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ABSTRACT

This paper addresses the segregation of student populations that results from adoption of multitrack year-round school attendance calendars. Its focus of analysis is the link between student achievement and the use of a multitrack year-round education (YRE) program to structure student attendance. Data for this study consist of achievement test data from the spring 1998 administration for a large urban California school district for grades 2 through 6. Results of statistical analysis of the data show that there are two forms of opportunity segregation related to multitrack YRE in this district. First, YRE schools have lower achievement and more challenging student populations (that is, higher proportions of students with characteristics associated with lower achievement) than do traditional calendar (TC) schools. The second form of opportunity segregation is between tracks at YRE schools; it changes over time, solidifying and elaborating intertrack differences. The critical driving force behind this demographic, resource, and achievement segregation is parental choice. Parental political pressure to use vouchers to create learning opportunities for their students in multitrack YRE learning environments had contrary outcomes. At present, there is no compelling evidence that multitrack YRE education programs lead to improved student achievement. (Contains 43 references.) (RT)

Student Segregation and Achievement Tracking in Year-Round Schools

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INTRODUCTION

There are many ways in which school attendance patterns serve to segregate student populations. Communities are segregated into districts, school attendance boundaries segment neighborhoods within districts, school populations are divided into age-grade cohorts within and across schools, special programmatic services segregate populations within and across classrooms, etc. (Entwisle, Alexander, & Olson, 1997). Policies arranging these segregated student opportunities have long histories and traditions associated with them; some have seen substantial change over the last half-century. Most notably, political and legal actions have been taken to racially desegregate schools on the basis of unequal outcomes for identified groups (Kirp, 1995). Others changes are the result of special program creation, fiscal and political constraints on school construction and school attendance boundary determination. This paper addresses the segregation of student populations that results from adoption of multi-track year-round school attendance calendars. In some instances multi-track year-round calendars are developed as innovative programs. More often, however, they are the result of overcrowding and under financing of school facilities.

The focus of analysis in this paper is the link between student achievement and the use of a multi-track year-round education (YRE) program to structure student attendance. Detailed study of achievement variations in one large urban school district in California documents the effects of this mechanism for segregating student opportunity. A context for the study is set by reviewing the literature on both curriculum and attendance tracking, followed by a detailed examination of the relationship between student achievement and multi-track YRE. Statistical analyses of relationships between achievement test scores and student and teacher characteristics are presented to empirically verify the extent of opportunity segregation created by YRE. A brief discussion of the importance and limitations of the findings follows the presentation of results, and the paper concludes with a description of how parental choice policies determine attendance patterns and thus create the documented achievement segregation.

TRACKING IN SCHOOLS

Among educators, the term tracking is used to refer to the organization of both attendance and curriculum. In the case of attendance on a multi-track year-round calendar, the tracking of students is seen as a matter of routine management. Administrators keep track of students, and ensure that their teachers, classrooms, and resources are in place and coordinated. By whatever mechanism that determines student assignment to an attendance track, once so placed, the school must be organized to deliver instruction and monitor participation. Typically, there are more students than there are seats and classrooms, so attendance must be structured to optimize the use of available resources. Curriculum tracking, by contrast, is used to intentionally structure school opportunities. Students are segregated into groups based on factors such as ability, interest, achievement test performance, or special needs. Curriculum tracking has been criticized for systematically differentiating educational services in such a way that the tracked groups are virtually guaranteed unequal outcomes and therefore unequal life chances outside of school. For both meanings of tracking, however, particular patterns of attendance and resource distribution are established. In both cases, students have distinctive opportunities and access to different resources.

Oakes, Gamoran, and Page (1992) have extensively reviewed curriculum differentiation. While school curricula differ sharply across schools (as a result of demographic segregation[1] and regional policy differences), within schools the biggest differentiation is the development of age-graded groups with distinctive grade-level curricula. Except for grade level distinctions, however, elementary schools throughout the world are characterized more by *within* classroom than between classroom differentiation. There are exceptions to this generalization, of course, magnet or specialty schools exist, and special programs separate students within schools into distinct instructional groups.[2] While curricula for classes operating at the same grade level are nominally similar, students are often intentionally sorted through the formation of ability or interest groups – a pattern that emerged during the1920's, encouraged by the development of IQ testing. According to Sørensen and Hallinan (1985), in the earliest elementary grades, little reliable assessment data is available leading educators to use more visible and arbitrary background characteristics to define classroom groups. Regardless of the actual basis of instructional grouping, these ability groups are most often restricted to reading, language arts, and mathematics, the bulk of the elementary curriculum. The students may be grouped for instruction in all of the main subjects or separately for one or more of them. The use of differentiated educational opportunities has been rationalized as a response to historical and persisting pressures on schools "to promote both equality and individual advantage" (Oakes, Gamoran, & Page, 1992, p. 582).

[1] Keep in mind that the value of real estate, and therefore the intentional sorting of students (children) between schools by their families, is strongly determined by the reputation of the neighborhood school (see, Black, 1999). See Entwisle, Alexander, and Olson (1997) for an excellent discussion of the profound demographic segregation that may occur.

[2] In school districts under court order to desegregate their schools, magnet programs often serve as an incentive for high SES families to voluntarily integrate low SES schools. Depending on the size and target group or content area, a magnet program may be functionally a "classroom choice plan" (Cookson, 1994:16) which preserves segregation within the school site. Entwisle, Alexander, and Olson (1997) also note grade retention and programmatic designation (i.e., special education) as powerful tracking mechanisms.

Programmatically differentiated educational opportunity, hereafter referred to as tracking, has been attacked because the outcomes it generates are unequal and biased. The 'promotion of equality' claim certainly has not always been found to be true. Identifiable students, typically "underrepresented minorities," have inferior learning opportunities and substandard achievement as a result of their "lower" track assignments. Since ability track assignment is largely controlled by the schools (i.e., teachers, counselors, and principals), as noted above, legal and policy remedies have sometimes been pursued by parent and community groups. Overall, curriculum differentiation affects five core dimensions of the educational process:

1. Distribution of teachers,
2. Distribution of knowledge,
3. Dynamics of classroom life,
4. Sorting of students along race and social class lines, and
5. Educational and social outcomes of schooling. (Oakes, Gamoran, & Page, 1992, p. 582)

In this analysis of the consequences of multi-track year-round education on student segregation, the distribution of teachers, the sorting of students along race and social class lines, and students' standardized achievement scores are presented.

Year-Round Education

Year-round education (YRE) is a particularly powerful mechanism for tracking student groups within schools. By creating distinct "schools within a school," YRE creates opportunities to separate children by ability, interest, achievement, special needs, or a variety of other factors. The separation may be intentional (through program differentiation) or the accidental by product of track selection.

The impact of YRE on school operations and student experiences has been reviewed most extensively by Zykowski, et al. (1991) and Shields & LaRocque (1996). Though not used widely until recent years, year-round calendars have been in existence for more than three centuries (Shepard & Baker, 1977; Zykowski, Mitchell, Hough, & Gavin, 1991). Primarily as a response to overcrowding, but also as a structure for academic innovation, YRE has seen a tremendous growth over the last few decades (Zykowski, et al., 1991; Shields & LaRocque, 1996). Once YRE programs have been implemented they have typically been judged quite positively by students, teachers, administrators, and parents, when surveyed.[3] In many locations, however, when financial or other constraints motivating the adoption of YRE calendars are removed, communities return to a traditional calendar (TC). When they have been implemented as part of a concerted reform effort, however, YRE programs typically include inter-session programs or other extensions of the school year. Under these circumstances, student achievement often goes up. But the widely used argument that the staggered schedules of YRE calendars alone will improve achievement by shortening vacation periods (there are typically three separate one-month breaks in each track's schedule – the 60/20 model) does not appear to have a scientific foundation. As Shepard and Baker (1977) have indicated, the shorter vacation periods are still too long relative to the "extinction curve" for learning, and the multiple breaks create multiple "forgetting" opportunities.[4]

The two states with the fastest growing student populations – California and Texas – have the greatest number of schools on a YRE calendar (Curry, Washington, & Zyskowski, 1997). California even enacted a law (Assembly Bill 87, 1991) giving priority funding for school building construction to districts with multi-track YRE programs (Smith, 1992). The 1996 *California Class Size Reduction (CSR) Program* further encouraged YRE as districts scrambled

[3] Some YRE programs do not survive the political battle that precedes their intended implementation. Deviation from the traditional calendar is a change many people are unwilling to accept without good rationale – change is not popular. Nonetheless, changing the calendar does not otherwise disturb people's sense of what education is about and what goes on in schools, making the change tolerable, if not advantageous.

[4] The only data available to test this was reported by Haenn (1996). The students who had inter-session tutoring during the week prior to 'going back on track' were the only ones to show consistent gains. Review prior to and contiguous with studying new material left no time for forgetting. The author notes that there are some limitations to the sampling and data collection.

to find classroom space for the newly funded smaller classes (Hymon, 1997).[5] Among elementary school children in California, just over one in four children attended a multi-track year-round school in 1997-98 (California Department of Education, 1998). The most popular YRE schedule involves four interwoven tracks. Three and five track structures also exist. Typically, students and classrooms are rotated on a four month cycle with three tracks in session at any given time (allowing four students to be accommodated with every three seats).

Multi-track YRE in the elementary schools creates distinct cohorts of students. Classroom groups are assigned to a specific attendance track, and students stay within a particular track for the entire school year. Ordinarily, track assignments are the result of parental preferences, but where specific tracks are designated for special programs (e.g., athletics, music, special education, GATE, bilingual education) families may have little choice of track for their children. Students typically have no exposure to children in other tracks during the instructional portion of their day. For this reason, issues of equality of opportunity arise – issues that are particularly pointed if there is a differential distribution of resources across the tracks. Multi-track YRE elementary schools are examined below in order to determine the extent to which achievement differences are linked to track assignment and the possible consequences of these differences.

Achievement Studies of Year-Round Education

Prior to the recent growth in multi-track YRE caused by California's rapidly growing school age population, poor financing of school facilities, and its CSR initiative, some studies of YRE programs had been undertaken in California, Utah, Texas, Virginia and Missouri (see Zykowski, et al., 1991 for a review of these studies). Only one study by the California State Department of

[5] This pressure to implement multi-track YRE may see some important reduction as a result of the passage of Proposition 1A on the November, 1998 California ballot. This funding measure provides money per pupil in support of CSR, independent of current district building space utilization. Nonetheless, the school construction

Education was able to make adequate and important distinctions among multi-track and single-track YRE schools (Quinlan, George, & Emmett, 1987). The statewide evaluation found that multi-track YRE schools scored below predicted state levels on the California Assessment Program (CAP) test even after statistically controlling for their over-representation of lower socioeconomic status (SES), AFDC, and limited English speaking students. Single-track YRE schools achieved at or slightly above predicted levels.

Not all studies of YRE programs separate single-track from multi-track YRE schools, and some only compare single-track YRE schools with TC schools. Thus, there is very little in the way of careful analysis of multi-track YRE clearly distinguished from TC education. A review of the methodologically coherent achievement studies comparing YRE schools with TC schools was reported by Kneese (1996). She performed a meta-analysis in an attempt to make sense of a host of studies offering no clear message. Kneese, as she noted in the study, was required to utilize results from studies that suffered from non-experimental implementations of YRE calendars, and occasionally commingled results of multi-track and single-track YRE schools. She reported a rather small positive effect favoring YRE over TC programs.

Five studies make direct contributions to understanding the impacts of multi-track YRE on student achievement. Two address factors influencing achievement differences across tracks. Brekke (1986) reported the performance of students in the Oxnard School District (California) for academic years 1980-81 through 1983-84. He found mean achievement to be similar across all YRE tracks and the traditional attendance calendar, except one. The odd track, labeled 'B' and having its summer break in September (winter break in January), had a much higher population of Hispanic children (93%) and the lowest average achievement. This population

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funding formula has been revised to "reward" districts for adopting a multi-track YRE calendar in response to the press to implement CSR.

bias was purposefully planned by the district in an effort to minimize school absenteeism among children of Mexican laborers. It is not clear whether the achievement levels observed were greater for these children than would have been obtained otherwise.[6]

Knudson (1995) found in a three-track YRE elementary school in California (to avoid confusion, the tracks have been relabeled 1, 2, & 3) that students on Track 1 outperformed students on Tracks 2 and 3 on a writing assessment. Track 1 also saw its advantage increase with increasing grade level (interaction of grade with track). This finding was documented with a full-factorial univariate general linear model (GLM) with writing achievement as the dependent variable and grade, track, and gender as independent variables. The fact that Track 1 was most like a traditional calendar, and the most popular among parents, was identified as a reason for this difference. Track 2 was second most popular. Late enrollees were left with Track 3. The hypothesis is that children from families who coordinate their children's education with their family calendar (exercise choice in track enrollment) are most supportive of student learning and that these children are most likely to benefit from the company of like children. The latter part of this argument, company of like children, is commensurate with the findings discussed by Oakes, Gamoran, and Page (1992) with respect to other forms of within school grouping that clustered high achievers. The high achievers experienced accelerated achievement while no consistent accelerated (or decelerated) gains are observed for other students.[7]

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[6] As is typically of most school practices, best professional judgment was exercised uniformly with no concern for limitations that would subsequently be imposed upon the conclusions to be drawn from a quantitative evaluation study.

[7] The study by the New York State Department of Education and State University of New York (1978), *Learning, retention, and forgetting* (cited in Curry, et al., 1997), actually offers the basis for an alternative explanation. High achieving students typically come from the non-disadvantaged homes. Such students gain about 1.25 years achievement in one academic year of school and gain 0.08 years achievement over the summer, whereas disadvantaged students gain about 1.08 years during the school year and lose 0.25-0.33 years achievement over the summer. By redistributing disadvantaged students so that their representation is not equal across tracks, it would be possible to create the impression of acceleration by 'purifying' the non-disadvantaged group – the group that experiences no losses over the summer. Combining this with the tendency for the highest achieving students to genuinely accelerate their achievement when grouped together, would make it possible for school-wide mean

In addition to the two studies accounting for performance differences across tracks above, three studies identify the segregation of school student populations across tracks while attempting to understand the consequences of the more frequent practice of grouping students into combination grade classrooms (placing students from two adjacent grades in the same classroom with a single teacher) in multi-track year-round schools. The reason for more combination grade classes in multi-track YRE schools is simple. The entire student body is divided into four groups. Each group is on its own track. The small number of students on a track often results in not having enough students in the least populated grades to fill single grade classrooms in each track. Though not immediately central to understanding how attendance tracking in the year-round schools segregates student achievement, combining grades in a classroom is a form of organizational bias that is more often purposive than random. If this structure is not evenly distributed across tracks, and can not be explained by other differences, then it demands simultaneous consideration.

At least partial resolution of the problem comes from the findings of Stimson (1991, 1992) and Burns (1996). Each examined the same student demographics and achievement data from the San Bernardino City Unified School District (a large urban California district – see Stimson, 1991). The Burns and Stimson argument is about whether or not there are detrimental consequences from the formation of combination grade classes. Burns makes the more convincing case that strategic grouping of students into combination grade classes occurs (Burns & Mason, 1998), and properly accounting for the systematic formation of these classes explains the lower performance observed by Stimson (1991).[8] Stimson's argument included the assertion

achievement to be increased without having done anything positive for the disadvantaged children – shorter vacations may not be short enough to really inhibit forgetting and other academic losses.

[8] Stimson used a MANOVA model with reading, mathematics, and language achievement as dependent variables with prior achievement as a covariate and classroom type (single grade, upper grade in combo class, or lower grade

that students are less often purposively assigned to combination grade classes in multi-track YRE schools. Burns speculated that the achievement pattern observed may be related to "parental self-selection" (1996, Appendix F) as well. He also noted that, "there is less between class variability in the multitrack context relative to the traditional calendar context, however, a finding expected if the multitrack context does reduce assignment flexibility" (1996, Appendix F).

Segregation of student achievement across tracks in the San Bernardino schools is addressed by Burns (1996). In particular, he provided a bivariate analysis of track differences in prior achievement, student SES (free or reduced price lunch eligibility), and student minority population (proportion of non-white students). Burns found that the track with the highest mean achievement (51.7 NCE points), labeled "C," was also the one with the lowest proportion of non-white students (.51), the fewest number of combination grade classes (12), and the lowest proportion of low SES students (.52). The track with the lowest mean achievement (45.5 NCE points), labeled "A," was the one with the highest proportion of low SES students (.72, followed by "B" at .67), nearly the highest number of combination grade classes (16, where B was the highest with 17), and a higher proportion of non-white students (.62, where B was highest at .66). Though the combination grade strategy was not evenly distributed across tracks, when Burns accounted for demographic and prior achievement differences, there was no remaining disparity to explain.

Student achievement differences across tracks were also found by Mitchell (1993) while seeking to understand the impacts of combination grade classroom policies. Included in his study were individual student level data identified by YRE track from a moderate size suburban

in combo class) as the factor of interest. Other factors were analyzed separately, but not included in the model described.

California district – arguably an urban context based on its school sizes and demographics. Here, there were two tracks (C and D) that had higher (nearly equal) mean achievement than the other two tracks (A and B, nearly equal), and the difference between these pairs was roughly eight NCE points. As with the Burns (1996) reanalysis, the C track (labels are aligned with calendars for both districts) was a high achieving track and the A track was a low achieving track. From this finding, Mitchell (1993, p. 7) concludes, regardless of the selection mechanism operating, that multi-track "YRE programs exacerbate the problems of coping with combination grade classes." Neither Mitchell nor the others (Brekke, Knudson, Stimson, or Burns) carefully examined the extent or time evolution of the demographic and achievement segregation.

While track assignment is an important source of opportunity segregation, many other factors influencing student achievement need to be taken into consideration. At the student level, socioeconomic status, ethnicity, gender, English language proficiency, home language, special program participation (e.g., GATE, RSP/special education, bilingual education), mobility, prior achievement, attendance regularity, and disciplinary referrals are known to be associated with measured achievement (see, Mitchell & Mitchell, 1999; Mitchell, Destino, & Karam, 1998; Entwisle, Alexander, & Olson, 1997). At the classroom level, the number of students in a classroom, classroom resources (instructional aides, special materials, computers, and other instructional resources), multi-age or combination grade structures, and teacher characteristics (e.g., education level, type of teaching credential, experience, etc.) influence achievement directly (see, Glass, Cahen, Smith & Filby, 1982; Finn & Achilles, 1990; Odden, 1990; Veenman, 1995; Burns, 1996; Darling-Hammond, 1998). Additionally, the concentration of various student factors (e. g., percent of classmates who are poor) also influence the learning environment (see, Pong & Pallas, 1999; Mitchell & Mitchell, 1999). Factors operating at both classroom and school levels include attendance track, instructional practices and curriculum.

It is important to determine whether multi-track YRE has a substantial impact on student achievement, and if so, whether these effects are the result of segregating students or of the operational characteristics of the YRE program itself. As Shepard and Baker (1977) noted, choice of calendar often appears to be merely a matter of convenience, prompted by program or economic efficiencies, rather than a compelling choice driven by evidence. If this turns out to be true, then we should consider Herman's (1991, p. 212) admonition that improving education for disadvantaged and minority children, "should be seen as no less an imperative than finding physical space for students."

ANALYSIS

The quantitative analysis of multi-track YRE presented below is informed by direct conversation with current and former district administrators. There will be no extended coverage of the scope and content of these discussions, however, as they provided insights that are validated through statistical tests. Nonetheless, these data should be noted for their confirmation of models examined herein.

Methodology

The data for this study consist of district provided achievement test data from the spring administration in 1998 for students in grades two through six. The Stanford Achievement Test, Version 9 or SAT-9 (the California STAR test), was used. The full reading, mathematics, and language batteries were administered. Only the reading comprehension and mathematics total battery NCE scores[9] are used in this analysis.[10]

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[9] The NCE score is the normal curve equivalent score with a national sample mean adjusted to 50 points and a standard deviation of 20 points *for all grades*. For extreme scores, floor and ceiling effects may occur since the

There are a variety of student demographic and programmatic indicators. Student level variables include: a unique student identifier, gender, ethnicity, home language, grade, National School Lunch Program (NSLP) participation, English language proficiency, identification for special education services, identification for gifted education services (GATE), and interdistrict mobility. The NSLP, gender, GATE, and mobility variables are dichotomously coded: NSLP as confirmed eligible or ineligible – a low-income family or "poverty" indicator;[11] gender as female or not (male); GATE as identified or not; and mobility as new to the district in 1997-98 or not new. Student English language proficiency is coded as limited English proficient (LEP), fluent English proficient (FEP), or English only. Special education services are coded as not identified, identified for the resource specialist program (RSP), or identified for designated instruction services (DIS). For the purpose of analysis, and reflecting the student population in the district, home language is coded as English, Spanish, or "Other." Similarly, student ethnicity is coded as "White," "Hispanic," "Black," or "Other."

Students' school and classroom assignments are also available, making it possible to identify attendance track and teacher. There are five types of tracks. The labeling that is most frequently used by California schools with a (60/20) four-track year-round attendance calendar is used here. The year-round schools cycle on a fiscal calendar (July through June). The tracks are off in reverse alphabetical order when the school year begins in July. The four year-round (YRE) tracks are coded as a "D" for the track with its summer vacation month in July, "C" with its vacation month in August, "B" with its vacation month in September, and "A" with its vacation

minimum score is 1 point and the maximum score is 99 points. That is, there are only 2.5 standard deviations about the mean.

[10] This choice was made because the Abbreviated SAT-8 data available from 1996 and 1997 did not include the full reading battery nor any of the language battery. Thus, references to prior year's scores are consistent with current ones.

month in October (its summer month off is June). The fifth track is the traditional calendar (TC), coded as "T," with the regionally typical mid-June through Labor Day summer vacation.

Teacher identification data makes it possible to link the achievement data to teacher data from the California Basic Education Data System (CBEDS) Professional Assignment Information File (PAIF). The variables taken from the CBEDS PAIF are: total years of teaching experience, number of years of teaching experience within the district, education level, credential status, and contract status. Education level is coded as a bachelor's degree (BA), BA with thirty or more semester hours advanced post-secondary education (+30), or having at least a master's degree (MA or Higher, i.e, MA, MA + 30, and PhD have been collapsed into one level). Two dichotomous credential status variables are used: the teacher has a full credential or not, and the teacher requires an alternative credential or not.[12] Contract is coded in three categories: "Tenured" (beginning with the third full contract year within the district and requires a preliminary or clear full credential), "Probationary" (two years or less experience within the district, and may include temporary credentials for persons holding credentials from other states, interns, or other persons having appropriate credentials to merit regular contract status), and "Other" (typically little or no experience within the district, and rarely represents a person qualified to receive a probationary or tenure contract).

There is some listwise sample loss due to missing data (from 13,447 to 12,174). About ten percent of the sample is excluded due to unavailability of data from either the students' records or CBEDS (teachers' data – the limiting factor). Since the proportion of multi-track YRE students increased (28% to 37%) in the elementary schools to accommodate the initial

[11] Free lunch actually comes at or below 1.35 times the poverty level (California data comes from CalWorks, reports, formerly AFDC). Eligibility for reduced price lunch is at or below 1.85 times the poverty level (Witte, 1998).

implementation of class size reduction in academic year 1996-97, reassignment and redistribution of students, teachers, and resources occurred.[13] Response to these changes was still evident in academic year 1997-98, as well as impacts from further expansion of CSR.

The data analyses were performed using *SPSS for Windows, Version 9.0* (SPSS Inc., 1999). From analysis of bivariate correlations, district teaching experience was found to be highly collinear with total teaching experience and was therefore dropped from further analyses.[14] The first point of inquiry was to establish what, if any, segregation there is in and as a result of students attending a YRE school. Striking differences in student demographic and programmatic characteristics, as well as teacher resources (qualifications), across attendance tracks were observed.[15] An analysis of variance procedure (MEANS) was initially used to determine whether significant differences in student achievement existed across attendance tracks. This same procedure was applied to determine if student achievement differed significantly across levels for the student demographic/programmatic and teacher resource factors.

Having found significant achievement differences across tracks, as well as across levels for student and teacher factors, attention was focused on YRE track differences. The objective from hereon was to determine to what extent the observed differences across YRE tracks could be accounted for by segregation. A second hypothesis tested (using a general factorial General Linear Model procedure called UNIANOVA) is whether track to track differences in teacher

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[12] It is possible to have both if the holder of a secondary level credential is teaching at the elementary level on a waiver, for example. It would also be possible if an elementary teacher has an emergency credential to fill a bilingual or ESL teaching position requiring additional authorizations.

[13] This was determined using the CBEDS School Information File (SIF) for years 1995-96 through 1997-98. Originally, six of the twenty-seven elementary schools were multi-track YRE schools in 1995-96. Two traditional calendar schools went year-round in 1996-97. Average elementary school population was 735 in 1997-98.

[14] The Pearson product-moment correlation coefficient is close to one (r=.95) for this pair of experience variables.

[15] Though Goodman-Kruskal τ or χ^2 tests could be performed, with group sizes of nearly 1,000 or larger, there is little doubt that many of the observable differences for factors such as Student Ethnicity, "Poverty," Home Language, GATE Identification, Inter-district Mobility, and Teacher Credential, Contract Status, and Education Level would be highly significant.

resources contribute to achievement differences. Total teaching experience, contract status, credential status, and education level were tested against student achievement with track as a mediating (independent) variable. The YRE estimated marginal mean differences (unstandardized regression coefficients) were compared. Models were run separately for total mathematics achievement and for reading comprehension achievement.

The third hypothesis tested is that track differences in student achievement are substantially produced by the student segregation resulting from differential track assignments. Students' gender, ethnicity, home language, English language proficiency, poverty, mobility, special education and GATE identification, and grade were used to predict student achievement with track as a mediating (independent) variable.

The fourth hypothesis tested is that track differences in student achievement are additionally affected by an inequitable distribution of teacher resources. For this test, the student model from the third hypothesis is augmented by the teacher model from the second hypothesis. That is, both student and teacher level factors were used to estimate the YRE track marginal mean differences.

The final hypothesis tested is that student segregation exacerbates initial variation in track achievement levels, causing greater inequalities in achievement to emerge over time. The test was complicated by the fact that six schools had been on YRE calendars for about a decade prior to 1996-97. Two additional schools went to YRE calendars that year to accommodate the initial partial implementation of class size reduction. Nonetheless, the model tested for this hypothesis adds a factor representing the number of years a student attended a school on a year-round calendar (up to three years: data available for academic years 1995-96 through 1997-98) to determine the extent of the interaction between track assignment and YRE school organization.

The resulting significant interaction effect indicates cumulative differences in achievement over a three year period.

Graphical representations of the findings were developed by calculating "shift functions" (Wilcox, 1997, pp. 93-95) for each track relative to a reference track. Shift functions help to identify differential "treatments," as well as mean differences. The position of the reference track is defined as the horizontal axis. The shift function for a comparison track shows the quantile differences between its distribution (of student achievement) and that of the reference track (plotted against the quantile values for the reference track). For example, if the comparison and reference tracks have the same distribution of achievement, but different means, then the shift function for the comparison track will be a straight horizontal line vertically offset from the horizontal axis (0) by the amount by which the means differ. If the comparison track has a larger percentage of low outcome students than the reference track, the shift function will be negative over the low quantiles, whereas if the comparison track has a larger percentage of high outcome students, the shift function will be positive over the high quantiles.

The shift functions for the analyses presented herein were obtained by calculating (EXAMINE) each fifth percentile (5^{th}, 10^{th}, 15^{th}, ..., 90^{th}, 95^{th}) for each track's achievement distributions. When examining all five of the attendance tracks, the traditional calendar served as the reference track. Shift functions for the YRE tracks were plotted against the quantiles for the T track. When focusing on only the YRE tracks, track B was the reference track. This choice was made for ease of comparison. The B track has the lowest track mean and therefore the other tracks' shift functions will be above (initially) the horizontal axis (reference). In order to obtain shift functions when controlling for student and/or teacher factors (second through fourth hypotheses), three steps were required. First, the respective general linear models were run without including track as a factor, and the unstandardized residuals were saved. The quantiles were then calculated for each track from the unstandardized residuals. The reference (B) track quantiles were subtracted from each of the other (A, C, and D) track's quantiles and the differences were plotted against the reference (B) track's quantile values to obtain the shift functions. Upper and lower confidence bounds were not estimated for these graphical representations.

Results

A univariate descriptive profile of the district's grades two through six elementary students tested in 1998 and their teachers is presented in Tables 1. The number of students on each attendance track is found at the bottom of the table.[16] The sample is plurality White (43.7%), followed closely by the Hispanic segment (41.5%). A much smaller proportion of the enrollment is Black (9.7%), with the remainder being classified as other. The NSLP participation rate is (50.5%). English is the predominant home language (75.3%), followed by Spanish (21.8%), with the remainder classified as other. The proportion of the students classified as LEP is 17.7%. Another 6.8% is classified FEP, with the remainder being English only. Gender and grade are fairly evenly distributed, with just a little higher proportional representation from the lower grades. There are two types of special education identifiers: GATE and Special Education. The GATE identified proportion of the sample is 9.8%. The Special Education identified students are divided into RSP, 3.2%, and DIS, 2.7%. Finally, 17.1% of the students were new to the district in 1997-98.

To review all teacher variables, total years of teaching experience is found in Table 2, which offers a descriptive summary of the continuous variables in this study. The district elementary

[16] In 1996 and 1997, the track most heavily enrolled by students who were tested for the annual standardized test administration was the C Track, followed by the D Track, then the A Track, and lastly the B Track.

Table 1. Total Sample and Attendance Calendar (Track) Percentages for Student and Teacher Factors for Academic Year 1997-98

Factor	Level	A Track	B Track	C Track	D Track	YRE Schools	T Track Schools	Total for Sample
Student Ethnicity	White	46.6	18.1	55.3	49.2	42.95	44.15	43.71
	Black	10.6	4.4	8.0	9.4	8.09	10.65	9.71
	Hispanic	33.8	74.6	30.0	36.6	43.17	40.47	41.47
	Other	9.0	2.9	6.7	4.8	5.79	4.73	5.12
Student NSLP Eligible ("Poverty")	Yes	51.8	73.1	30.8	45.0	49.21	51.32	50.54
	No	48.2	26.9	69.2	55.0	50.79	48.68	49.46
Student Home Language	English	82.1	37.6	88.8	85.1	74.17	75.98	75.32
	Spanish	11.1	60.8	7.9	12.4	22.39	21.39	21.76
	Other	6.7	1.6	3.3	2.5	3.44	2.62	2.92
Student English Language Proficiency	English Only	82.1	37.7	88.8	85.1	74.19	76.30	75.52
	LEP	12.3	52.0	4.5	9.6	18.86	16.98	17.67
	FEP	5.6	10.3	6.7	5.3	6.95	6.73	6.81
Student Gender	Female	46.2	46.7	47.6	48.3	52.76	49.81	48.87
	Male	53.8	53.3	52.4	51.7	47.24	50.19	51.13
Student Grade	2nd	19.5	25.6	21.6	22.7	22.39	20.33	21.09
	3rd	21.6	19.6	17.7	18.6	19.24	21.68	20.78
	4th	22.3	20.4	19.4	19.7	20.34	19.64	19.89
	5th	19.3	16.9	19.5	20.2	19.02	17.86	18.28
	6th	17.4	17.5	21.9	18.8	19.02	20.50	19.95
Student Identified GATE	Yes	5.7	3.8	16.3	7.4	8.67	10.44	9.79
	No	94.3	96.2	83.7	92.6	91.33	89.56	90.21
Student Identified for Special Education	RSP	3.2	2.3	2.6	3.8	2.97	3.38	3.23
	DIS	2.1	3.1	3.3	2.5	2.77	2.62	2.68
	No	94.7	94.6	94.1	93.7	94.26	94.00	94.09
Student New to District in 1997-98 (Mobility)	Yes	16.2	14.6	8.2	13.7	12.92	19.52	17.09
	No	83.8	85.4	91.8	86.3	87.08	80.48	82.91
Teacher Has Full Credential	Yes	92.5	89.2	96.4	87.3	91.46	92.86	92.34
	No	7.5	10.8	3.6	12.7	8.54	7.14	7.66
Teacher Has Alternative Credential	Yes	8.6	20.7	5.4	16.7	12.69	10.12	11.06
	No	91.4	79.3	94.6	83.3	87.31	89.88	88.94
Teacher Contract Status	Tenured	67.3	64.4	78.0	73.7	71.28	68.88	69.76
	Probationary	19.9	29.5	15.9	10.5	18.61	20.73	19.95
	Other	12.8	6.1	6.1	15.8	10.10	10.39	10.28
Teacher Education Level	MA or Higher	16.3	5.2	19.5	15.0	14.21	16.07	15.39
	BA + 30	65.1	80.4	73.1	66.3	71.28	66.22	68.08
	BA	18.6	14.5	7.4	18.7	14.50	17.72	16.54
Enrollment		8.04	8.75	10.30	9.67	36.76	63.24	100.00
N		979	1065	1254	1177	4475	7699	12174

NOTE: Teacher factors are student weighted. That is, calculations are performed under the assumption that each student will have a teacher "treatment" effect on his/her individual achievement.

school student population has teachers with an average total teaching experience of 7.3 years with a standard deviation of 8.2 years (skewness about 1.3 and kurtosis about 0.8). The central tendency of the distribution of teaching experience is better characterized as 3.4 years, given by Huber's M-Estimator (see, Wilcox, 1997, pp. 46-52). Unlike the mean, this robust measure of central tendency is not strongly influenced by outlying values. Its smaller value indicates that there is an important, but relatively small number of teachers with experience much greater than the median (3 years). To state differently, at least half of the students are in a classroom with a

Table 2. Total Sample and Attendance Calendar (Track) Descriptive Statistics for Student SAT-9 Mathematics Total and Reading Comprehension NCE Scores and Years Teaching Experience for Academic Year 1997-98

Quantity	Statistic	A Track	B Track	C Track	D Track	YRE Schools	T Track Schools	Total for Sample
SAT-9 Mathematics Total (NCE points)[a]	Mean	43.59	36.61	52.91	44.74	44.87	45.83	45.48
	Huber's M-Estimator	42.57	35.06	53.42	43.76	44.13	44.92	44.69
	Median	41.9	34.4	54.3	43.6	44.1	44.7	44.7
	Std. Deviation	19.97	19.30	21.24	21.06	21.30	21.51	21.44
	Interquartile Range	28.8	29.1	31.2	30.7	31.3	31.1	31.3
	Skewness	.281	.414	-.075	.262	.222	.235	.231
		(.079)	(.076)	(.069)	(.072)	(.037)	(.028)	(.022)
	Kurtosis	-.437	-.326	-.579	-.556	-.584	-.500	-.529
		(.158)	(.151)	(.138)	(.143)	(.074)	(.056)	(.045)
	N	960	1049	1250	1162	4421	7632	12053
SAT-9 Reading Comprehension (NCE points)[b]	Mean	43.00	34.53	50.23	44.02	43.35	44.48	44.07
	Huber's M-Estimator	42.42	33.80	50.29	43.02	42.65	43.43	43.15
	Median	41.9	32.7	50.5	42.2	41.9	43.0	42.5
	Std. Deviation	19.14	18.22	19.18	19.38	19.81	20.04	19.97
	Interquartile Range	28.4	23.3	27.7	28.2	28.4	28.8	29.0
	Skewness	.161	.327	.019	.228	.173	.253	.224
		(.079)	(.076)	(.069)	(.072)	(.037)	(.028)	(.022)
	Kurtosis	-.511	-.024	-.438	-.465	-.436	-.404	-.410
		(.157)	(.153)	(.138)	(.143)	(.074)	(.056)	(.045)
	N	969	1024	1250	1170	4413	7584	11997
Years Teaching Experience[c]	Mean	6.35	4.14	8.47	5.72	6.25	7.84	7.26
	Huber's M-Estimator	3.50	1.00	5.80	3.18	3.29	4.37	3.44
	Median	3	1	5	3	3	4	3
	Std. Deviation	7.36	5.39	8.68	6.84	7.40	8.59	8.20
	Minimum	1	1	1	1	1	1	1
	Maximum	29	27	33	31	33	34	34
	Interquartile Range	6	4	12	6	7	13	11
	Skewness	1.560	2.546	1.174	1.836	1.684	1.132	1.311
		(.078)	(.075)	(.069)	(.071)	(.037)	(.028)	(.022)
	Kurtosis	1.272	7.185	.676	3.116	2.281	.231	.791
		(.156)	(.150)	(.138)	(.142)	(.073)	(.056)	(.044)
	N	979	1065	1254	1177	4475	7699	12174

NOTE: Following Wilcox (1997), K=1.28 for Huber's M-Estimator (a robust measure of central tendency). For Years Teaching Experience for B Track, the median has been substituted for Huber's M-Estimator since all values up to and including the median are equal to the median (1 year of teaching experience), and no estimate can be obtained for such a case.

Standard errors of skewness and kurtosis are shown in parentheses below the estimates.

[a] For the analysis of variance across the five attendance tracks, $\eta^2 = .028$, $p < .0005$ by the F-test.

[b] For the analysis of variance across the five attendance tracks, $\eta^2 = .030$, $p < .0005$ by the F-test.

Since these tests lack variance homogeneity (Levene's test) for both mathematics total and reading comprehension achievement, Dunnett's T3 was used for multiple pairwise comparisons of attendance track means. For $p < .0005$, C and B track are different from each other and all other tracks, while A, D, and T tracks are not different from each other.

[c] Teacher factors are student weighted. That is, calculations are performed under the assumption that each student will have a teacher "treatment" effect on his/her individual achievement.

teacher who has three years teaching experience or less; about a third of all students have first year teachers. The proportion of students with teachers on probationary contracts is 20.0%. The proportion of students with teachers having tenure contracts is 67.3%, with the remainder being those with other contracts, typically representing under-qualified teachers. The proportion of students with teachers holding a BA is 17.5%, with a BA+30 is 68.1%, and with a MA or higher is 14.4%. More than ninety percent (92.3%) of the students have teachers with some form of full certification for public school teaching, but 11.1% of the students are in a classroom with a teacher who requires an alternative credential to hold the position.

Looking at track differences across Tables 1 and 2, C and B tracks are the most different. The results for A and D tracks are similar and will not be discussed further. The C track has the highest group mean achievement of any track, including T track. It also has the highest proportion of White, English only (home language), and GATE students. The C track has the lowest proportion of Hispanic, "poverty," Spanish home language, LEP, and mobile students. In contrast, B track has the lowest group mean achievement of all attendance tracks. This is associated with having the highest proportions of Hispanic, low-income status, Spanish home language, LEP, and FEP students. The B track has the lowest proportions of White, Black, and other ethnicity students, English and other home language (which, of course, means the fewest English only) students, RSP students, and GATE students.

The traditional calendar schools (TC or T track) have, in absolute terms, more of every kind of student. This nearly two-thirds (63.2%) of the district sample is very similar to the total sample. For this un-redistributed attendance track, the non-white, non-English home language, and non-English only student proportions are greater than all tracks except B track. The highest proportion of GATE students, except for C track, is found in the TC schools.

Teacher resources are concentrated on C track. It has the highest proportion of students having teachers with the MA or higher and those beyond the BA (BA+30 and MA or higher combined). The highest proportion of students having a teacher with a full credential and tenured contract status is only on C track. The Huber's M for teaching experience on the C track, 5.8 years, is clearly the highest of all attendance tracks. Again, this contrasts strikingly with the teacher resources for the students on B track. The lowest proportions of tenured and other contract teachers, as well as for the MA or higher, and the second lowest proportion of fully credentialed teachers are found for B track. Additionally, the highest proportion of students with teachers requiring alternative credentials and teachers on a probationary contract are on B track; Huber's M (the median) is only 1 year of teaching experience!

The TC schools have higher mean achievement than the YRE schools, though only the reading comprehension difference is significant at the $p<.05$ level, and neither reading nor mathematics differ at the $p<.01$ level. Traditional calendar schools (T track) have a lower proportion of male, DIS, LEP, "poverty," Spanish and other home language, and Hispanic and other ethnicity students. The proportion of students having tenured contract status and alternative credential teachers is lower for TC schools. The proportion of students who are GATE, RSP, and new to the district in 1997-98 is higher. The proportion of students having full credential teachers and teachers with the MA or higher is greater for TC schools. Knowing that YRE schools differ from TC schools, as well as YRE tracks differing from each other, sets the stage for the presentation of the results of bivariate and multivariate analyses of the variance in student achievement in the YRE tracks.

Bivariate Analysis of Mathematics Achievement

The uncontrolled group mean student achievement in total mathematics for each attendance track is presented in Table 2, and graphically represented in Figure 1a. The grand mean for the district is also tabulated. The C track has a group mean achievement that is significantly higher than all other tracks. The A, D, and T tracks have nearly equivalent group means, with T track closest to C.[17] The B track is lowest and significantly lower than all of the other tracks. The difference between C and B

Table 3. SAT-9 Mathematics Total and Reading Comprehension Mean NCE Scores for Student Factor Levels and Analysis of Variance for Student Factors for Academic Year 1997-98

		Mathematics Total				Reading Comprehension			
Student Factor	Level	Mean	Standard Deviation	N	η^2	Mean	Standard Deviation	N	η^2
Ethnicity	White	52.34	21.07	5288	.112	50.88	19.99	5303	.111
	Black	36.75	19.23	1172		38.71	17.28	1173	
	Hispanic	38.91	19.24	4972		37.24	17.76	4900	
	Other	56.10	21.88	621		49.86	19.68	621	
NSLP Eligibility ("Poverty")	Yes	38.32	19.30	6064	.113	36.95	17.77	6002	.127
	No	52.73	21.05	5989		51.20	19.50	5995	
Home Language	English	47.64	21.52	9097	.048	47.03	19.91	9117	.081
	Spanish	36.73	18.51	2600		33.05	16.11	2525	
	Other	54.22	21.64	356		46.31	18.66	355	
English Language Proficiency	English Only	47.59	21.53	9122	.058	47.00	19.91	9142	.104
	FEP	50.49	20.33	821		46.66	17.36	824	
	LEP	34.39	17.58	2110		29.81	14.24	2031	
Gender	Male	45.00	21.87	6164	.001	42.36	20.13	6123	.008
	Female	45.98	20.97	5889		45.85	19.64	5874	
Grade	2nd	44.25	21.72	2529	.018	42.16	19.83	2465	.015
	3rd	42.79	21.61	2501		41.02	19.62	2490	
	4th	43.21	20.47	2402		43.80	19.60	2402	
	5th	46.94	21.85	2209		46.14	20.59	2217	
	6th	50.47	20.57	2412		47.52	19.52	2423	
GATE Identified	Yes	72.89	15.68	1190	.179	69.63	15.39	1189	.180
	No	42.48	19.79	10863		41.26	18.35	10808	
Special Education Identification	RSP	24.90	12.99	388	.032	23.63	11.41	384	.037
	DIS	42.17	22.17	324		39.32	19.48	321	
	Not Identified	46.28	21.29	11341		44.90	19.82	11292	
New to District in 1997-98 (Mobility)	Yes	42.10	21.18	2054	.005	41.70	19.54	2039	.003
	No	46.17	21.43	9999		44.55	20.02	9958	

NOTE: For all factors, for both mathematics and reading achievement, $p < .0005$ by the F-test, except for Gender for SAT-9 Mathematics Total achievement, for which $p = .012$.

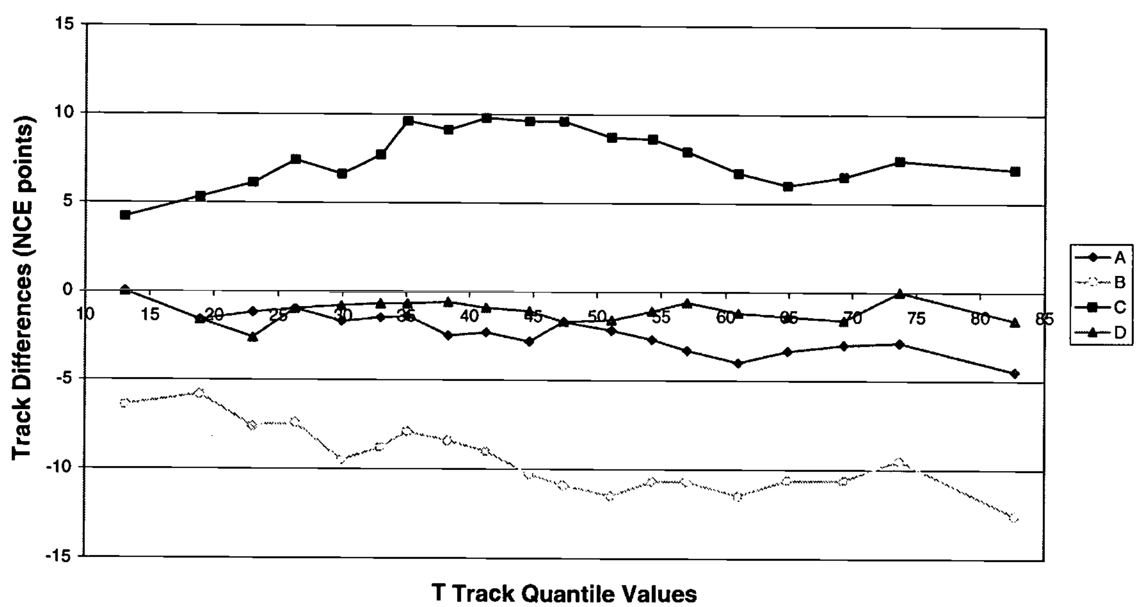
Since all tests lack variance homogeneity (Levene's test), Dunnett's T3 was used for multiple pairwise comparisons. For $p < .01$, the following differences are found. Ethnicity: White & Other are different from Black & Hispanic, but these two pairs are not different from each other. Home Language: All groups are different for math, but English and Other not different for reading. English Language Proficiency: All groups are different for math, but English Only and FEP not different for reading. Grade: 5th & 6th are different from all others, but not each other; for reading 3rd & 4th are different from each other. Special Education: All groups are different.

[17] In 1997 and 1996, T Track also had the second highest group mean with a significant difference from (5 NCE points less than) the higher C Track.

tracks is 16.3 NCE points in favor of C track.[18] Track, by itself, accounts for essentially 3% of the variance in student achievement in total mathematics.

The comparison of the full distributions of achievement for each track, rather than simply the group means, is graphically represented by shift functions, where the T track is the reference group (Figure 1a). As noted earlier, this is a way to reveal differential "treatment" effects. Most notably, C track is a more powerful "treatment" for middle range performers, while B track is remarkably least effective for high range performers. The A track also appears to be somewhat less powerful for high range performers. It and D track are both very similar in distribution and very close to the T track.

Figure 1a. Mathematics Total Achievement Shift Functions for the Four YRE Tracks with No Statistical Control for Student or Teacher Factors (Compared to TC Schools)



The group mean mathematics achievement for each student factor is found in Table 3; those for teacher factors are in Table 4. The continuous variable total teaching experience was binned

[18] A difference of 10 NCE points is roughly one-year's achievement!

into seven groups, with no less than five hundred students having a teacher with experience in the range of years specified. In reviewing these tables, attention should be focused first on the uncontrolled means for student ethnicity and family income status. White and other ethnicity students (White a little lower than other) have higher group mean achievement than either Black or Hispanic students (which are very similar; Black is lower). Additionally, student ethnicity and "poverty" each account for the second largest proportion of variance (η^2) in student achievement among all the factors available for analysis. The mean difference between White and Hispanic students is 13.4 NCE points. The students qualified for the subsidized lunch program have a significantly lower group mean than students not qualified (14.4 NCE points).

The largest proportion of variance in student achievement is accounted for by the GATE identification variable. The difference between the group means (identified vs. unidentified) is 30.4 NCE points. This largest "explanatory" power and mean difference is not too surprising since the programmatic identifier is often based on some sort of test of "intelligence." Though special education identification only accounts for a sixth of the variance "explained" by GATE, it has the second largest inter-level difference. The students not identified for special education are, as a group, 21.3 NCE points higher than the RSP students. Again, this is expected since RSP students must be under-performing to be so designated. The DIS students are only 4.1 NCE points lower than those not identified for special education.

For mathematics, students with home languages other than English and Spanish have the highest group mean achievement. The students with Spanish as a home language have the lowest group mean, 10.9 NCE points less than the group mean of students with English as their home language (the latter is 6.6 NCE points lower than the "Other" group). English language proficiency carries two different messages. First, students who are LEP score significantly lower than English only students (13.2 NCE points). Second, students who are FEP score higher than English only students primarily because their fluency is defined by achieving at least the 35th percentile on their SAT scores. This wipes out the bottom third of the score distribution for this population. Grade level means do differ, some significantly, but there is no obvious reason for this. Curriculum alignment with test content is one likely explanation. Students who are new to the district in 1997-98 did less well as a group than those who were not mobile that year (4.1 NCE points). There is no significant gender difference.

Table 4. SAT-9 Mathematics Total and Reading Comprehension Mean NCE Scores for Teacher Factor Levels and Analysis of Variance for Teacher Factors for Academic Year 1997-98

		Mathematics Total				Reading Comprehension			
Teacher Factor	Level	Mean	Standard Deviation	N	η^2	Mean	Standard Deviation	N	η^2
Full Credential	Yes	45.79	21.49	11128	.003	44.39	20.04	11081	.003
	No	41.67	20.39	925		40.12	18.58	916	
Alternative Credential	Yes	40.47	20.33	1332	.007	39.00	18.82	1305	.008
	No	46.10	21.49	10721		44.69	20.01	10692	
Contract Status	Tenured	46.91	21.71	8404		45.16	20.10	8376	
	Probationary	42.85	20.58	2408	.007	42.15	19.76	2390	.008
	Other	40.90	20.09	1241		40.39	18.68	1231	
Education Level	MA or Higher	46.56	21.71	1855		45.44	20.67	1861	
	BA + 30	46.18	21.50	8201	.007	44.71	19.86	8175	.008
	BA	41.59	20.51	1997		40.10	19.23	1961	
Teaching Experience	1 Year	43.16	20.87	5143		42.23	19.81	5103	
	2-5 Years	46.90	20.86	2164		44.41	19.15	2174	
	6-10 Years	44.51	21.45	1293		43.71	19.78	1289	
	11-15 Years	47.78	22.41	1238	.013	45.66	20.54	1217	.011
	16-20 Years	50.69	23.02	1073		48.83	21.41	1077	
	21-25 Years	48.44	21.47	610		47.46	19.86	601	
	26-35 Years	45.18	20.39	532		44.08	18.57	536	

NOTE: Teacher factors are student weighted. That is, calculations are performed under the assumption that each student will have a teacher "treatment" effect on his/her individual achievement. For all factors, for both mathematics and reading achievement, $p < .0005$ by the F-test.

Since all tests lack variance homogeneity (Levene's test), Dunnett's T3 was used for multiple pairwise comparisons. For $p < .01$, the following differences are found. Contract Status: Tenured is different from Probationary & Other, but the latter pair are not different from each other. Education level: MA or Higher & BA+30 are different from BA, but not each other. Teaching Experience: Being rather complicated, the key differences to note are that for experience levels greater than 10 years, only the 16-20 & 26-35 pair are different; for experience levels less than 11 years, 2-5 & 6-10 are different from 1, but not each other; Between the over a decade set and the decade or less set, 26-35 is not different from any group, the 16-20 group is always different, and the 2-5 group is only different from the 16-20 group. Differences from this pattern for reading are: the 6-10 group is not different from any other group; 16-20 & 21-25 are not different from each other, but they are both different from 11-15 & 26-35.

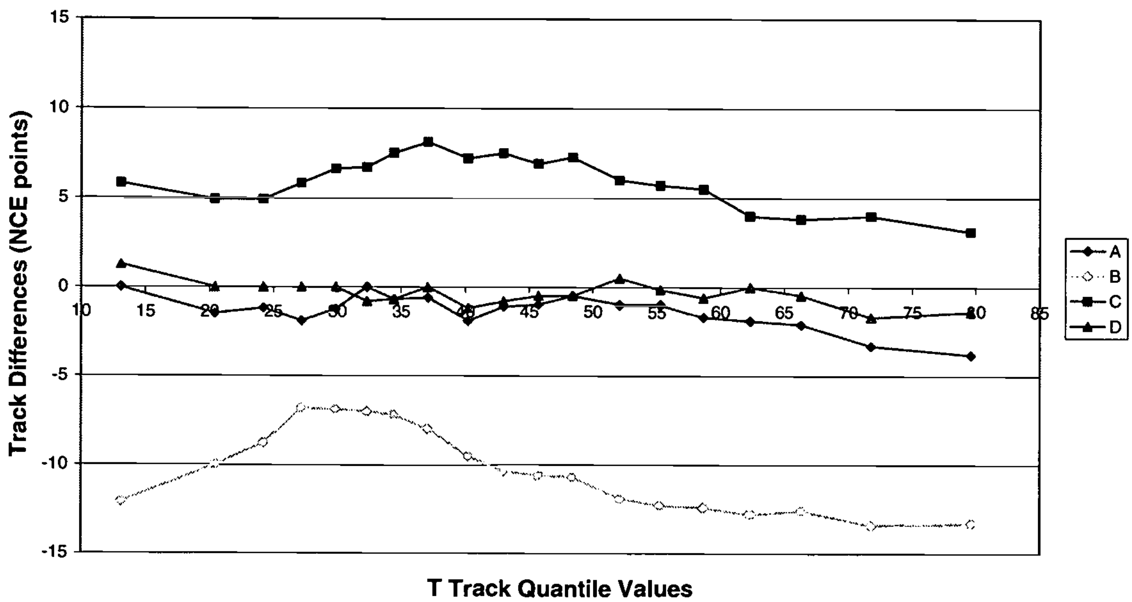
With respect to teachers, small but significant differences in student group mean achievement in mathematics are associated with teacher qualifications (resources). Group means are higher with higher teaching experience and education level. It appears that somewhere in the neighborhood of 16-20 years teaching experience, student achievement generated in these classrooms have reached a maximum (7.5 NCE points greater than first year teachers). Teachers' education beyond the BA is clearly associated with higher achievement, with the MA or higher teachers generating the highest achievement (not significantly different from the BA+30 teachers – both roughly 5 NCE points higher than BA teachers). Teachers who have a tenured teaching position generate significantly higher group means than teachers on any alternative contract (4 to 6 NCE points). Teachers with proper credentials also generate higher achievement. A full credential is worth, on average, an additional 4.1 NCE points. Not being in a position necessitating an alternative credential benefits students about 5.6 NCE points, on average.

Bivariate Analysis of Reading Achievement

The results for student achievement in reading comprehension are very similar in character to those for mathematics. A graphical representation is shown in Figure 1b. The most striking difference is the consistently lower means as reflected in the grand mean (Table 2). There is also a slightly smaller difference between the highest group, C track, and the lowest group, B track (15.7 NCE points). More importantly, from examining the shift functions, the lowest range performers are receiving a far less effective "treatment" on B track compared to all other tracks. Further, except for B track, the disparities among the high range performers is less pronounced.

As with the YRE tracks, student and teacher group means in reading achievement strongly resemble the patterns in mathematics (see Tables 3 and 4). Here, the important differences to note are with respect to English language related categories. Other ethnicity and other home language group means are no longer different from White and English home language groups. Similarly, the FEP group no longer has an advantage over the English only group. Additionally, female reading achievement is greater than male reading achievement for the elementary grades.

Figure 1b. Reading Comprehension Achievement Shift Functions for the Four YRE Tracks with No Statistical Control for Student or Teacher Factors (Compared to TC schools)



Multivariate Models of Achievement Segregation

Marginal mean differences for mathematics and reading achievement for each track from three separate general linear models controlling for teacher resources, student demographics, and teachers and students simultaneously, respectively, are presented along with the uncontrolled means in Table 5. The variance in the group means and the proportional reductions thereof are also provided in Table 5.

Graphical representations for each separate model are shown in Figures 2, 3, 4, and 5. Figures 2 reproduce the data in Figures 1, but this time the B track is the reference group, and only the remaining three YRE tracks' shift functions are graphed. As noted earlier, this change of the reference track occurred for two reasons. First, attention is now focused only on YRE track differences. The T track is no longer the subject of comparison. Second, the B track serves

Table 5. Variance Comparison of Marginal Mean Differences in Student Achievement NCE Scores for Year-Round Education Tracks Controlling for Teacher Resources, Student Demographics/Program Identification, and Teacher & Student Factors Simultaneously with Uncontrolled Track Means

	Mathematics Total Achievement				Reading Comprehension Achievement			
		Control Variables Group				Control Variables Group		
YRE Track	Uncontrolled(1)	Teacher Factors(2)	Student Factors(3)	Teachers & Students(4)	Uncontrolled(5)	Teacher Factors(6)	Student Factors(7)	Teachers & Students(8)
A Track	-1.15	- .89	- .33	- .26	-1.02	-1.03	- .06	- .18
B Track	-8.14	-7.14	-1.21	- .30	-9.49	-8.91	-1.86	-1.46
C Track	8.17	7.59	3.64	3.02	6.22	5.81	2.15	1.74
D Track	.00	.00	.00	.00	.00	.00	.00	.00
Variance of Means	44.65	36.42	4.57	2.60	41.68	36.65	2.69	1.73
Proportional Reduction of Variance		.184	.898	.942		.121	.936	.959
Model η^2	.077	.098	.348	.362	.081	.096	.367	.375

NOTE: D track is the reference track for the estimation of marginal mean differences (unstandardized regression coefficients). The GLM results, where η^2 = unadjusted proportion of variance in individual level student achievement, (YRE track as a factor in each model, as well as the total model, has $p < .0005$ by the F-test) include pairwise comparisons ($p < .0005$ unless otherwise noted) of marginal mean differences :

(1) A & D are **not** different
(2) A & D are **not** different
(3) Only C is different
(4) Only C is different
(5) A & D are **not** different
(6) A & D are **not** different
(7) Only C is different ($p < .001$)
(8) Only C is different ($p < .01$)

as the most convenient reference because as track differences are eliminated, the shift functions will converge down to zero – the horizontal axis or reference track. By examining the repositioned shift functions in Figures 2, the more effective "treatment" on A, C, and D tracks for high range performers is more clearly apparent. Additionally, the ineffectiveness of B track for the lowest performers in reading comprehension is quite noticeable.

Accounting for teacher resources segregation results in an 18.4% reduction in variance of the uncontrolled track means for mathematics and a 12.1% reduction for reading. The most striking impact is that the ineffective "treatment" of the B track for the lowest range performers is strongly accounted for by differences in teacher resources (Figures 3a & 3b).

Accounting for student demographics segregation results in an 89.8% reduction for mathematics and a 93.6% reduction for reading. By examining the shift functions (Figures 4a

Figure 2a. Mathematics Total Achievement Shift Functions for YRE Tracks with No Statistical Control for Student or Teacher Factors (Compared to B Track)

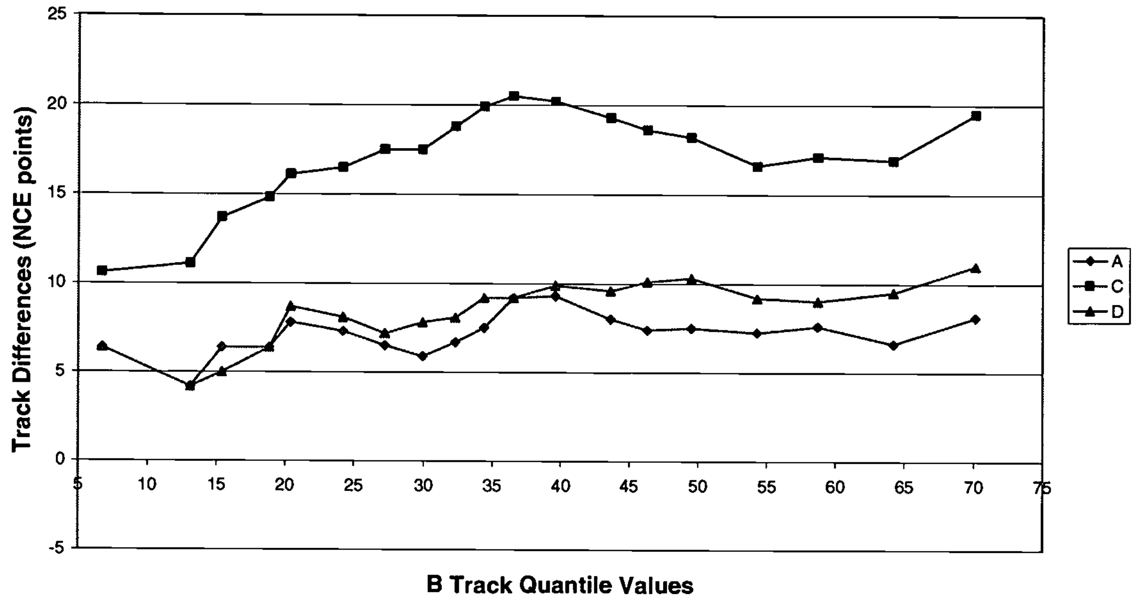


Figure 2b. Reading Comprehension Achievement Shift Functions for the Four YRE Tracks with No Statistical Control for Student or Teacher Factors (Compared to B Track)

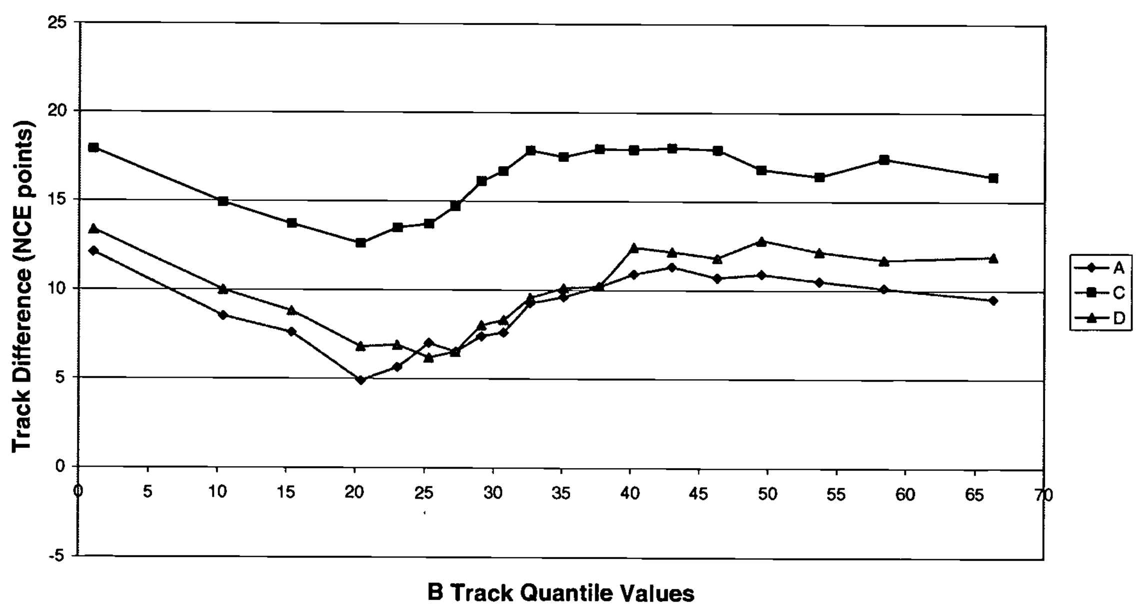


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Figure 3a. Mathematics Total Achievement Shift Functions for YRE Tracks with Statistical Control for Teacher Factors (Compared to B Track)

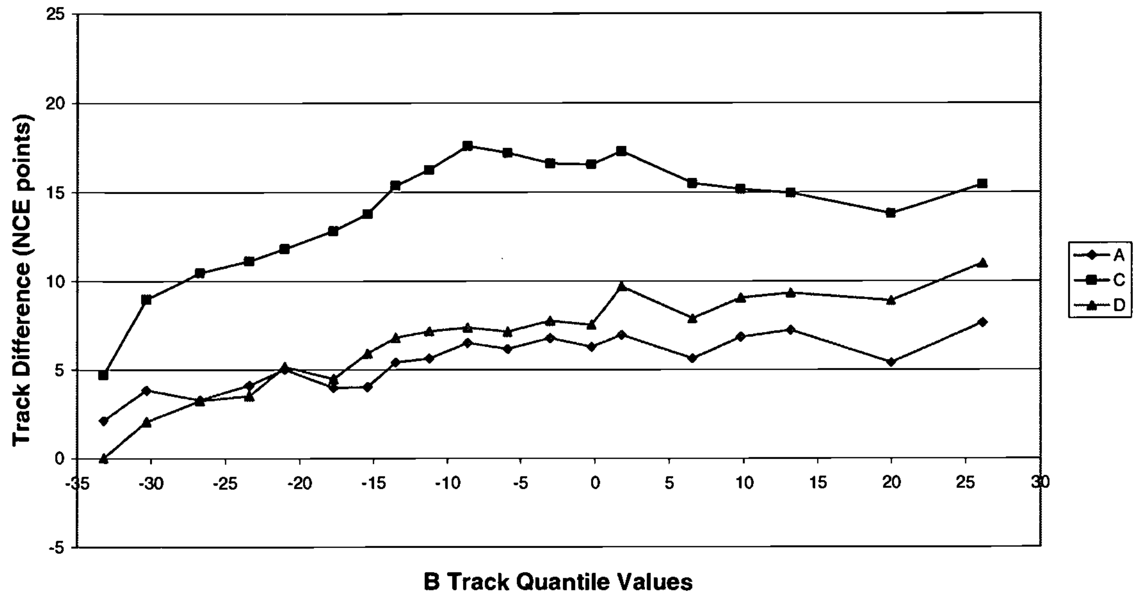

Figure 3b. Reading Comprehension Achievement Shift Functions for YRE Tracks with Statistical Control Teacher Factors (Compared to B Track)

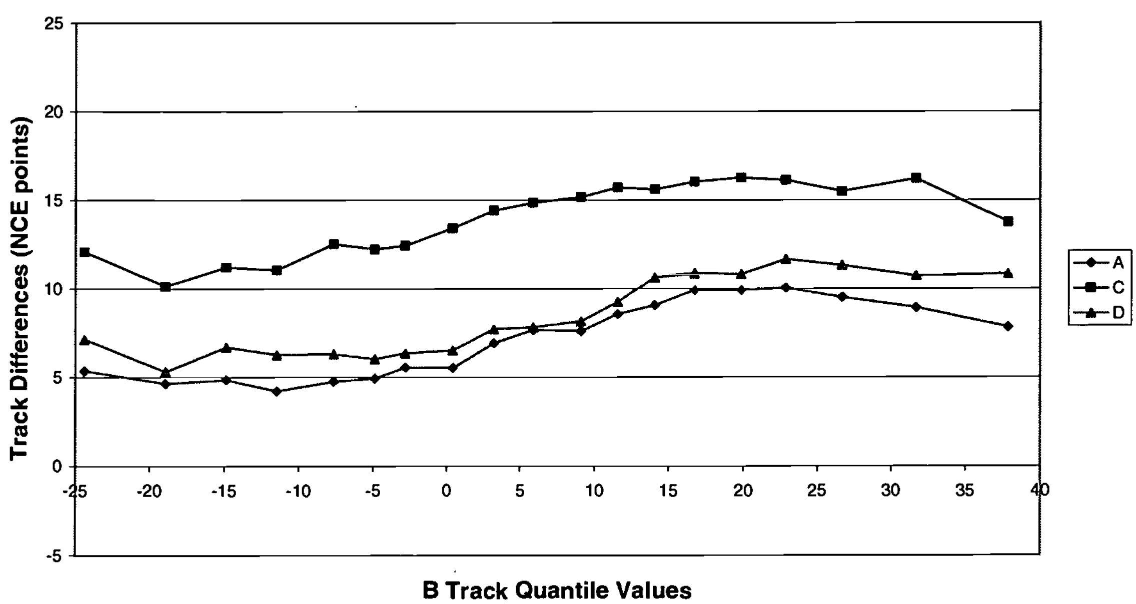

Figure 4a. Mathematics Total Achievement Shift Functions for YRE Tracks with Statistical Control for Student Factors (Compared to B Track)

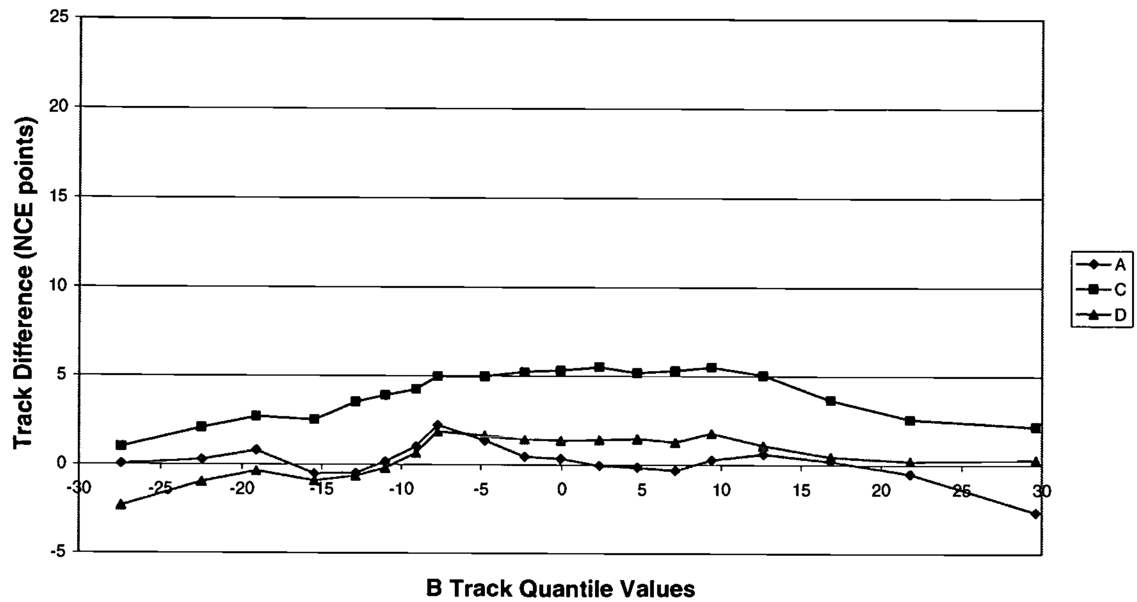

Figure 4b. Reading Comprehension Achievement Shift Functions for YRE Tracks with Statistical Control Student Factors (Compared to B Track)

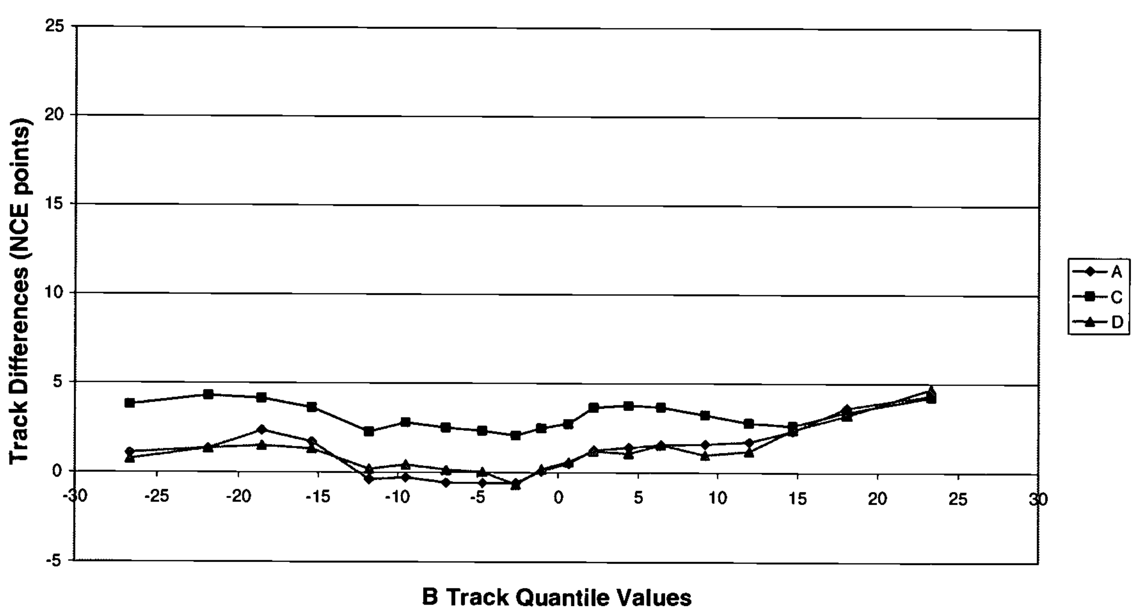

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Figure 5a. Mathematics Total Achievement Shift Functions for YRE Tracks with Statistical Control for Student and Teacher Factors (Compared to B Track)

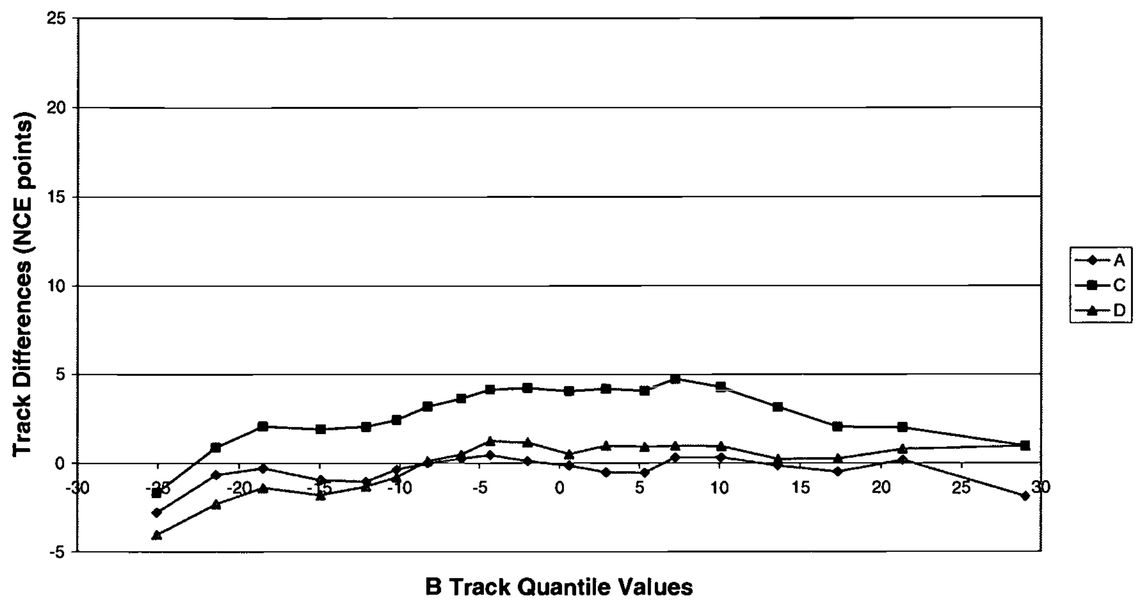
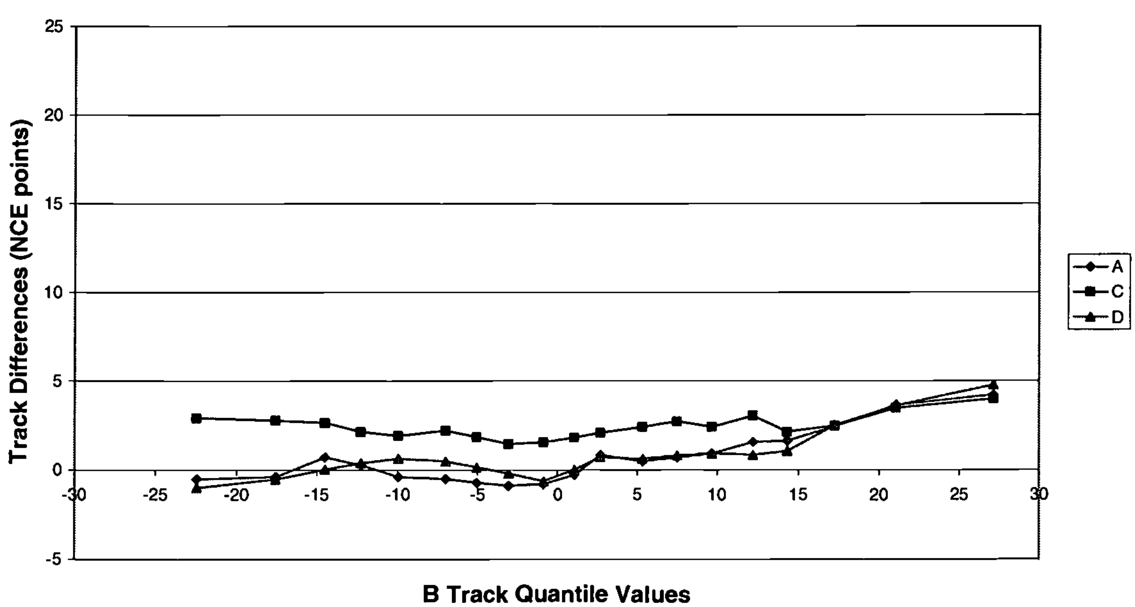


Figure 5b. Reading Comprehension Achievement Shift Functions for YRE Tracks with Statistical Control Student and Teacher Factors (Compared to B Track)



and 4b), it becomes apparent that virtually all of the differences among A, B (the reference), and D tracks is accounted for in mathematics, and all but the highest range performers receive equivalent "treatment" in reading (B track is still disadvantaged). Nonetheless, the C track remains a modestly more effective "treatment" for all performers, especially for the upper middle range performers.

Including teachers and students simultaneously causes a 94.2% reduction in the variance of the group means for mathematics and a 95.9% reduction for reading. By examining Figure 5a, it is now apparent that student and teacher differences across tracks removes all of the advantages for the highest and lowest performers in mathematics. Only C track remains a marginally superior "treatment" for the extended middle range of performers. Figure 5b makes it possible to see that B track, with its high proportion of non-English proficient students, is not a relatively effective "treatment" for high performing readers – there just aren't many there. The only other point to note is that C track retains a small advantage across the entire performance range in reading comprehension.

From the combined teacher and student level model, the independent contributions of the separated models can be estimated. About 4.4% of the reduction in variance of the uncontrolled track means due to teacher resources remains after subtracting the overlap with the student demographic model for mathematics, while 2.3% of the reduction remains for reading. For both reading and mathematics, more than 75% of the reduction in variance due to segregation between tracks is uniquely attributable to student demographics and program identification.

Finally, the analysis of cumulative differences in YRE track mean achievement in total mathematics and reading comprehension using a general linear model is presented in Table 6. Both models are significant. The purpose of these models was to test for the accumulation of advantage to students on a given track. As noted earlier, due to attendance calendar shifts for two schools (TC to YRE) in response to a major state policy initiative (class size reduction), dramatic reshuffling during "year two" was likely to have caused some disturbance in the long standing enrollment patterns. Nonetheless, by focusing on the students having only one or three years in YRE in 1997-98, the original pattern and its re-establishment should be more obvious.

The marginal mean adjustments to the group mean NCE scores have been calculated for each YRE track for each of the possible number of years a student could have been in YRE in the data set (one, two, or three years). That is, this model estimates the main effects for track and years in YRE, and the interaction between these two factors, while controlling for student and teacher level factors. The B Track is the reference track and one year of YRE is the reference time for cumulative experience. The main effect for YRE track is significant for both mathematics and reading. The main effect for years in YRE is not significant. The interaction effect for YRE track by years in YRE is significant for both mathematics and reading.

Table 6. Cumulative Marginal Mean Adjustments to Year-Round Education Track Group Mean NCE Achievement Scores in 1998 as a Function of the Number of Years in Year-Round Education from 1996 to 1998 - An Interaction Model

	Mathematics Total Achievement			Reading Comprehension Achievement		
	Years in YRE			Years in YRE		
YRE Track	1	2	3	1	2	3
A Track	0.61	0.54	0.80	1.97	1.24	4.51
B Track	0.00	1.70	0.09	0.00	3.48	0.85
C Track	1.60	2.51	7.46	4.61	3.59	5.55
D Track	0.89	1.78	-0.23	2.16	3.71	2.30
Model η^2		.366			.377	

NOTE: D track and 1 year in YRE are the reference levels for the estimation of marginal mean differences (unstandardized regression coefficients); values were adjusted to make B track the reference level for presentation. The GLM results, where η^2 = unadjusted proportion of variance in individual level student achievement, provide significance tests (the F-test) for each factor in the model. For mathematics, $p<.0005$ for both YRE track and the interaction of track with years in YRE, while $p>.4$ for years in YRE. For reading, $p<.001$ for YRE track, $p>.5$ for years in YRE, and $p<.02$ for the interaction of track with years in YRE.

Initially, A, C, and D tracks have larger (positive) marginal adjustments relative to the B track. For two years in YRE, A track has a smaller positive marginal adjustment than B track. In mathematics, B, C, and D tracks have increased positive marginal adjustments. The C track has the largest value. For reading, B and D track have increased. The C track has the second largest value nonetheless. For three years in YRE, only D track, and only for mathematics, has a negative marginal adjustment. Substantial increases are observed for C track for both mathematics and reading, while A track only has a substantial increase for reading. The marginal mean adjustments for C track have a positive acceleration for mathematics achievement (net gain of 5.9 NCE points, and at least 6.7 NCE points over the other tracks). The A track closes much of the gap with C track in reading achievement at three years in YRE, while B track remains the same distance below, and the gap between C and D tracks widens a little. Nonetheless, all tracks have larger positive marginal adjustments after three years in YRE.

DISCUSSION

There are two forms of opportunity segregation related to multi-track YRE in this district.[19] First, YRE schools have lower achievement and more challenging student populations (i.e., higher proportions of students with characteristics associated with lower achievement) than TC schools. An explanation may be sought in that neighborhood and possibly other sociopolitical circumstances contribute to segregation in a way that compounds organization of attendance (YRE) with what might otherwise have been simply site differences. That is, YRE and TC differences may be accounted for by family housing choices and exacerbated by neighborhood resource differences. Impacted schools forced to go to YRE to create classrooms for class size

[19] A third type of opportunity segregation, classroom teacher assignment, would be expected to operate relatively independently of attendance calendar – remembering that there are significant differences in teacher resources across tracks. That is, in addition to parental influence in choice of residence and attendance track, a family may attempt to influence determination of the particular classroom and teacher to which their child is assigned.

reduction are more likely to have higher "underrepresented minority" and higher poverty feeder enrollments than the schools remaining on the traditional calendar. Schools that real estate agents use to help establish higher housing values are not usually located in neighborhoods easily occupied by lower income families.

The second form of opportunity segregation, much more informative to policy considerations, is between tracks at YRE schools. The segregation in YRE schools changes over time, solidifying and elaborating inter-track differences. The C Track emerges as the highest achieving track, gaining in differential over time. The D Track shifts from positive to negative or lagging marginal adjustment over time. The B Track starts out behind and gets further behind in comparative student achievement (with C and A tracks, while comparison is the opposite with D track). Two possible causes for these outcomes can be offered. The first is educational. Initial advantage "snowballs," i.e., the segmentation of the student population in the initial enrollment choice by the students' parents and the initial assignment of teachers to tracks makes further segregation possible by accumulation of advantage. Educational opportunities afforded by higher achieving peers and better teachers may accelerate student achievement over time. The second cause is sociopolitical. The dynamics of continued choosing elaborates and extends population segregation. Parents may choose to move their children toward the track likely to be advantageous for their child.[20] Teachers may use their collectively bargained seniority rights to seek a preferable assignment. Of course, these causes may have historical ordering. Initial selection may have led to sufficient accumulation of advantage to activate the choosing dynamic toward the now more differentiated track choices.

[20] There is typically a waiting list for openings on C track at each YRE school. It is always the most heavily enrolled. If a school is severely impacted, the other tracks may have waiting lists as well.

PARENTAL CHOICE POLICIES

The critical driving force behind the demographic, resource and achievement segregation discussed above is parental choice. It serves to close the discussion of organizational segregation in education. Parental choice determines location of residence and enrollment on a particular attendance track. In most districts, as in the one studied here, the opportunity to exercise choice is determined by a sign-up cue. Spaces are allotted in the order in which they are requested so that some tracks fill before others due to the popularity of the vacation schedule of a given track or internal organizational characteristics of the track (e.g., special programmatic services, particular teachers, siblings on the same track, etc.). The interests of parents, though varied, are directed toward family and child opportunity and convenience (facilitation of opportunities not related to schooling). The interests of the school are generally directed toward the collective interests of the community and the school's own organizational survival.

Loveless (1995) demonstrated that parental interest in particular opportunities for their children was mobilized into political activity that curtailed the de-tracking of middle school curriculum in California, despite the interests of educators as organizational actors and agents for the collective interests of society. Parental choice and curriculum tracking are policies that organize opportunities for families to maximize individual interests and lead to markedly differentiated educational opportunities by population segregation or tracking. McRobbie (1998) has reported on several districts in California struggling with the practical and political issues of attendance tracking raised by CSR. For example, in Newhall School District security guards were hired to secure an amiable overnight campout for track registration, whereas in the Fresno Unified School District the board rejected going to multi-track year-round schooling after parents (and teachers) offered testimony claiming that "students in special programs such as English

Language Learners and accelerated education would have to stay in the same track, resulting in segregation based on ethnicity and ability."

School vouchers represent a different and potentially more powerful mechanism for exercising parental choice. Given the substantial contribution of YRE track choice to educational opportunity segregation, a voucher policy is also likely to exacerbate school to school performance differences by population segregation rather than educational performance differences. Whitty's (1997) review of parental choice in the United States, Britain, and New Zealand lead him to conclude that "there is no evidence to date that the provision of notional choices of other schools is a realistic alternative solution for most families" (Whitty, 1997, p. 20). Specifically examining the Milwaukee Parental Choice Program (MPCP), a voucher program where reasonable debate still occurs over whether or not reported positive achievement differences have accrued to program participants (see, Witte, 1998), Rouse (1998, p. 18) concluded that, "we need a better understanding of what makes a school successful, and not simply assume market forces explain sectoral differences and are therefore the magic solution for public education." In a more recent review by Molnar (1998), he also finds that the consequences of parental choice include similar, if not more profound segregation of the student population within and across schools than existed before vouchers were available (including the MPCP). There is no compelling evidence that the opportunity to use vouchers to choose schools leads to improved student achievement in the United States or internationally. Molnar goes beyond his discussion of vouchers, in the context of advice to the State of Pennsylvania, to present class size reduction as a policy recommendation for equitably and positively impacting student achievement based upon the findings of Tennessee's *Project STAR* experiment in class size reduction (see, Finn & Achilles, 1990; Finn, Fulton, Zaharias, & Nye, 1989).

We have now come full circle back to the context in which this study's findings are embedded. The apparently efficacious and equitable structural intervention of CSR implemented in California in wholesale and rapid fashion has dramatically increased the necessity of YRE. In addition to several more classrooms into which students potentially may be segregated, students must also be segregated by attendance track. In the effort to create learning opportunities for all, opportunities have been simultaneously restricted. Parental choice policies, as popular and desirable as they may be, serve individual or social stratum interests rather than community or societal interests.[21] In cases like the one studied here, where districts have desegregation policies (or are under court orders), there is no safeguard against resegregation at the site level without some form of "controlled choice" (Cookson, 1994, pp. 56-60). And since premium choices are always limited, only a subset of the population eligible realizes their first or best choice. In the case of multi-track year-round education, as with vouchers, there is no evidence that a choice policy with limited availability of any particular choice leads to opportunities for improved achievement for all or even most. In fact, the findings reported here have shown that multi-track YRE serves to act in a contrary fashion. Only a limited subset of the student population gains advantages when children are divided among the multiple attendance tracks of the year-round calendar.

[21] This is essentially Bourdieu's (1973) argument that trading social capital is occurring to obtain information about the best track on which to enroll a child. Status seeking/maintaining coalitions may be forming to secure educational opportunities. That is, "most culturally privileged find their way into institutions capable of reinforcing their advantage," (p. 85) and they do so by trading "social capital or capital of social relationships which will provide, if necessary, useful 'support'" (p. 93). After all, as Weber and others have long noted, education is the primary means of status differentiation in modern societies (Gerth & Mills, 1946, p. 300).

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