EFFECTS OF CLASS-SIZE REDUCTION IN THE EARLY GRADES (K-3) ON HIGH SCHOOL PERFORMANCE

Preliminary Results (1999) from Project STAR, Tennessee's Longitudinal Class-Size Study

Helen Pate-Bain, B. DeWayne Fulton, and Jayne Boyd-Zaharias[1]
Health and Education Research Operative Services, (HEROS) Inc.

April 1999

Background[2]

The Student/Teacher Achievement Ratio (STAR) Study was a research project designed to provide information related to the effects of early elementary (K-3) small-size classes on student performance. This Tennessee-based educational experiment began in 1985 with the random assignment of 6,328 kindergarten students to one of 3 class sizes: small (13 to 17 students), regular (22 to 25), or regular with a full-time teacher aide. At this time (1985), kindergarten was not mandated in Tennessee, and when the study progressed to first grade (1986) the number of students participating in STAR grew to 6,835. The experiment could not control students transferring in and out of the STAR schools. Therefore, the 6,835 first grade sample does not include all of the 6,328 kindergarten participants. In second grade (1987) there were 6,846 STAR participants and in third grade (1988) the sample was 6,804. In all, there were 11,600 different students who participated in Project STAR, of whom 1,842 were in the same class-size condition for all four years (K-3) of the study. Out of the 11,600, there were 2,571 students who remained in the same class-size condition for grades 1 through 3.

The original STAR database[3] has been analyzed and reanalyzed by various researchers who have used a variety of statistical applications and who have employed specific sample selections from the database. Although their methods have differed, their basic findings have been relatively consistent – students who attended small size classes in K-3 outperformed their peers who attended larger size classes. Similarly, a number of STAR follow-up studies (grades 4 and beyond, after the experiment ended) have been conducted. Again basic findings agree that there are carry-over advantages from having attended small-size classes in grades K-3. This paper focuses on analyses of newly collected data from STAR students' high school (grades 9-12) records.

Student Sample and Data Description

STAR students who were promoted on schedule from grade level to grade level would have graduated in the Spring of 1998. HEROS, Inc. began collecting high school data on STAR students in the Fall of 1997. Data collection has been a lengthy process because some data are available only at the State Department of Education, some only from individual school systems, and other data are available only at the individual school level. This has required numerous and multiple contacts (via every available method – phone, fax, mail, e-mail, and

---

[1] Helen Pate-Bain serves as Chairperson, DeWayne Fulton is Research Associate, and Jayne Boyd-Zaharias is Director of HEROS, Inc., a nonprofit [501 (c) (3)] research and evaluation organization. The authors have worked together on Project STAR since 1985 when the study was initiated by Pate-Bain.

[2] The official State of Tennessee Project STAR Final Technical Report contains full details on background, procedures, and findings. Reports are available from HEROS, Inc. (e-mail: heros@telalink.net).

[3] HEROS, Inc. has made STAR students' demographic and reading and mathematics test scores (K-3) available through the World Wide Web: **www.telalink.net/~heros.**

personal visits), but has resulted in the collection of invaluable data. Data include student grades from various subject areas, grade point averages, graduation date, type of diploma, Tennessee proficiency test scores, attendance reports, discipline information, participation in extra-curricular activities, retention, and more. These new data have increased and enhanced the power of the STAR database. To date over 3,000 high school records have been collected and merged with the original STAR data set. Unfortunately, some school systems and schools have been slow to respond to requests for data. In order to obtain as many high school records as possible, HEROS will continue data collection efforts through 1999, and if funding permits, will try to obtain information on students who have moved out of state. Therefore, the following findings are labeled "preliminary." However, with over 3,000 records, researchers are confident that results reported in this paper are valid and reliable.

Preliminary Findings

Overall, findings show that small classes in the early grades (K-3) produce significant long-term benefits through high school. The students who attended small classes early in their school careers continue to outperform their counterparts who attended regular-size classes and regular-size classes with full-time teacher aides.

Since school systems and schools do not all retain the same type of student data, and store their data in different ways using different recording methods, the results presented in the following tables include the number of available records for each specific area of analyses.

Table 1
Preliminary Results of the Effects of Small Classes on High School Performance

	Small (13 to 17 students)	Regular (22 to 25 students)	Regular/Aide (22 to 25 students)	Total Sample
Available Records	638	823	877	2338
Completed Honors English	73 (11%)	76 (9%)	83 (10%)	232 (10%)
Available Records	638	823	877	2338
Completed Advanced Math	464 (73%)	563 (68%)	593 (68%)	1620 (69%)
Available Records	752	1056	1049	2857
Graduated on Schedule	538 (72%)*****	696 (66%)	680 (65%)	1914 (67%)
Available Records	483	628	612	1723
Received an Honors Diploma	165 (34%)	194 (31%)	194 (32%)	553 (32%)
Available Records	221	270	270	761
Graduated in Top 10%	36 (16%)	33 (12%)	39 (14%)	108 (14%)
Available Records	658	903	937	2498
High School Drop Outs	127 (19%)*****	210 (23%)	246 (26%)	583 (23%)

*****Indicates the results were statistically significant ($p < .05$).

Notice that the data reported in Table 2 are based on larger samples. Since these data were made available electronically by the Tennessee Department of Education, HEROS' staff was

able to request a search of the statewide database to obtain this information for STAR students. Since these data are routinely collected and kept on file by the state, this method resulted in locating more data on STAR students than collecting other types of data that are available only at the individual system or school level. The types of data available at the local level also vary according to the record keeping methods of individual school systems. Thus, when state data are available, sample sizes are larger.

Table 2
Preliminary Results of the Effects of Small Classes on High School Performance

	Small (13 to 17 students)	Regular (22 to 25 students)	Regular/Aide (22 to 25 students)	Total Sample
Available Records	2303	3274	3259	8836
Retained (failed): 1 or More Years	552 (24%)	850 (26%)	870 (27%)	2272 (26%)
Available Records	1372	1350	1413	4135
Math Subject Matter Test: Advanced Mathematics (Algebra I & II or Geometry)	883 (64%)*	818 (61%)	826 (59%)	2527 (61%)
Available Records	1372	1350	1413	4135
Math Subject Matter Test: Technical Math I	155 (11%)	144 (11%)	143 (10%)	442 (11%)

*Indicates the results were statistically significant ($p \leq .05$).

Preliminary findings indicate that the benefits of having attended a small class in grades K-3 continue through high school. Small-class students have completed more advanced courses (mathematics, honors English, etc.) than regular or regular/aide-class students. They are also more likely to graduate on schedule with higher rankings (top 10% of their class) than their counterparts who attended larger size classes.

The students who were in small classes in K-3 were less likely to be retained than those who attended regular or regular/aide classes. According to the Tennessee State Department of Education, the average per pupil expenditure in the 1997-1998 school year amounted to approximately $4,686. The preliminary results from this study show about a 2.5% failure rate (retained in one or more grades) differential between the number of students who attended regular-size and regular-size classes with full-time teacher aides and the number of students who attended small-size classes. A total of about 30,287 Tennessee students (grades K-8) were retained in the 1997-1998 school year. If having attended small size classes could have saved 2.5% (757) students from failing a grade, this would translate into cost savings of at least $3,547,302 ($4686 multiplied by 757). Savings could be substantially greater if multiple retentions (failing more than one grade level) were calculated into the formula. This would mean savings to all entities that contribute to the education budget (i.e., local school systems, the state, and the federal government).

It seems that STAR small-class students were less likely to drop out of high school than were regular and regular/aide-class students. As reported by the U.S. Census Bureau, in 1997 a typical high school graduate made $5,276 more per year than a high school dropout (average earnings were $21,400 and $16,124 respectively). Preliminary analyses show a 5% difference between the number of STAR small-class students and regular and regular/aide-

class students who dropped out of high school before scheduled graduation (Spring 1998). In 1997-1998 Tennessee experienced a 15.2% dropout rate (grades 9 through 12) which amounts to about 7,799 students. Multiplying the figure $5,276 by 5% of the total statewide dropouts (390) provides an estimated economic impact in the amount of $2,057,640, and this figure does not take into account the number of dropouts who would not become employed and/or who would receive welfare. This approximate amount of lost earned income would appear to have a negative impact to some degree on the State of Tennessee as well as the Federal Government.

Summary & Conclusions

Preliminary findings indicate that students who attended small classes completed more advanced courses than did students who attended regular and regular/aide classes. Therefore, it appears that small-class students were better prepared to enter college than their peers from the larger size classes. Furthermore, it seems that the students who were in STAR small classes were less likely to be retained, and were less likely to drop out of school. Keeping children in school and learning on (or above) grade level can be vital to the economy. The preliminary findings in this paper, coupled with other research findings, show that there are numerous short- and long-term benefits associated with class-size reduction. It is true that the cost of implementing small-class sizes is not cheap, however, in the long run, the cost of not reducing class sizes would likely result in greater social and economic expenditures.