals, i.e., sex, race, education, experience, etc.

c. Teacher Profile- provided background information including college attended and level of education, certification, amount of teaching experience, type of in-service training completed, career ladder level, sex and race.

d. Teacher Log- recorded the time spent on typical daily activities which included routine paper work, student activities, small group, whole group, and individualized instruction, planning and preparation time, and personal time.

e. Grouping Questionnaire- recorded the number of small groups teachers created within their classes for instruction in reading, math, science, and social science, the average number of minutes spent each week in small group instruction and the criteria used for assigning students to instructional groups.

f. Parent/Volunteer/Teacher Interaction Questionnaire- provided the number of times during a four-week period that teachers communicated with parents about the performance or behavior of students or about general classroom activities. Modes of interaction included in person, by phone, or written contact. The quantity and quality of assistance were also noted, including the type of assistance and number of times that assistance was received from a volunteer or BSF aide.

g. Teacher Problem Checklist- indicated the frequency and extent to which teachers were bothered by 61 problems they were likely to encounter. The problems related to their responsibilities to students, their relationships with staff, administrators, and parents, the use of their time, and their professional growth (Cruickshank, D.R., 1980).

h. **Exit Interview**- Teachers were interviewed "in-person" at the end of the school year. These interviews allowed the teacher to describe differences between teaching in a small class or teaching with a full-time aide and teaching in a regular class. This open-ended interview gave the teachers an opportunity to express their feelings and experiences. The kindergarten interview (1985-86) was unstructured since its primary purposes were to get overall reflections of teachers about their teaching experiences, to thank participants and to serve a public relations function. The interviews provided some important and useful subjective and context data. Based upon an analysis of the first year's interview experience, the researchers developed a more highly structured interview format for subsequent years.

i. **Aide Profile**- provided information on full-time aides which included education, experience, teaching experience, teaching certification, sex and race.

j. **Aide Questionnaire**- provided information about an aide's interaction with his/her assigned project STAR teacher. In addition the specific types of daily tasks (e.g., bus duty, lunch duty, teaching lessons, giving tests, etc.) and the amount of time spent on these tasks were reported.

k. **Aide Log**- provided information about the time full-time aides spent on various generalized categories of activities during a typical day. The activities are the same as the ones described previously under the **Teacher Log** heading.

l. **Roster**- provided student demographic information such as sex, race, and birthday. Also, at the end of the school year, attendance, promotion, and free-lunch status were reported on the roster.

m. **Special Programs Form**- identified students who left their classes to participate in special programs such as Chapter I, Special Education, Language Development, Gifted programs, etc. The average amount of time students spent each week in these programs was also recorded.

Based on the data collected in kindergarten, some forms were modified to make them easier to process, and some forms were redesigned in other ways. Some new instruments were devised to collect additional data. These changes did not affect the basic study design but did improve data collection and processing.

Further information regarding testing or data collection instruments may be obtained from the Assistant Commissioner of Curriculum and Instruction, Tennessee State Department of Education, Cordell Hull Building, Fourth Floor North, Nashville, Tennessee 37243-0379.

F. General Description of Key Variables for Analysis

1. **Outcome Variables:**

   a. Stanford Achievement Tests (SESAT II, Primary I, Primary II, Primary III)
   b. SCAMIN Self-Concept and Motivation Subscores
   c. Promotion/Retention
   d. Attendance
   e. Teacher Problem Checklist
   f. Basic Skills Criterion Tests in Reading & Math (Grades 1,2,3)

Key Variables Cont.

2. **Student Variables:**

   a. Age
   b. Sex
   c. Race
   d. Free Lunch (SES Variable)
   e. Project Entry Date
   f. Total Years in STAR

3. **School Variable**: School Type (Inner City/Rural/Urban/Suburban)

4. **Classroom Variables:**

   a. Class Type (Small/Regular/Regular with Aide)
   b. Average Weekly Volunteer Time
   c. Grouping Practices
   d. Parent-Teacher Interaction

5. **Teacher Variables:**

   a. Teaching Experience (total, at grade level, in this school)
   b. Education Level
   c. Certificates Held
   d. Age (available for K only)
   e. Race
   f. Sex
   g. Instructional Time

6. **Teacher Aide Variables:**

   a. Years of Experience as an Aide
   b. Race
   c. Sex
   d. Age (available for K only)
   e. Use of Time

7. **Comparisons:**

   a. Between/Among Class Conditions and School Types
   b. With Comparison Schools
   c. With Selected State Averages
   d. Within Conditions

G. Methodology (Primary Analysis)

Project STAR's primary analysis consisted of a cross-sectional analysis of data from all students participating in project classes at each grade level, and two longitudinal analyses. For the latter, data were analyzed for students who were in the project in the same class type for four consecutive years (K-1-2-3). Analyses-of-variance procedures were employed to address the major questions of the study as follows:

(1) Class Type (Small/Regular/Aide) was assumed to be a fixed dimension; mean differences among class types comprise the most important question of the investigation.

(2) School Type (Inner City/ Urban/ Suburban/ Rural) was assumed to be a fixed dimension, crossed with class type.

(3) Schools were treated as a random dimension, nested within locations, but crossed with class type, since all three class types were present in each school. This is an important aspect of the design to account for the influence of shared conditions on all project classes within a school.

(4) Classes were treated as a random dimension when there were more than one class of a given type within a particular school.

(5) Students were treated as a random sample, nested within each class. A diagram of the complete design is shown in Figure II-2.

When all of the main effects and interactions of these factors are assembled into an analysis-of-variance model and expected mean squares evaluated, the resulting tests of significance are those given in Table II-4.

TABLE II-4

Analysis of Variance Source Table

Source of Variation	Error Term
Fixed effects:	
Location	Schools
Class Type	Location X Class
Type	Schools X Class Types
Random Effects:	
Schools	
Schools X Class Types	
Classes	
Students	

Figure II-2
A Diagram Of The Project STAR Research Design:
Individual Classes By Class Type Within Schools By Location

LOCATION	Schools	TYPE OF CLASS: SMALL	REGULAR	REGULAR / AIDE
INNER-CITY	1	Class 1,2,3, etc.	Class 1,2,3, etc.	Class 1,2,3, etc.
	2			
	3			
	4			
	5			
	etc.			
SUBURBAN	1	Class 1,2,3, etc.	Class 1,2,3, etc.	Class 1,2,3, etc.
	2			
	3			
	4			
	5			
	etc.			
RURAL	1	Class 1,2,3, etc.	Class 1,2,3, etc.	Class 1,2,3, etc.
	2			
	3			
	4			
	5			
	etc.			
URBAN	1	Class 1,2,3, etc.	Class 1,2,3, etc.	Class 1,2,3, etc.
	2			
	3			
	4			
	5			
	etc.			

Since the error terms needed to test the significance of the fixed effects in the data are variation attributable to Schools and the School-X-Type interaction, student-level data were not required for this portion of the STAR analysis. Thus, data were aggregated to the level of class means before the analysis was conducted, to reduce the magnitude of statistical computations. Table II-4 also shows that the correct error degrees of freedom for the primary questions of the study are proportional to the number of schools -- in the neighborhood of 75 for some tests and 150 for others -- and not the number of students. The exact degrees of freedom for each computer run was affected slightly by the pattern of missing data on the particular instrument.

A parallel analysis was conducted with sex (grades K and 1 only) and race (all grades) as an additional factor of classification. Since both males and females are present in each class and, potentially, both white and minority students, these factors were treated as fixed effects, crossed with all other dimensions in the design. The error terms for treating sex, Sex-X-Location, Sex-X-Type, and Sex-X-Location-X-Type are Schools-X-Sex, Schools-X-Sex-X-Location, Schools-X-Sex-X-Type and Schools-X-Sex-X-Location-X-Type, respectively. For these tests means of all males and all females in each class, or all white and all minority students in each class were used as the units of analysis. Race and Sex were analyzed in parallel computer runs, so that no analysis of both factors simultaneously was conducted.*

The design has unequal N's and many empty cells. A general linear model approach for nonorthogonal designs was employed, using the MULTIVARIANCE computer program (Finn and Bock, 1985).

In each year, data from the measurement instruments were analyzed in subsets: the SAT achievement scales, the BSF performance tests (beginning in grade 1), and the SCAMIN self-concept and motivation scales. Since the measures are intercorrelated, multivariate test statistics (Wilks' likelihood ratios) were employed for each subset.

Once a significant main effect or interaction was found, two findings were examined: (A) A univariate test of significance for each scale separately; as follow-up procedure, these are termed "protected" tests; (B) Two orthogonal comparisons among Class Types, when the Class Type effect was found to be significant. The two particular contrasts used were (1) Small Class Means - (Regular + Regular with aide class means)/2 and (2) Regular with aide Class Means - Regular Class Means. The first (1) was selected because no mean differences were found between Regular and Teacher Aide classes in kindergarten, and because children were exchanged between these two Class Types before entering grade 1. The comparison of Small Classes with the average of the other two is not confounded by this procedural modification.

The two contrasts were examined in multivariate form for the entire subset of measures (Hotelling's T^2) and in univariate form for each scale separately (t-tests), but only after an overall test was found to be significant. Again, this is a "protected" procedure. Finally, effect size measures were computed from these contrasts, to reveal the magnitude of the effect (e.g., what impact did reducing the class size really make?).

*This decision was made because means of all white males, minority males, white females and minority females would be based on very small and unreliable groups of youngsters. Also, the magnitude of a combined analysis would be unwieldy.

Prior to all analyses, the distributions of the criterion measures were examined for skewness and outliers. This resulted in only a few deletions of data that were obviously erroneous, and a rescaling of the BSF reading and mathematics scale. Individual students were scored as pass or fail, based on whether or not they passed 80 percent of the objectives covered on the respective test. At the class level, the percentage of students passing each test was obtained (P). Since these were not normally distributed, a "log-odds index" was obtained for each class, ln(P/100-P).

The distribution of the index was normal and used for tests of significance. Descriptive tables in this report, however, give BSF results just as average percent of objectives mastered.

The longitudinal analysis used the same basic design, but in a "repeated measures" form, and with just that subset of students who were in the same experimental condition for three consecutive years. The dependent variables were differences in mean performance between K and grade 1 and between grade 1 and 2; in the second longitudinal analysis, they were differences between grade 1 and 2 and between 2 and 3. Only the SAT measures were scaled as to permit grade-to-grade comparisons of this sort.

The original three years of data are intercorrelated, because they are obtained on the same individuals over time. As a result, the two difference scores are correlated as well. Thus, multivariate repeated measures analyses were used to control statistical errors, in the manner described by Bock (1975). Individual year-to-year growth was examined, or its interaction with other corresponding factors in the design, only when the corresponding overall test was statistically significant.

While the global analyses used the procedures outlined above, other more specific analyses employed a variety of statistical methodologies. These are described in the following chapters of the report, together with the results that were obtained. The analysis procedures employed were conservative and should have provided significant results only when there were considerable differences.

III. Descriptive Data and Teacher Effectiveness

A. Descriptive Characteristics

Descriptive data were collected in the beginning of each school year on profiles of each school and system, principal, teacher, and teacher aide participating in Project STAR (See Appendix C for profile instruments.) This section contains information obtained from descriptive data collected across the four years of the study.

1. School and System Profile Data

Completed STAR school and system profiles contain information on school enrollment, average daily attendance (ADA) and average daily membership (ADM), Chapter I eligibility, percent of free/reduced lunch, percent of students bussed, percent of race, grade span, system enrollment, total expenditure per pupil and location in the state. STAR schools were located in the eastern (n=21), the middle (n=33), and the western (n=25) portions of the state. Support for STAR was provided by four universities in Tennessee: University of Tennessee, Knoxville personnel worked with 21 schools in East Tennessee, Memphis State University with 25 schools in West Tennessee, Tennessee State University with 20 schools and Vanderbilt University with 13 schools in Middle Tennessee. The project schools were in school systems of all sizes. Table III-1 shows the STAR schools classified by system size. ADA figures for kindergarten through third grade are shown in Table III-2. ADM figures are shown in Table III-3.

Out of a total of 79 schools in STAR kindergarten, 64 were eligible for Chapter I and 15 were not. Out of a total of 76 during the STAR first grade year, 63 were eligible for Chapter I and 13 were not. Out of 75 in the second grade year, 66 were eligible and 9 were not. In the third grade year, out of a total of 75, 62 were and 13 were not eligible for Chapter I.

TABLE III-1

Number of Schools by System Size (Number of Students) and by Grade Project STAR (1985-89)

	Number of Schools			
	Kindergarten	1st Grade	2nd Grade	3rd Grade
System Size (Student Enrollment)				
Under 1,000	1	1	3	2
1,001 - 5,000	27	26	24	27
5,001 - 10,000	18	16	16	14
10,001 - 100,000	13	14	13	13
100,001 - 107,000	20	19	19	19
Total Number of Schools	**79**	**76**	**75**	**75**

TABLE III-2

STAR Average Daily Attendance (ADA) of Students by Number of Schools and by Grade* (1986-89)

	Number of Schools		
ADA	1st Grade	2nd Grade	3rd Grade
Under 400 Students	11	10	9
401-500 Students	21	16	14
501-700 Students	31	34	38
701-1,000 Students	13	15	14
Total Number of Schools	**76**	**75**	**75**

*This information was not collected during Kindergarten (1985).

TABLE III-3

STAR Average Daily Membership (ADM) of Students by Number of Schools and by Grade* (1986-89)

	Number of Schools		
ADM	1st Grade	2nd Grade	3rd Grade
Under 400 Students	10	8	7
401-500 Students	16	13	12
501-600 Students	15	22	24
601-700 Students	20	17	17
701-1,000 Students	15	15	15
Total Number of Schools	**76**	**75**	**75**

*This information was not collected during kindergarten (1985).

The percentage of students on free/reduced lunch was divided into two categories: 1) schools with 50 percent or less of their students on free/reduced lunch and 2) schools with more than 50 percent of their students on free/reduced lunch. The percent of students on free/reduced lunch for each year of the study is shown in Table III-4.

TABLE III-4

Percent of Students on Free/Reduced Lunch by Number of Schools and by Grade Project STAR (1985-89)

	Number of Schools			
Percent of Students on Free/Reduced Lunch	Kindergarten	1st Grade	2nd Grade	3rd Grade
50% Or Less	55	46	49	44
More Than 50%	24	30	26	31
Total Number of Schools	**79**	**76**	**75**	**75**

In the Project STAR kindergarten year, 32 schools had 50 percent or fewer students bussed and 47 had over 50 percent bussed. Out of a total of 76 schools in the first grade year, 33 had 50 percent or fewer students bussed and 43 had over 50 percent bussed. In second grade, out of a total of 75, 30 schools had 50 percent or fewer students bussed and 45 had over 50 percent bussed. In third grade, 29 schools had 50 percent or fewer students bussed and 46 had over 50 percent bussed.

The percent of race by school was reported according to white students, black, Asian, Hispanic, American Indian, and "Other." In the kindergarten year, out of 79 schools, 19 had 50 percent or fewer white students, and 60 had over 50 percent; 60 had 50 percent or fewer black students and 19 had over 50 percent; all schools had less than 2 percent Asian, Hispanic and American Indians. In the first grade, out of 76 schools, 18 had 50 percent or fewer white students and 58 had over 50 percent; 58 had 50 percent or fewer black students and 18 had over 50 percent; and all had 3 percent or less Asian, 1 percent or less Hispanic, no American Indians and 1 percent or less "Other." In the second grade, out of 75 schools, 20 had 50 percent or fewer white students and 55 had over 50 percent; 56 had 50 percent or fewer and 19 had over 50 percent black students; and all had 2 percent or less Asian, 6 percent or less Hispanic, 1 percent or less American Indians, and 3 percent or less "Other." In the third grade, out of 75 schools, 19 had 50 percent or fewer white students and 56 had over 50 percent; 56 had 50 percent or fewer black students and 19 had over 50 percent; and all had 3 percent or less Asian, 5 percent or less Hispanic, 2 percent or less American Indians, and 1 percent or less "Other."

The grade span for the majority of STAR schools ranged from kindergarten through sixth grade for all four project years, although some schools had a grade span of kindergarten through ninth grade. The average total expenditure per student for the STAR kindergarten year was $2,035.07; for the first grade year, $2,218.40; for the second grade year, $2,356.56; and for the third grade year, $2,641.71.

2. Principal Profile Data

All Project STAR principals completed principal profiles: 79 in kindergarten (1985-86), 76 in first grade (1986-87), 75 in second grade (1987-88) and 75 in third grade (1988-89). Principal profiles included information on principal sex, race, college or university attended, teacher certification, teaching experience, administrative experience and career ladder level.

The number of female principals in the kindergarten year was 18 and male was 61 out of a total of 79. In first grade, female principals numbered 21 and males 55 out of 76. Female principals in second grade numbered 22 and males 53 out of 75. During the third grade year, 23 principals were female and 52 principals were male out of 75.

Out of a total of 79 principals in kindergarten, 18 were non-white (NW) and 61 were white (W). Sixteen principals were NW and 60 were W out of 76 in the first grade. In both the second and third grades, 17 were NW and 58 were W out of a total of 75 principals.

Principals' college/university degrees earned included bachelor's (B.S./ B.A.), master's (M.A./ M.S./ M.Ed.), second master's, specialist (Ed.S.) and doctorate (Ph.D./ Ed.D.). All principals had earned at least a bachelor's degree. Out of 79 principals in the kindergarten year, 17 reported having earned an Ed.S. or Ph.D./Ed.D. Sixteen STAR principals in the first grade reported having received an Ed.S. or Ph.D./Ed.D., 19 in the second grade, and 16 in the third grade year. The colleges/universities having five or more STAR principals as graduates were LeMoyne-Owen College, Memphis State University, Middle Tennessee State University, Tennessee State University and Tennessee Technological University.

All STAR principals were certified to teach. In the kindergarten year, 26 principals had from 0 to 10 years of teaching experience; 28 had from 11 to 20 years; 18 had from 21-30; and 6 had over 30 years. Forty-one STAR principals in the first grade year reported having 0 to 10 years of experience; 27 had 11 to 20 years; 5 had 21 to 30 years; and 3 had over 30 years. In the second grade year, 36 principals had 0 to 10 years of teaching experience; 36 had 11 to 20; and 2 had 21 to 30 years. Thirty-nine principals in third grade had 0 to 10 years of teaching experience; 29 had 11 to 20 years; 5 had 21 to 30; and 1 had over 30 years.

All STAR principals were certified as administrators except for one in the kindergarten year. In kindergarten 34 principals had from 0 to 10 years of administrator experience; 32 had 11 to 20 years; 12 had 21 to 30 years; and 1 had over 30 years. Thirty-seven principals in first grade had from 0 to 10 years of administrator experience; 28 had from 11 to 20 years; and 11 had from 21 to 30 years. In second grade, 39 principals had 0 to 10 years of administrator experience; 27 had from 11 to 20 years; 8 had from 21 to 30 years; and 1 had over 30 years. Thirty-four STAR principals in third grade had from 0 to 10 years of administrator experience, 27 had from 11 to 20 years; and 14 had 21 to 30 years.

STAR principal participation in career ladder was categorized as follows: not on career ladder; on level one; on level two; on level three; and pending. In the kindergarten year, 13 principals were on level one, 2 were on level two, and 31 were pending. Fourteen first grade principals were not on career ladder, 31 were on level one, 4 were on level two, 20 were on level three, and 7 were pending. In second grade, 12 principals were not on career ladder, 29 were on level one, 4 were on level two, and 30 were on level three. In the third grade year, 9 principals were not on career ladder, 30 were on level one, 7 were on level two, and 29 were on level three.

3. Teacher Profile Data

Each STAR teacher completed a teacher profile. Self-reported data included class type, teacher sex, race, college or university attended, degree(s) earned, certification, teaching experience, in-service training (within the last two years), and career ladder level. Table III-5 shows the number of teachers in school types by class types. A total of 339 teachers in kindergarten, 350 in first grade, 344 in second, and 334 in third grade completed teacher profiles.

Table III-6 shows the number of teachers by sex and class type for each year of the study. In kindergarten, there were no male teachers. There were 348 females and 2 male teachers in the first grade, 341 females and 3 males in the second grade, and 323 females and 11 males in the third grade.

In STAR kindergarten, of 339 total teachers, 55 were non-white (NW) and 284 were white (W). In first grade, 64 were NW and 286 were W out of a total of 350 teachers. In second grade, 72 teachers were NW and 272 were W out of a total of 344. In the third grade year, 71 teachers were NW and 263 were white out of a total of 334. The number of STAR teachers by race and class type is shown in Table III-7.

Every STAR teacher had at least a bachelor's degree. Table III-8 shows the number of STAR teachers holding degrees compared to class size. Table III-9 shows the number earning a bachelor's degree from colleges or universities that had ten or more graduates teaching in STAR.

All teachers, during each year of the study, were certified to teach at the appropriate grade level. Project STAR teachers reported from 0 to over 40 years of teaching experience. Table III-10 shows the total number of years of teaching experience by class type.

STAR teachers reported which types (TIMS, reading workshop, math workshop, classroom management, career ladder, taking college courses) of in-service training they had or had not completed during the past two years. The number of teachers completing selected in-service training sessions by class type is shown in Table III-11.

Some STAR teachers (K-3) reported having completed career ladder level one, level two, level three or other. Teacher career ladder levels by class types are shown in Table III-12.

TABLE III-5

Number of Teachers by School Type, Class Type and Grade Project STAR (1985-89)

Kindergarten 1985-86

School Type	Small	Regular	Regular/Aide	Total
Inner City	28	27	23	78
Suburban	31	20	23	74
Rural	59	52	44	155
Urban	13	8	11	32
Total	**131**	**107**	**101**	**339**

First Grade 1986-87

School Type	Small	Regular	Regular/Aide	Total
Inner City	25	27	23	75
Suburban	28	29	24	81
Rural	62	51	50	163
Urban	12	9	10	31
Total	**127**	**116**	**107**	**350**

Second Grade 1987-88

School Type	Small	Regular	Regular/Aide	Total
Inner City	27	22	24	73
Suburban	31	25	26	82
Rural	64	47	48	159
Urban	13	6	11	30
Total	**135**	**100**	**109**	**344**

Third Grade 1988-89

School Type	Small	Regular	Regular/Aide	Total
Inner City	26	19	22	67
Suburban	32	22	25	79
Rural	69	42	48	159
Urban	13	6	10	29
Total	**140**	**89**	**105**	**334**

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

TABLE III-6

Number of Project STAR Teachers by Sex and Class Type (1985-89)

Kindergarten 1985-86

Class Type	Female	%	Male	%	Total	%
Small	131	38.6	0	0.0	131	38.6
Regular	107	31.6	0	0.0	107	31.6
Regular/Aide	101	29.8	0	0.0	101	29.8
Total	**339**	**100.0**	**0**	**0.0**	**339**	**100.0**

First Grade 1986-87

Class Type	Female	%	Male	%	Total	%
Small	125	35.9	2	0.0	127	36.3
Regular	116	33.3	0	0.0	116	33.1
Regular/Aide	107	30.7	0	0.0	107	30.6
Total	**348**	**99.4**	**2**	**0.6**	**350**	**100.0**

Second Grade 1987-88

Class Type	Female	%	Male	%	Total	%
Small	135	39.6	0	0.0	135	39.2
Regular	99	29.0	1	33.3	100	29.1
Regular/Aide	107	31.4	2	66.7	109	31.7
Total	**341**	**99.1**	**3**	**0.9**	**344**	**100.0**

Third Grade 1988-89

Class Type	Female	%	Male	%	Total	%
Small	135	41.8	5	45.5	140	41.9
Regular	85	26.3	4	36.4	89	26.6
Regular/Aide	103	31.9	2	18.2	105	31.4
Total	**323**	**96.7**	**11**	**3.3**	**334**	**100.0**

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

TABLE III-7

Number of Project STAR Teachers by Race and Class Type (1985-89)

Kindergarten 1985-86

Class Type	Non-White	%	White	%	Total	%
Small	17	30.9	114	40.1	131	38.6
Regular	22	40.0	85	29.9	107	31.6
Regular/Aide	16	29.1	85	29.9	101	29.8
Total	**55**	**16.2**	**284**	**84.0**	**339**	**100.0**

First Grade 1986-87

Class Type	Non-White	%	White	%	Total	%
Small	22	34.4	105	36.7	127	36.3
Regular	19	29.7	97	33.9	116	33.1
Regular/Aide	23	35.9	84	29.4	107	30.6
Total	**64**	**18.3**	**286**	**81.7**	**350**	**100.0**

Second Grade 1987-88

Class Type	Non-White	%	White	%	Total	%
Small	27	37.5	108	39.7	135	39.2
Regular	23	31.9	77	28.3	100	29.1
Regular/Aide	22	30.6	87	32.0	109	31.7
Total	**72**	**20.9**	**272**	**79.1**	**344**	**100.0**

Third Grade 1988-89

Class Type	Non-White	%	White	%	Total	%
Small	31	43.7	109	41.4	140	41.9
Regular	18	25.7	71	27.0	89	26.6
Regular/Aide	22	31.4	83	31.6	105	31.4
Total	**71**	**21.0**	**263**	**78.7**	**334**	**100.0**

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

TABLE III-8

STAR Teachers' Highest College/University Degrees Earned by Class Type and by Grade (1985-89)*

Kindergarten 1985-86

Degree	Small	Regular	Regular/Aide	Total
Bachelor's	87	71	63	221
Master's	41	36	38	115
Specialist	3	0	0	3
Doctorate	0	0	0	0
Total	**131**	**107**	**101**	**339**

First Grade 1986-87

Degree	Small	Regular	Regular/Aide	Total
Bachelor's	82	79	63	224
Master's	44	37	42	123
Specialist	1	0	1	2
Doctorate	0	0	1	1
Total	**127**	**116**	**107**	**350**

Second Grade 1987-88

Degree	Small	Regular	Regular/Aide	Total
Bachelor's	90	67	63	220
Master's	43	32	44	119
Specialist	1	1	1	3
Doctorate	1	0	1	2
Total	**135**	**100**	**109**	**344**

Third Grade 1988-89

Degree	Small	Regular	Regular/Aide	Total
Bachelor's	89	51	51	191
Master's	50	37	52	139
Specialist	1	1	2	4
Doctorate	0	0	0	0
Total	**140**	**89**	**105**	**334**

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

Table III-9

Colleges/Universities Attended by Ten or More STAR Teachers by Project Grade and by Class Type

Kindergarten 1985-86	Small	Regular	Regular/Aide	Total
Austin Peay State Univ.	5	4	2	11
LeMoyne-Owen College	3	11	7	21
Memphis State Univ.	16	9	11	36
Middle Tenn. State Univ.	15	7	13	35
Tenn. Tech. Univ.	18	7	8	33
UT - Martin	6	4	3	13
East Tenn. State Univ.	6	7	2	15
UT - Knoxville	12	14	9	35
First Grade 1986-87	Small	Regular	Regular/Aide	Total
LeMoyne-Owen College	9	5	6	20
Lincoln Memorial Univ.	2	3	5	10
Memphis State Univ.	9	12	5	26
Middle Tenn. State Univ.	19	12	14	45
Tenn. State Univ.	2	3	5	10
Tenn. Tech. Univ.	11	10	12	33
UT - Knoxville	11	12	9	32
UT - Martin	7	6	11	24
Second Grade 1987-88	Small	Regular	Regular/Aide	Total
Austin Peay State Univ.	4	1	5	10
Carson-Newman College	5	2	4	11
East Tenn. State Univ.	8	4	6	18
LeMoyne-Owen College	11	9	8	28
Memphis State Univ.	6	10	11	27
Middle Tenn. State Univ.	20	5	15	40
Tenn. State Univ.	4	3	4	11
Tenn. Tech. Univ.	14	9	10	33
UT - Knoxville	13	7	5	25
UT - Martin	6	7	6	19
Third Grade 1988-89	Small	Regular	Regular/Aide	Total
East Tenn. State Univ.	6	7	4	17
LeMoyne-Owen Univ.	11	6	8	25
Memphis State Univ.	8	5	8	21
Middle Tenn. State Univ.	15	8	12	35
Tenn. State Univ.	3	4	4	11
Tenn. Tech. Univ.	14	11	6	31
UT - Knoxville	12	8	7	27
UT - Martin	4	3	3	10

TABLE III-10

STAR Teachers' Total Years Teaching Experience by Project Grade (1985-1989) and by Class Type

Years Experience	Kindergarten*			First Grade		
	Small	Regular	Regular/Aide	Small	Regular	Regular/Aide
0-9	72	59	48	57	61	46
10-19	50	42	45	47	38	37
20-29	9	6	7	15	12	18
30-39	0	0	0	8	4	6
40+	0	0	0	0	1	0

Years Experience	Second Grade*			Third Grade		
	Small	Regular	Regular/Aide	Small	Regular	Regular/Aide
0-9	50	40	37	53	35	30
10-19	59	42	45	58	30	52
20-29	18	11	15	19	21	15
30-39	8	6	10	10	3	8
40+	0	1	0	0	0	0

*One kindergarten and 2 second grade teachers did not provide this information.

TABLE III-11

Number of Teachers Completing Selected In-service Training by Grade and by Class Type

First Grade 1986-87

In-service Choices	Small	Regular	Regular/Aide	Total
TIMS	80	68	69	217
Math Workshop	48	41	40	129
Reading Workshop	67	55	52	174
Classroom Management	60	54	57	171
Career Ladder Workshop	51	47	47	145
Taking College Courses	57	45	45	147

Second Grade 1987-88

TIMS	71	50	55	176
Math Workshop	66	51	57	174
Reading Workshop	71	60	56	187
Classroom Management	67	61	62	190
Career Ladder Workshop	63	44	52	159
Taking College Courses	59	47	43	149

Third Grade 1988-89

TIMS	55	37	43	135
Math Workshop	69	41	44	154
Reading Workshop	83	45	55	183
Classroom Management	86	54	61	201
Career Ladder Workshop	45	41	40	126
Taking College Courses	69	33	48	150

TABLE III-12

STAR Teacher Career Ladder Levels by Class Type and by Grade (1985-89)

Kindergarten 1985-86

	Small	Regular	Regular/Aide	Total
Level I	96	70	80	246
Level II	2	2	2	6
Level III	1	2	0	3
Non-Career Ladder*	19	20	11	50
Total	**118**	**94**	**93**	**305****

First Grade 1986-87

	Small	Regular	Regular/Aide	Total
Level I	87	73	72	232
Level II	2	0	4	6
Level III	8	4	3	15
Non-Career Ladder*	30	38	28	96
Total	**127**	**115**	**107**	**349****

Second Grade 1987-88

	Small	Regular	Regular/Aide	Total
Level I	92	64	81	237
Level II	3	1	2	6
Level III	6	5	1	12
Non-Career Ladder*	33	30	23	86
Total	**134**	**100**	**107**	**341****

Third Grade 1988-89

	Small	Regular	Regular/Aide	Total
Level I	92	59	68	219
Level II	7	3	12	22
Level III	10	7	7	24
Non-Career Ladder*	31	20	18	69
Total	**140**	**89**	**105**	**334**

*Includes all teachers who were apprentice, probationary, pending, or not on Career Ladder.

**Thirty-four kindergarten, 1 first grade, and 3 second grade teachers did not provide this information.

Note: Number of teachers exceeds the number of classes because there were changes of teachers during the year.

4. Teacher Aide Profile Data

Self-reported descriptive data were collected from aides on background characteristics such as age, race, sex, experience as an aide, and educational level. Ninety-nine STAR kindergarten, 105 first grade, 106 second grade, and 106 third grade teachers were assigned full-time aides. All STAR aides were female with the exception of one male aide during third grade. Out of a total of 98 kindergarten aides, 30 were non-white (NW) and 68 were white (W). Out of a total of 105 first grade aides, 29 were NW and 76 were W. Out of 106 total second grade aides, 32 were NW and 74 were W. Out of a total of 106 third grade aides, 33 were NW and 73 were W.

During kindergarten, 97 teacher aides reported receiving a high school diploma. One hundred three aides in first grade had graduated from high school or received a GED, and only 1 had not. Out of 106 second grade aides, 104 had graduated and 2 had not. All 106 third grade STAR aides had graduated from high school.

Ten kindergarten aides had a bachelor's and 6 had associate degrees. Six first grade aides had bachelor's degrees and 1 had a master's degree. In second grade, 11 aides had bachelor's and 2 had master's degrees. Seven third grade aides had bachelor's degrees.

Out of 98 total kindergarten aides, 9 were and 89 were not certified to teach. Out of a total of 105 first grade aides, 3 were and 101 were not certified to teach. Four second grade aides were certified and 101 were not. Two third grade aides were certified and 103 were not.

In first grade 95 aides had 5 or fewer years of experience as an aide and 9 had from 6 to 21 years of experience. Ninety-three second grade aides had 5 or fewer years of experience and 13 had from 6 to 26 years of experience as an aide. Ninety-one third grade aides had 5 or fewer years of experience and 12 had from 6 to 26 years of experience as an aide.

During the STAR kindergarten year, 81 aides had no teaching experience, 5 had one year and the remaining 12 aides had between two and eight years of teaching experience. In the first grade year, six aides reported between one and three years of teaching experience. No STAR aides had over eight years of experience in the second grade year. During the STAR third grade year, seven aides had under 10 years of teaching experience and one aide had 19 years.

B. Teacher Effectiveness

1. Distribution of Top 10% of Classes in K-3

The question of small class effectiveness was also evaluated by looking at the class size of the top 10% of classes each year (Table III-13).

Table III-13

Number of Top 10% Classes from Project STAR Kindergarten through Third Grade: Stanford Total Reading Achievement

Grade	Small	Regular	Regular/Aide	Total
Kindergarten	18	10	5	33
1st Grade	22	5	7	34
2nd Grade	23	5	6	34
3rd Grade	25	2	5	32

The number of small classes in the top 10% increased each year. Eighteen of the top 33 kindergarten classes were small; 22 of the 34 first grade classes were small; 23 of the 34 second grade classes and 25 of the 32 third grade classes were small.

The scaled score average for the top ten percent small third grade classes was 649.3 which was 27 points above 622.3, the average scaled score for all of the third grade small classes.

The kindergarten top ten percent classes which included 18 small classes had scaled scores which ranged from 463 (75th percentile) to 494 (90th percentile). (See Table III-14.) The top percentile rank increased to the 93rd percentile in first grade and to the 96th percentile in second grade. It dropped back to the 90th percentile in third grade.

Table III-14

Scaled Scores and Percentile Ranks for Top 10 Percent Classes: Stanford Total Reading Achievement

Grade	Scaled Score	Percentile Rank*
Kindergarten	463 to 494	75th to 90th
First Grade	564 to 599	81st to 93rd
Second Grade	616 to 663	79th to 96th
Third Grade	642 to 669	76th to 90th

*Percentile Ranks Based on Multilevel Norms

2. First Grade Effective Teachers

The teaching practices, the materials used, and professional and personal characteristics of forty-nine effective teachers were studied to determine what effective teachers do to promote learning in reading and mathematics.

Did the classes with the highest scores make the greatest gain? In order to identify the classes with the greatest gains at the end of first grade the following procedure was used. Average student gains were computed by class type and in terms of scaled scores. (See Table III-15)

a. The outcome measures were the Stanford Achievement Tests, administered at the end of kindergarten (SESAT II) and first grade (Stanford Primary I). Composite scores for calculating scaled score gains for the 338 classes were derived as follows:

(1.) The SESAT II Total Reading scores were averaged to obtain a class reading mean score. The SESAT II Total Math scores were averaged to obtain a class math mean score.

(2.) The same procedures were used to calculate a class reading mean score and a class math mean score for the Stanford Primary I test administered at the end of first grade.

(3.) The SESAT II class reading mean score was subtracted from the Primary I class reading mean score to provide a scaled score average gain in reading for each class. The same procedure was repeated for math.

(4.) In order to obtain a scaled score average gain for each class, the reading mean gain and the math mean gain were averaged.

(5.) The scaled score average gains were ranked within each school type category.

(6.) The top 15% of each category was selected for this study.

(7.) Teachers were chosen for observation /interview whose classes ranked in the top 15% of scaled score average gains for each of four school types: rural, urban, suburban, inner city.

(8.) The distribution of class types taught by the effective teachers were 23 small (13-17); 8 regular (22-25); and 12 regular plus a full time instructional aide (22-25). Seven teachers' classes did not meet the specified requirements and are identified as Not in Design (18-21).

TABLE III-15

Average Class Gains in Scaled Scores by Class Type Project STAR Grade One (1987-88)

Total Reading	Top 15%			Other 85%		
Class Type	Kindergarten	Grade 1	Gain	Kindergarten	Grade 1	Gain
Small (13-17)	444	564	120	443	527	84
Regular (22-25)	443	554	111	439	515	76
Regular/Aide (22-25)	438	556	118	438	522	84

Total Math	Top 15%			Other 85%		
Class Type	Kindergarten	Grade 1	Gain	Kindergarten	Grade 1	Gain
Small (13-17)	444	564	120	443	527	84
Regular (22-25)	443	554	111	439	515	76
Regular/Aide (22-25)	438	556	118	438	522	84

b. Characteristics of Effective Teachers

For the teacher characteristics, the interview guide drew on personal characteristics summarized by the Educational Research Service. The characteristics included: preparation, certification, experience, in-service education, and family background.

The sample consisted of 50 females, of which 41 were white and 9 were black. The teachers' ages were in the following ranges: 25 to 34 (N=11), 35 to 44 (N=24), 45 to 54 (N=8), 55 to 64 (N=3), unknown (N=4) resulting in a median age of 38.5. Data collected on teacher preparation included BA/BS degree (N=32), MA/MS degree (N=18), full primary certification (N=50), teaching experience at the first grade level: less than 1 year (N=8), 1 to 5 years (N=12), 6 to 10 years

(N=12), 11 to 15 years (N=9), 16 to 20 years (N=5), 21+ years (N=4); total years of teaching experience: less than 1 year (N=2), 1 to 5 years (N=10), 6 to 10 years (N=13), 11 to 15 years (N=13), 16 to 20 years (N=5), 21+ years (N=7). In addition, in-service training completed within the past two years was reported as follows: Tennessee Instructional Model (N=36), Reading Workshop (N=23), Math Workshop (N=18), Classroom Management (N=23), Orientation to Career Ladder (N=16), College Courses (N=26). See Table III-16.

Thirty percent (N=19) chose teaching as a career when they were in elementary school 27% (N=13) made this choice in high school. While 18% (N=9) chose teaching during their college training, only 16% (N=8) made career changes in order to become teachers.

Fifty-seven percent (N=28) have other teachers in their families. Twenty-nine percent (N=14) are children of a teacher. Thirty-three percent (N=16) have one or more siblings who are in the teaching profession. Eight percent (N=4) are married to educators.

Eighty-six percent (N=42) of the effective teachers belong to a professional association, and 45 percent (N=22) work actively in the association.

C. Teaching Practices and Materials used by Effective Teachers

A procedure was established for documenting the effective teachers' teaching practices and use of materials. The procedure included both observation and interview.

An interview guide was designed based on the adaptation of Concepts of Effective Teaching delineated in "A Synthesis of Effective Schools Research" compiled by the Northwest Regional Educational Laboratory (Appendix D). Observer reliability was achieved by using paired observers who checked each other's independent judgement. Teachers were rated poor, fair, good, or excellent on each of the 12 criterion included in "A Synthesis of Effective Schools Research".

Six categories were developed to describe the practices used by effective teachers:

A. Preplanned Instruction
B. Expectations
C. Strategies for Accomplishing Expectations
D. Organization and Classroom Management
E. Personal Interaction
F. Family Involvement

(1) Preplanned Instruction

Instruction is guided by a preplanned curriculum which is adapted to the needs of students. The teachers use a broad range of resources and activities. Eighty-two percent of the effective teachers were rated excellent and 18% were rated good.

Table 4

Professional and Personal Characteristics of Teachers

Characteristics	Top 15% (N=50)	Other 85% (N=288)
Race: White	41 (82%)	238 (83%)
Black	9 (18%)	50 (17%)
Age: 25-34	11 (22%)	NA*
35-44	24 (48%)	
45-54	8 (16%)	
55-64	3 (6%)	
Missing	4 (8%)	
Preparation:		
B.A. or B.S.	32 (64%)	187 (65%)
M.A. or M.S.	18 (36%)	101 (35%)
Certification:		
Full Primary	50 (100%)	288 (100%)
Years of Teaching Experience at First Grade Level:		
Less than 1	8 (16%)	48 (17%)
1 to 5	12 (24%)	99 (34%)
6 to 10	12 (24%)	58 (20%)
11 to 15	9 (18%)	36 (13%)
16 to 20	5 (10%)	24 (8%)
21 or more	4 (8%)	23 (8%)
Total Year of Teaching Experience:		
Less than 1	2 (4%)	11 (4%)
1 to 5	10 (20%)	74 (26%)
6 to 10	13 (26%)	58 (20%)
11 to 15	13 (26%)	58 (20%)
16 to 20	5 (10%)	44 (15%)
21 or more	7 (14%)	43 (15%)
In-service Training Completed Within Last Two Years:		
Tennessee Instructional Model (TIM)	36 (72%)	173 (60%)
Reading Workshop	23 (46%)	145 (50%)
Mathematics Workshop	18 (36%)	105 (36%)
Classroom Management	23 (46%)	142 (49%)
Orientation to Career Ladder	16 (32%)	124 (43%)
College Courses	26 (52%)	116 (40%)

*Project STAR did not collect data on age.

(2) Expectations

The observer/interviewers (O/Is) determined that effective teachers had high expectations for student learning. O/Is ranked eighty percent of the 49 teachers excellent at setting expectations and twenty percent above average on a scale of 1-4 with 4 being the highest. On a scale of below average, average and above average, the majority of teachers stated that their class was either average (n=27) or above average (n=18).

Effective teachers set and maintain quality standards consistently. These teachers use a variety of strategies to assure that all students will be at the level of learning necessary to be successful in the next grade. The strategies mentioned most often were: parent involvement (n=18), individualization (n=18), use of teacher assistant where available (n=15), peer tutoring (n=12), and praise and encouragement (n=10).

(3) Strategies For Accomplishing Expectations

Effective teachers use a variety of teaching strategies which fall within the following general areas:

(a) Orientation
(b) Clear and focused instruction
(c) Monitoring
(d) Grouping
(e) Reteaching
(f) Incentives and Rewards
(g) Learning Centers
(h) Manipulatives

(4) Organization and Classroom Management

All of the teachers have a scheduled time for each subject and concentrate on using class time for learning. Ninety-four percent (N=46) of the teachers were evaluated as excellent on the efficiency of their classroom routines. Eighty-four percent (N=41) of the effective teachers have excellent standards for classroom behavior. These effective teachers who demonstrated excellent organizational skills had almost an hour more of teaching time per week for each math and reading.

(5) Personal Interaction

Eighty-four percent (N=41) maintained excellent personal interactions with the students. An additional 10% had good interactions with students. When asked how they let the students know that they really cared, through pats and hugs, group sharing time, one-on-one sharing time, and praise and other positive comments.

(6) Family Involvement

Effective teachers believe that the families of their students should be involved in the students' continuous learning process. These teachers believe in open communication between home and school by either telephone, notes, conferences, or quick chats when someone in the family comes to pickup the student after school. These teachers' beliefs are evidenced by the fact that 95% of them said that they encourage the families of their students to keep up with their progress in school.

Effective teachers involve the families of their students in other important ways. They invite the families to serve as volunteers at school. These teachers are able to explain to the families of their students the necessity of becoming involved in their learning in a variety of ways:

Listening to the students read at home.
Helping them with math by using flashcards or other manipulatives.
Checking their homework.
Eating lunch with them at school.
Various activities to keep them involved.

When these teachers were asked "What kinds of things do you do in order to prevent a student in your classroom from experiencing failure?", 37% said they involve the families of their students in the learning process in order to try to prevent failure.

It is often said that a child's parents are the first and foremost teachers. It appears that effective teachers believe this premise to be true.

E. Profile

A profile of the effective first grade teacher in this study reveals the following:

median age - 38.5 yrs.
education - BA/BS
median years of teaching experience - 10.5
median years of teaching experience at first grade - 8.0
K-3 certification
TIM trained
taking college courses
Level I of Tennessee Career Ladder
other educators in the family

These teachers consistently displayed similar affective qualities. Enthusiasm in the form of "acting", demonstrating, and role-playing activities on the part of the teacher was prominent. Having positive attitudes toward children, emphasizing positive behavior and praising success were observed as common. Having and using a sense of humor to promote learning and motivate students were often observed. Finally, "a love for children" seemed to permeate the entire professional repertoire in nearly all of the observations.

In addition to these common characteristics, class size appears to have been a contributing factor to the success of these fifty effective teachers. Only 8 (16%) had a regular class (22-25). Twenty-three (46%) had small classes (13-17); 7 (14%) had a class of 18-21 and 12 (24%) had a full time instructional aide. Additional material on first grade effective teachers and the complete findings on second and third grade effective teachers are reported in appendix D.

IV. PRIMARY FINDINGS

Effects of Small Classes and a Teacher Aide on Student Achievement and Self-Concept

A. Introduction

This chapter presents the results of the four cross-sectional analyses done at the end of each year, kindergarten through third grade. A similar format is used in each section; first reporting class type achievement differences as measured by the Stanford Achievement Test and the Tennessee Basic Skills First test, followed by a report of the class type differences on the SCAMIN Self-Concept. The final section of this chapter compares results for the one-year analyses across all four years.

The analysis in this chapter is based on Dr. Jeremy Finn's methodology described in chapter 2. This analysis was confirmed by other analyses that examined different subgroups of students who were included or excluded from the analysis.

B. Kindergarten

1. Description of the Data Base

In the first year every effort was made to look at the sample and to identify the similarities and differences that existed among systems, schools, teachers, and students. Selected characteristics of the sample (1985-86) are in Table IV-1 which shows the total numbers of schools, classes and students in STAR and those included in the analysis. The analysis of student achievement was limited to students in STAR for most of the year (entered by 11/1/85) and who had completed either the SESAT II math or reading subtests, or both. Analyses of student development (SCAMIN) required the student to have SCAMIN subtest scores. Table IV-1 shows that approximately 39 percent of the classes were Small, 31 percent were Regular and 30 percent were Regular with aide.

Analyses reported in this section are from test data collected for 5,734 students. Student data were divided into achievement and non-cognitive measures. Achievement measures were results on the SESAT II* (Math or M, Sounds and Letters or S&L, Words and Sentences or W&S, and Total Reading or TR). The non-cognitive measures were the two SCAMIN subscales (Motivation or MOT and Self-Concept or SC). The research tape included complete data for more students for achievement measures (5734) than for non-cognitive measures (4806). Tables IV-2 and IV-3 show the numbers of schools, classes and students by class type and location used in the analyses: IV-2 for Achievement and IV-3 for Non-cognitive Measures.

*The consortium chose SESAT II over SESAT I for several reasons. Tennessee K objectives correlated better with SESAT II than SESAT I; some comparison schools already used SESAT II, and SESAT II offered a higher "ceiling." This resulted in some test-taking frustrations for some students and teachers. Students had difficulty with one section of the SESAT II (sentence reading) and this section was not used in the kindergarten analyses.

TABLE IV-1

Numbers of Districts, Schools, Kindergarten Students and Classes by Type: STAR (1985-86)

	Dist.	Sch.	Pupils	Classes							
				Small		Regular		Regular With Aide		Total	
1985-86 (K)	N	N	N	N	%	N	%	N	%	N	%
Total Project	42	79	6328	127	39	103	31	99	30	329	100
Data Used for K Analysis*	42	79	5734	127	39	103	31	98	30	328	100

*This includes students with required test scores who entered Kindergarten before November, 1985.

TABLE IV-2

Total Kindergarten Sample For Achievement Measures

Class Type					
Location/ and (N)	Item	Small N	Regular N	Reg/Aide N	Total N
Inner City (16)	Class	26	25	22	73
	Pupils	341	494	449	1284
Suburban (18)	Class	30	20	22	72
	Pupils	396	399	469	1264
Rural (38)	Class	59	51	45	155
	Pupils	787	1020	911	2718
Urban (6)	Class	12	7	9	28
	Pupils	154	136	178	468
Total (79)	**Class**	**127**	**103**	**98**	**328**
	Pupils	**1678**	**2049**	**2007**	**5734**

TABLE IV-3
Total Kindergarten Sample For Non-Cognitive Measures

Class Type Location/ and (N)	Item	Small N	Regular N	Reg/Aide N	Total N
Inner City (15)	Class	25	23	21	69
	Pupils	281	400	377	1058
Suburban (15)	Class	27	18	20	65
	Pupils	342	322	395	1059
Rural (37)	Class	56	49	42	147
	Pupils	704	893	769	2366
Urban (5)	Class	10	6	6	22
	Pupils	114	99	110	323
Total (73)	**Class**	**118**	**96**	**89**	**303**
	Pupils	**1441**	**1714**	**1659**	**4806**

2. Analyses of Kindergarten Class Size Effect

Data were collected at the individual level (students, teachers, etc.), but the classroom was the unit of analysis since the primary variable was class size. Class type was analyzed for its effect on four achievement measures, with controls for school location, sex, race, and student socioeconomic status or SES (as determined by free or reduced lunch).

The mean scores and transformed variance measures* for STAR students on four Achievement measures by class type appear in Tables IV-4. Similar data for the SCAMIN measures appear in Table IV-5. Scaled scores are shown for all achievement measures. Scaled scores cannot be compared across tests.

The small class mean was consistently higher than the regular or regular with aide mean on the achievement measures. On only 2 of 40 class mean score comparisons were small class scores lower than regular or regular/aide classes. The non-cognitive results (Table IV-5) are less definite, but the small class means exceed regular and regular/aide means in all but 6 of 20 comparisons. Thus, small classes outscored regular and regular/aide classes 95 percent of the time on achievement and 70 percent of the time on non-cognitive measures when considering class average scores grouped by school location.

* Complete details of all analyses are in an Analysis Report prepared by Dr. Finn and available from the Tennessee State Department of Education. This report shows all data, mean scores, analyses, etc. Persons interested in the technical details of the analyses should review that report. Some results presented in other sections of this report are summarized from the Finn technical report without the accompanying tables.

TABLE IV-4

Mean Scale Scores for Achievement Measures and Class Variability Scores: STAR, 1985-86

Class Mean	Math				Sounds/Letters				Words/Sent.				Total Read.			
	S	R	RA	All	S	R	RA	All	S	R	RA	All	S	R	RA	All
Inner City	474.3	470.6	470.6	471.9	432.5	424.1	435.3	430.5	431.4	424.6	429.0	428.4	431.8	424.4	431.1	429.1
Suburban	491.7	494.9	487.0	491.1	454.2	451.9	445.3	450.8	443.2	435.3	433.9	438.2	447.6	441.0	438.6	443.0
Urban	495.3	482.3	479.3	486.9	459.3	455.4	447.9	454.7	444.1	440.6	437.7	441.1	449.0	445.5	441.5	445.7
Rural	492.3	482.2	484.8	486.8	445.1	438.4	439.4	441.2	437.7	434.8	435.0	436.0	440.6	436.3	436.7	438.0
Total	**488.8**	**481.9**	**481.6**	---	**446.0**	**438.7**	**440.6**	---	**438.3**	**432.8**	**433.7**	---	**441.2**	**435.0**	**436.3**	---
Class Variability																
Inner City	3.45	3.37	3.20	NA	3.30	3.21	3.08	NA	2.63	2.59	2.61	NA	2.81	2.73	2.70	NA
Suburban	3.51	3.45	3.43	NA	3.29	3.32	3.26	NA	2.89	2.90	2.87	NA	2.95	2.96	2.92	NA
Urban	3.38	3.57	3.50	NA	3.24	3.28	3.22	NA	2.87	2.97	2.92	NA	2.89	3.01	2.95	NA
Rural	3.44	3.44	3.42	NA	3.25	3.30	3.27	NA	2.87	2.82	2.91	NA	2.93	2.93	2.95	NA
Total	**3.45**	**3.43**	**3.38**	**NA**	**3.27**	**3.28**	**3.22**	**NA**	**2.82**	**2.79**	**2.84**	**NA**	**2.91**	**2.89**	**2.89**	**NA**

TABLE IV-5

Mean Raw Scores for Kindergarten (SCAMIN) by Class type and Location: STAR, 1985-86

Class Means	Motivation			Self-Concept		
	Small	Regular	Regular/Aide	Small	Regular	Regular/Aide
Inner C.	25.99	25.96	25.45	31.28	30.12	30.09
Suburban	25.48	25.40	25.64	30.39	30.07	30.29
Urban	25.58	25.67	25.65	31.02	29.85	30.39
Rural	25.66	25.67	25.69	30.60	30.17	30.10
Total	**25.68**	**25.69**	**25.62**	**30.73**	**30.12**	**30.16**
Class Variability Scores						
Inner C.	0.88	0.79	0.83	1.07	1.11	1.10
Suburban	0.70	.69	0.69	1.02	1.07	1.08
Urban	0.81	.81	0.81	1.01	1.13	1.09
Rural	0.65	.71	0.75	0.96	1.08	1.08
Total	**0.72**	**0.73**	**0.76**	**1.00**	**1.09**	**1.08**

Table IV-6 contains the principal main effects (class type) analysis for the 1985-86 results on achievement (SESAT II) and non-cognitive (SCAMIN) results for kindergarten classes. Table IV-6 shows the actual significance levels (for all $p<.05$) of the analyses, with explanatory notes as appropriate. In summary, smaller classes have significantly higher achievement scores on all four measures. They have significantly higher self-concept scores but not higher academic motivation scores. There are also differences by location, but these disappear when the analysis is controlled for socioeconomic status (SES). That is, SES "explains" differences by location. The analyses and inspection of mean scores (Table IV-4) show that there are no significant differences between regular and regular with a full- time aide classes.

TABLE IV-6

Summary of Tests of Significance for Differences in Kindergarten Class Means and Variability on Achievement and Non-Cognitive Measures by Class Type and School Type: STAR, 1985-86

	Achievement Measures						Non-Cognitive Meas.				
	Math	S&L	W&S	T. Read	All		Mot.	Self-Con.		All	
Location											
Class x	.05	.01	.08	.02	.01	[A]	NS	NS		NS	
Control for SES	NS	NS	NS	NS	.05	[B]	NS	NS		NS	
Variability	NS	NS	.01	[C] .05	NS		.01	[D] NS		.05	
Class Type											
Class x	.02	.02	.001	.001	.05	[E]	NS	.01	[F]	.05	
Control for SES	.02	.01	.001	.001	.05		NS	.01		.05	
Variability	NS	NS	NS	NS	NS		NS	.02	[G]	.06	
Location X Class Type											
Class x	NS	NS	NS	NS	NS	[H]	NS	NS		NS	
Control for SES	NS	NS	NS	NS	NS		NS	NS		NS	
Variability	NS	NS	NS	NS	NS		NS	NS		NS	

S&L=Sounds and Letters; W&S=Words and Sentences; T Read=Total Reading;
NS=Not Significant; S=Small, R=Regular and RA=Regular Class w/Full-time Aide.

[A] For all measures, urban > inner city, esp. reading; inner city has lowest mean, followed by rural, suburban, and urban.
[B] Effects are NS when controlled for SES. SES "explains" school location differences.
[C] Inner city less variable than all others.
[D] Rural and suburban much less variable than urban and inner city.
[E] Small classes significantly better than others on all measures. No difference between (R) and (RA). This is true when controlling for SES.
[F] Small classes higher x Self-Concept than others in all locations. No difference in motivation.
[G] Small classes less variable than (R) and (RA), also higher Self-Concept.
[H] No interaction, type x location. (S) are significantly better to same extent in all locations.

3. Comparison of Class Types Within Schools

Since the regular classes outperformed the small classes in some cases, an analysis was done to compare individual small and regular classes within schools. The analyses employed a "small class advantage score" determined by calculating difference scores for each small class on each measure by subtracting the small class mean from the regular class mean. A **big benefit** of a small class was defined as a difference of two standard errors or more on each test; **some benefit** was a positive gain on each test; **mixed results** was some gain on some tests; **no benefit** was no advantage to the small class on any test. These results are summarized in Table IV-7. Note that on achievement measures small classes benefited 39.4 percent, had mixed results 34.6 percent and no benefit 26 percent. On non-cognitive measures, the respective results were 39.8, 34.7 and 25.4 percents. There are modest overall benefits to small classes in kindergarten. These benefits varied by location with the inner city small classes having the greatest "big benefit" (52 percent) and rural having the least (26.8 percent). Since inner-city schools included the most minority students and rural schools included the fewest, this finding points to a differential effect of small classes favoring minority students.

Results in Table IV-7 suggest that teacher effect is important; good teachers get good results regardless of class size. If true, the issue still remains to be solved: do good teachers get better results in small classes (1:15) than in regular classes (1:25)? Table IV-8 provides a summary of differences between 1) small classes and regular classes and 2) small classes and regular/aide classes on measures shown.

Further analyses were done using only those classes that were termed highly effective. Highly effective small classes were those that had a two standard error advantage over large classes in the same school on every one (of four) achievement and/or both non-cognitive measures. "Ineffective" small classes performed more poorly than regular classes in the same schools on all four achievement and/or both non-cognitive measures respectively.

On four measures (teacher years' experience, teacher highest degree, percent minority and proportion free lunch or SES), there were no patterned (significant) differences between the highly effective and highly ineffective small classes on achievement and non-cognitive measures ($p<.05$).

Classes effective in improving achievement measures are not necessarily effective in achieving positive non-cognitive results ($X2=11.71$, $p<.05$, df2). There are positive ($p<.05$) relationships between each of the achievement measures and self-concept, but not between achievement measures and the non-cognitive measure of achievement motivation.

TABLE IV-7

Benefits to Small Classes on Achievement and Non-Cognitive Measures: STAR Kindergarten (1985-86)

	Big Benefit 2 Standard Error on Ea. Test.	Some Benefit On Each Test	Mixed Results	No Benefit on Any Test
AchievementClasses (n=127)	41(32.3%)	9 (7.1%)	44(34.6%)	33(26.0%)
Tests (n=4)				
Schools* (n=79)	39(49.4%)	40(50.6%)		
Non-Cog.Classes (n=118)	40(33.9%)	7 (5.9%)	41(34.7%)	30(25.4%)
Measures(n=2)				
Schools* (n=73)	37(50.7%)	36(49.3%)		

* This is just the number of different schools in which these classes are found; not all small classes in these schools may have benefited as shown.

TABLE IV-8

Extent of Small Class Advantage Over Regular (R) and Regular with Aide (RA) Classes: Project STAR, 1985-86, Total Sample

Measures	Small Class Advantage Over...			
	Regular Class		Reg. with Aide	
	Scaled Score	Grade Eq.	Scaled Score	Grade Eq.
Math	6.9	<.1	7.2	<.1
Sounds & Letters	7.3	<.1	5.4	0.0
Words & Sentences	5.5	.1	4.7	.1
Total Reading	6.2	.1	4.9	.1
Self-Concept	.61	.39*	.57	.37*

*Standard deviations

4. Summary

The overall superiority of the performance of students in small classes on the tests used in STAR and the similarity of performance of students in regular and regular/aide classes are shown graphically in Figures IV-1 to IV-6. Figures IV-1 through IV-3 present the scaled scores of kindergarten classes on Total Reading, Total Math, and Word Study Skills from the Stanford Achievement Test (SESAT II) results. Figures IV-4 thru IV-6 show these scaled scores by school location and class type.

STAR's kindergarten results showed definite advantage for small classes in achievement but no significant advantage for the use of a teacher aide. Differences found at the kindergarten level are consistent with the results of some other studies of early primary grades (K-3). A summary of 22 well-designed studies (ERS, 1986) concludes:

> In general the more recent studies that have used a "small" class range of 15-22 have found such class sizes to be related to greater student learning in the early primary grades, (ERS, 1986, p.32.)

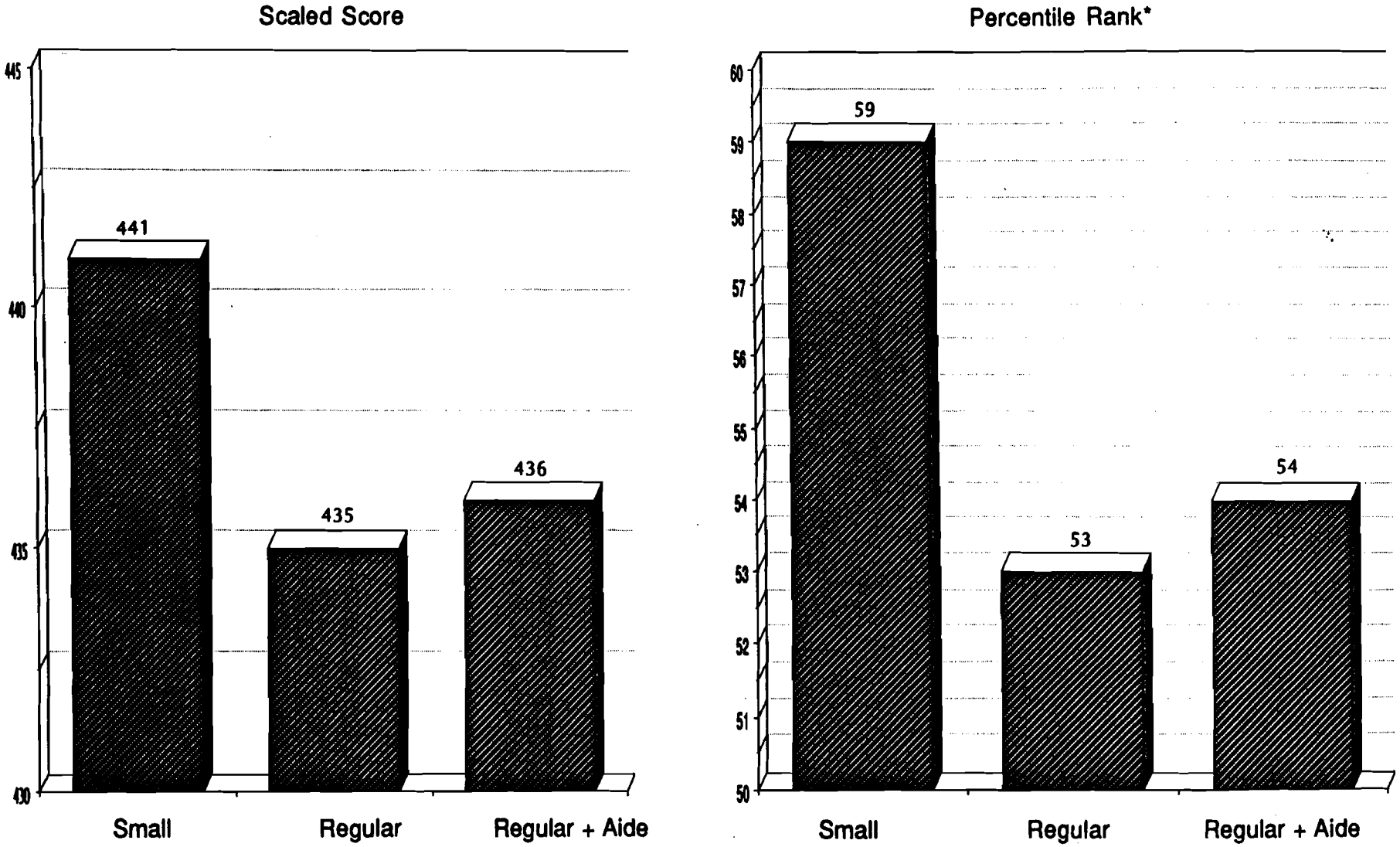
The kindergarten results show the consistent finding that small is better, at least in Project STAR.

Figure IV-1

Project STAR

Kindergarten Stanford Achievement Test

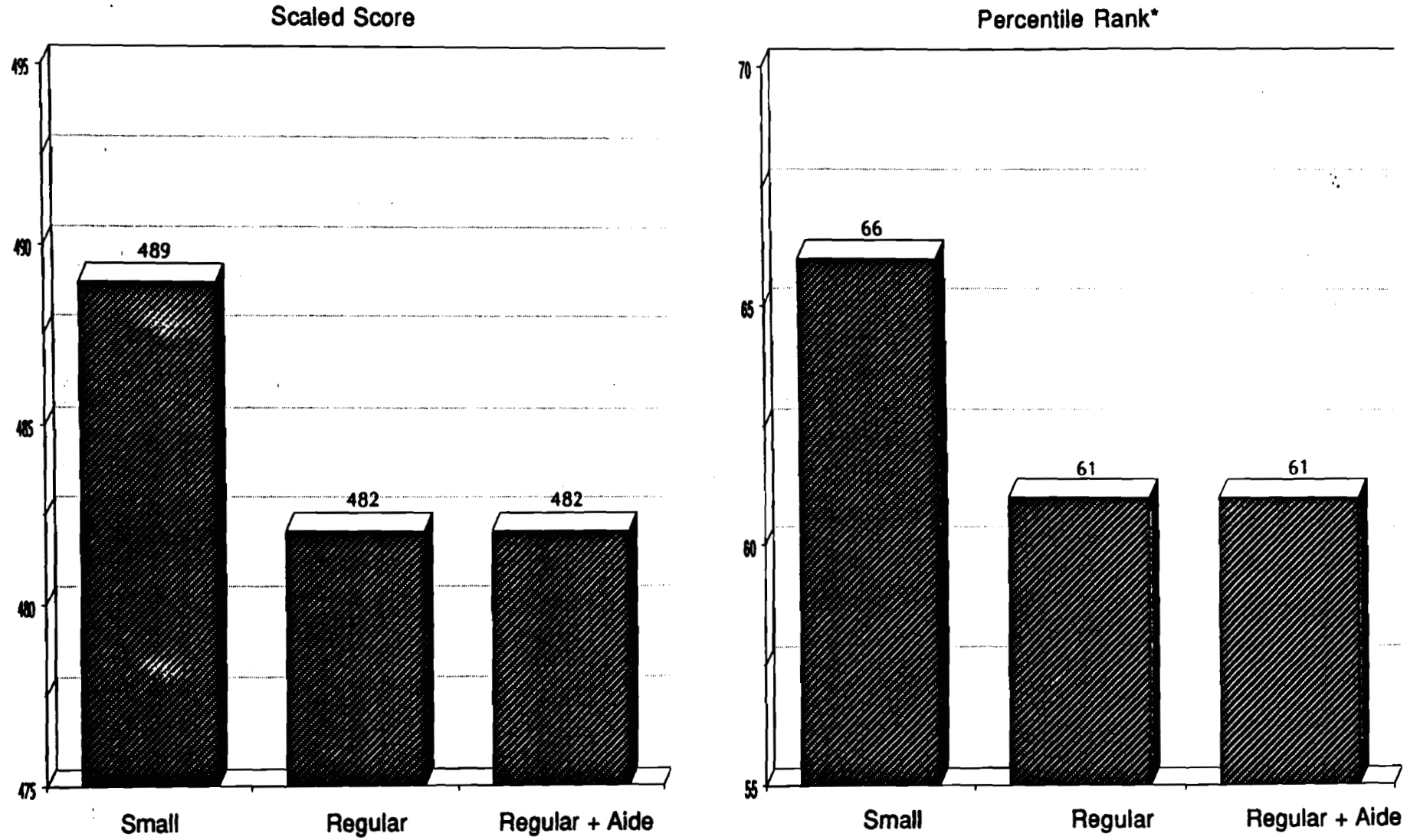
Total Reading by Class Type



Stanford SESAT II

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-2
Project STAR
Kindergarten Stanford Achievement Test
Total Math by Class Type



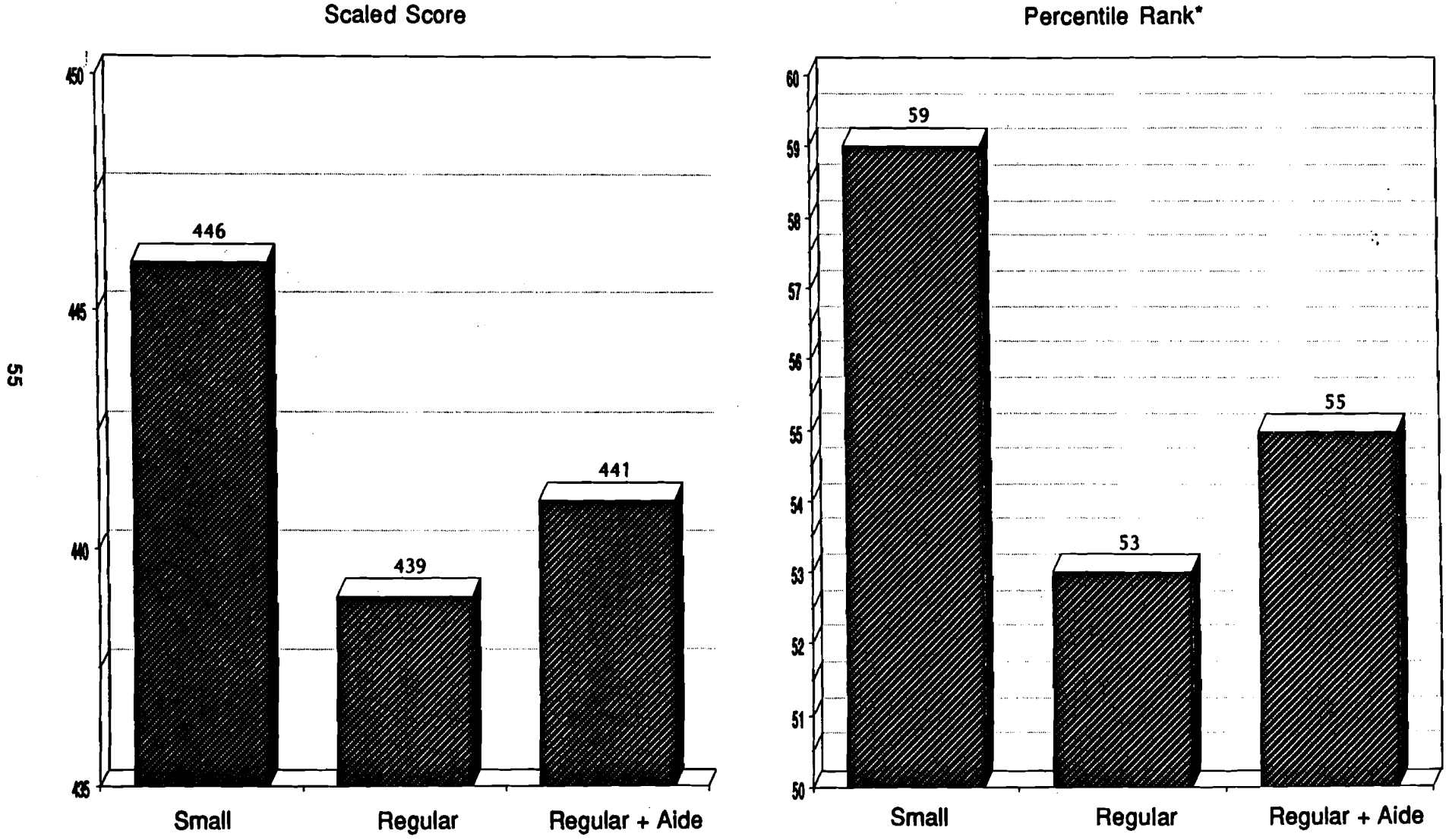
Stanford SESAT II
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-3

Project STAR

Kindergarten Stanford Achievement Test

Word Study Skills by Class Type

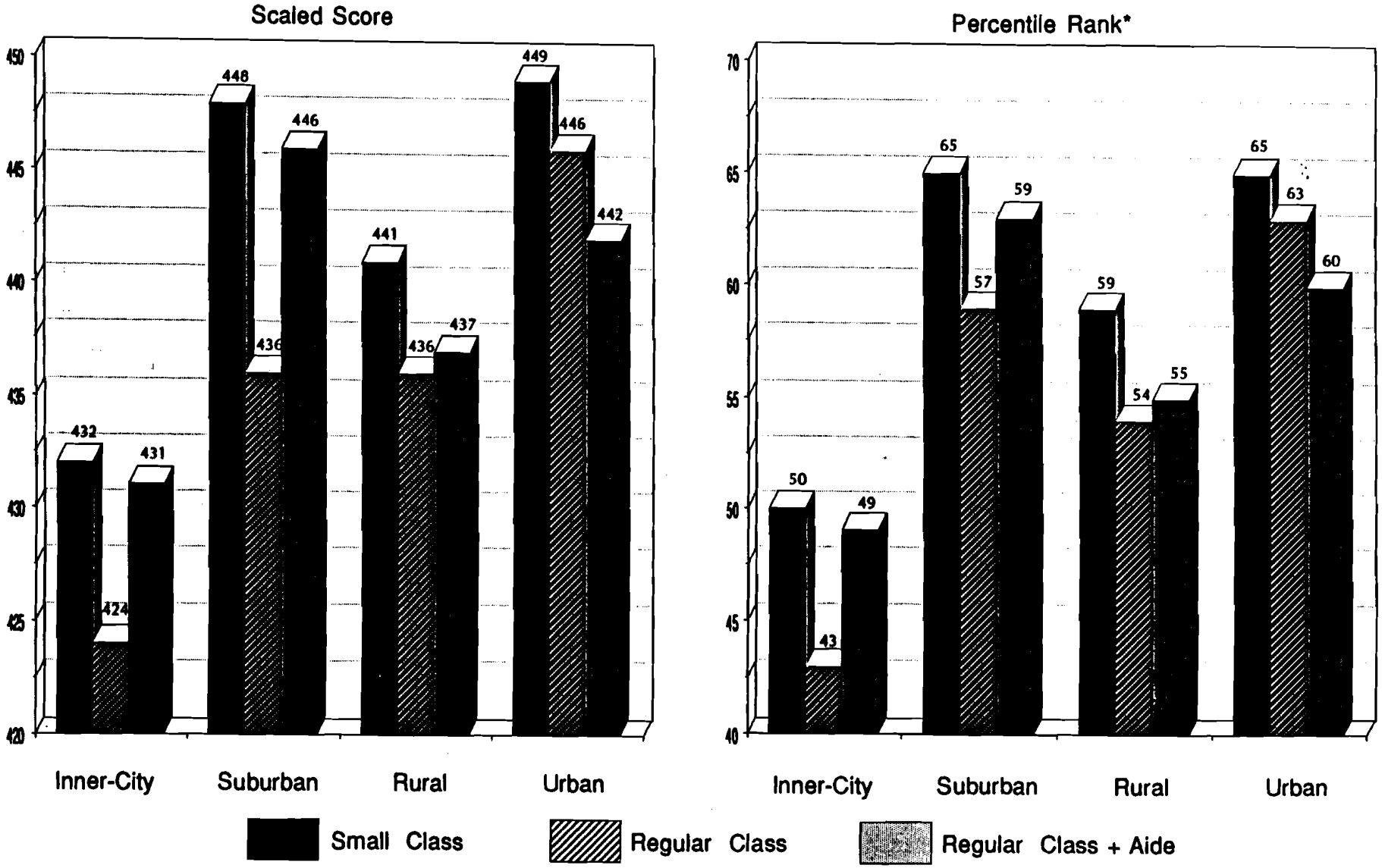


55

Stanford SESAT II

*Percentile rank is based on Stanford Multilevel Norms

Figure IV-4
Project STAR
Kindergarten Stanford Achievement Test
Reading: Class Type by School Type



Stanford SESAT II

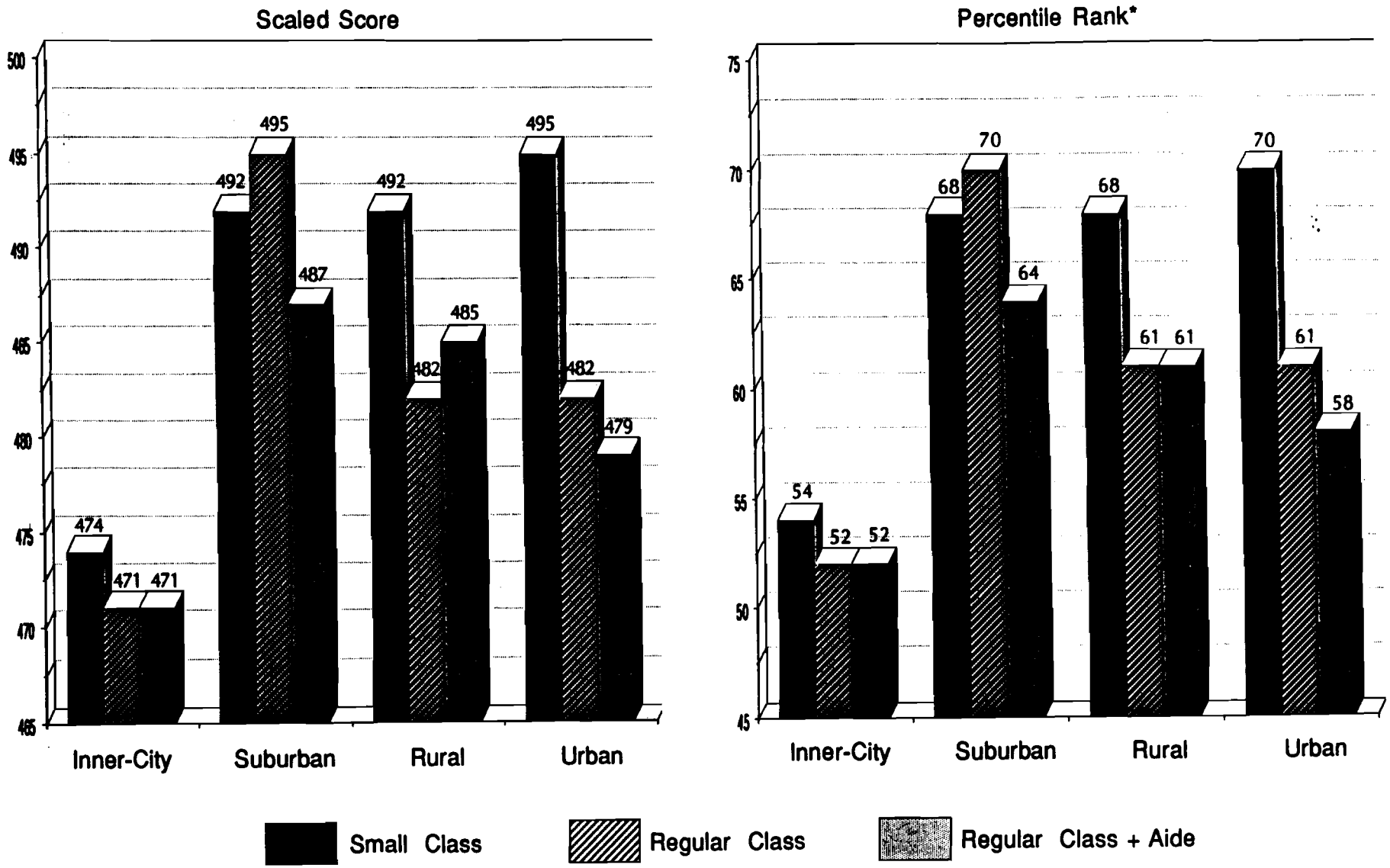
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-5

Project STAR

Kindergarten Stanford Achievement Test

Total Math: Class Type by School Type



Stanford SESAT II

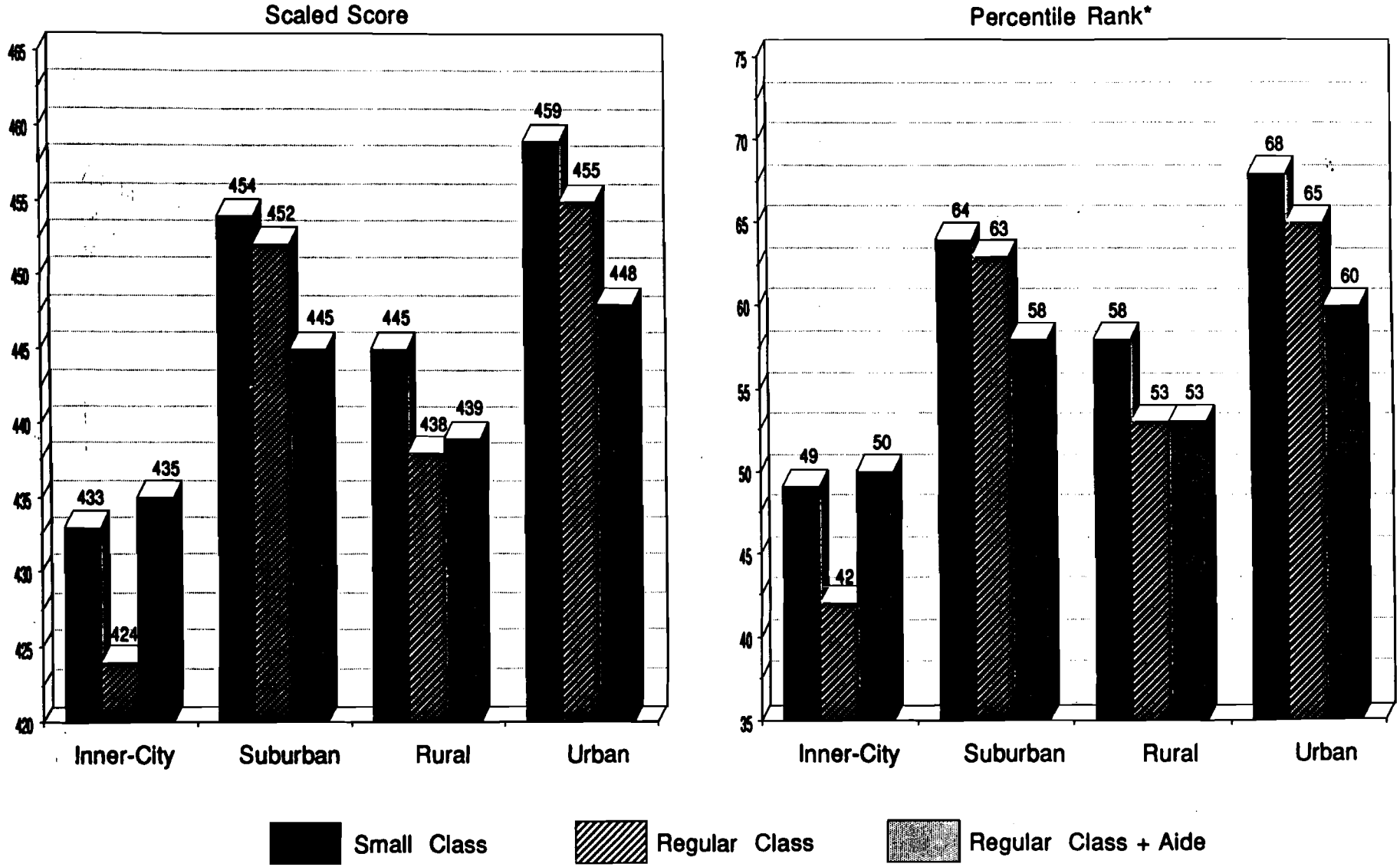
*Percentile rank is based on Stanford Multilevel Norms

Figure IV-6

Project STAR

Kindergarten Stanford Achievement Test

Word Study Skills: Class Type by School Type



Stanford SESAT II

*Percentile rank is based on Stanford Multilevel Norms

C. First Grade

1. Description of the Data Base

At the beginning of first grade the sample changed as schools were permitted to interchange students in regular and regular with a full-time aide classes. This was due primarily to teacher-identified discipline problems and because some parents complained about their children being in a "regular" class with no opportunity for another condition for four years. Since there were no significant differences between performances of students in regular and regular with aide classes, the exchange between these two class types was allowed. The students in kindergarten small classes remained in first grade small classes and in small classes throughout the study. This first grade interchange resulted in 664 students moving from a regular class to a regular class with a full-time aide while 734 remained in a regular class; 760 moved from regular with aide classes to regular classes, 705 students remained in a regular with aide classes and 1,291 students remained in small classes. In order to achieve sexual and racial balance and to separate incompatible children, 48 students from small kindergarten classes moved to regular with aide classes and 60 moved to regular classes. Because kindergarten is not mandatory, the number of students in the project increased as children entered school for the first time. These were randomly assigned at the beginning of first grade.

Another change from the kindergarten to first grade data base was the school location reclassification of one school from inner city to suburban. In addition, three schools asked to be removed from the project in September 1986 at the end of the kindergarten year: one because of a loss in enrollment; one because of parental dissatisfaction; and one because school personnel elected to ability group across classes. The number of districts, schools, first grade students, and classes by type is reported in Table IV-9.

TABLE IV-9

Number of Districts, Schools, Students and Classes by Type: STAR, 1st Grade (1986 - 87)

	Dist.	Sch.	Pupils	Classes							
				Small		Regular		Regular With Aide		Total	
1986-87 (1)	N	N	N	N	%	N	%	N	%	N	%
Total Project	42	76	6835	124	37	115	33	100	30	339	100
Data Used for Grade 1 Analysis*	42	79	6572	122	37	111	34	98	29	331	100

*This includes students with required test scores who entered 1st grade before November, 1986.

2. Achievement Results

The kindergarten results appear in detail in the prior section. Results of the primary year-by-year analyses for students in grades 1, 2 and 3 on the Stanford Achievement Tests (SAT), the State of Tennessee's criterion-referenced Basic Skills First (BSF) tests, and on the SCAMIN are reported in the same format as the kindergarten results shown in Table IV-6 for ease of comparison and reading. At the end of first grade, Project STAR students in small classes were outperforming students in regular and in regular with aide classes by substantial (statistically and educationally significant) margins on standardized tests, and also on the state's Basic Skills First (BSF) test of reading and math. Few consistent differences were found in SCAMIN results. This superior performance by students in small classes was evident in all locations (rural, suburban, urban, and inner city schools), and for students of different races and of both sexes.

As shown in Table IV-10 there were differences ($p<.001$) in class mean scores in the four locations (generally with classes in rural areas having the highest mean scores). Class mean scores by location are shown in Table IV-10. The differences ($p<.001$) by class type, with small classes better than all others on all measures, identifies the strong class-size effect in all school types (inner city, suburban, rural, urban) equally.

The self-concept (SCAMIN) results in grade one generally were not significant based upon class size, but there is a statistically significant result based upon school location. Notes on Table IV-10 explain the specific findings in detail. The pattern shown in Table IV-10 for grade one results is essentially the pattern of results (with minor variation) found for the SCAMIN results in kindergarten and grades two and three.

The primary analysis (class type and location) was also performed on the class results obtained on the state criterion-referenced Basic Skills First (BSF) tests. Those results appear in Table IV-11.

Analysis results of the BSF test scores are essentially the same as results from analyses of data obtained from the SAT. Differences ($p<.001$) were obtained by school location with inner city students performing least well and classes scoring about the same in the other three school types. The strong ($p<.001$) class-size effect showed that the small classes were significantly better (and the teacher aide effect was non-significant) on all measures. These differences were obtained wherever the classes were located.