Teacher Tracking in High School Mathematics: An Inequitable Structure

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Abstract

NCTM identified teacher tracking as a persistent inequitable structure in high school mathematics. In our statewide research study, we found that almost 70% of high school mathematics teachers are tracked. Teachers with different seniority levels are tracked in very different ways. Next, we discuss issues with teacher tracking from teacher and student perspectives. Finally, we provide several questions for high school mathematics departments to initiate critical conversations about how and why courses are assigned to teachers.

Keywords: Equity, teacher tracking, senority, mathematics, high school

1 Introduction

Consider the following vignette. Central High School has 10 teachers in the mathematics department. The department offers algebra 1, geometry, algebra 2, precalculus, and calculus. For many of the courses, multiple versions are offered that students are tracked into based on teacher recommendations. For example, three versions of geometry exist: informal, college-prep, and honors. Consider two math teachers: Ms. Anderson who has just been hired this past summer and Ms. Bradford who has been teaching math at Central longer than anyone else. How do you think Ms. Anderson's and Ms. Bradford's teaching schedules for the upcoming school year would compare?

2 Defining and Measuring Teacher Tracking

NCTM has identified student tracking and teacher tracking as inequitable structures that persist in high school mathematics (Bush et al., 2024; NCTM, 2018). Most teachers are familiar with student tracking, but many may be less familiar with teacher tracking. We define teacher tracking to mean "that much of a teacher's teaching assignment consists of courses from a particular student track, course level, or both" (Nirode & Boyd, 2023, p. 7). In the opening vignette, you might have conjectured that Ms. Anderson would teach mostly low track and entry-level courses since she was new to the building, and that Ms. Bradford would teach mostly high track and upper-level courses because of her relative seniority in the building. How prevalent is this situation in high schools? In our research on teacher tracking, we set out to answer this question.

To measure teacher tracking, we looked at two ways that a teacher could be tracked. We first looked at teachers' schedules by student track. Because some schools have two student tracks and some have three, we focused only on the low and high tracks when identifying a teacher as tracked. We then looked at entry-level courses (courses below algebra 2 or its equivalent) and upper-level courses (algebra 2 or its equivalent and above). To determine whether a teacher was tracked, we compared their teaching schedule to a balanced schedule where all teachers taught the same percentage of course sections by track and by level. If a

teacher taught greater than 1.5 course sections or less than 1.5 course sections compared to a balanced schedule, we designated them as tracked. For example, suppose the breakdown of course sections is 55% entry level and 45% upper level. For a balanced schedule, a teacher assigned six course sections should teach between 1.8 and 4.8 ($0.55 \times 6 \pm 1.5$) entry-level sections and between 1.2 to 4.2 ($0.45 \times 6 \pm 1.5$) upper-level sections.

3 Research Results

In our research (Nirode & Boyd, 2023), we analyzed statewide data for 1,822 mathematics teachers in 184 high schools with enrollment of at least 600 students. We built our dataset by collecting three data sources from each high school: teacher hire dates, the department schedule, and course descriptions. We focused on teacher tracking patterns across quintiles according to years of teaching experience in a teacher's current building. For example, in a 10-teacher department all with different hire dates, two teachers would be in each quintile. Figure 1 shows the results by course track.
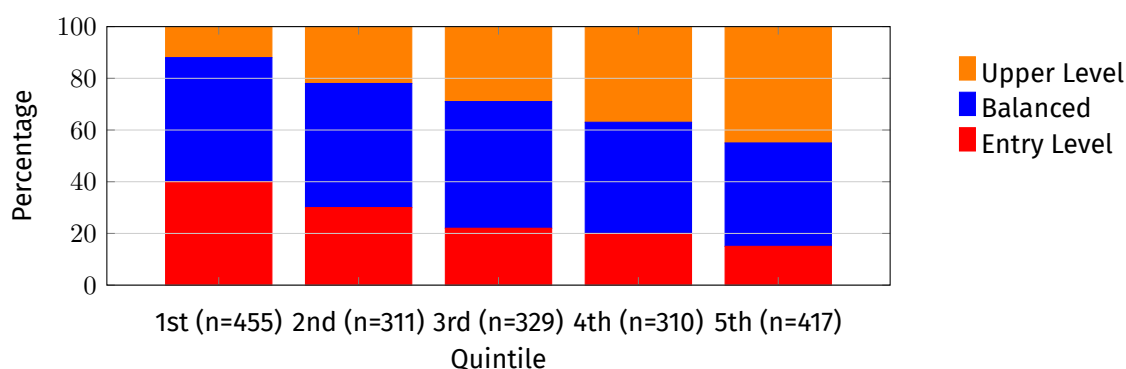
Figure 1: Percentage of Teachers Tracked by Course Track.
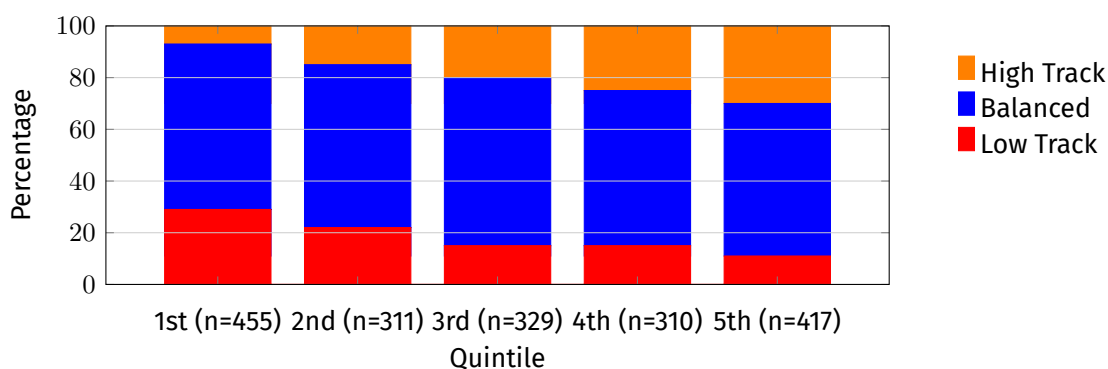
Across all five quintiles, approximately 62% of teachers have balanced schedules and are not tracked, but the remaining 38% are tracked differently across quintiles. In particular, the first bar shows that 29% of first quintile teachers (those with the least seniority in their math department) are tracked because they teach too many low track courses, but only 7% are tracked because they teach too many high track courses. In contrast, the last bar shows that only 11% of fifth quintile teachers (those with the most seniority in their math department) are tracked because they teach too many low track courses, but 30% are tracked because they teach too many high track courses.

Figure 2 shows the results by course level.

Figure 2: Percentage of Teachers Tracked by Course Level.

Across all five quintiles, approximately 45% of teachers have balanced schedules and are not tracked, but the remaining 55% are tracked very differently across quintiles. In particular, the first bar shows that 40% of first quintile teachers are tracked because they teach too many entry-level courses, but only 12% are tracked because they teach too many upper-level courses. In contrast, the last bar shows that only 15% of fifth quintile teachers are tracked because they teach too many entry-level courses, but 45% are tracked because they teach too many upper-level courses.

Figure 3 shows the combined results for teacher tracking by track and course level.

Figure 3: Percentage of Teachers Tracked by Course Track and Course Level.
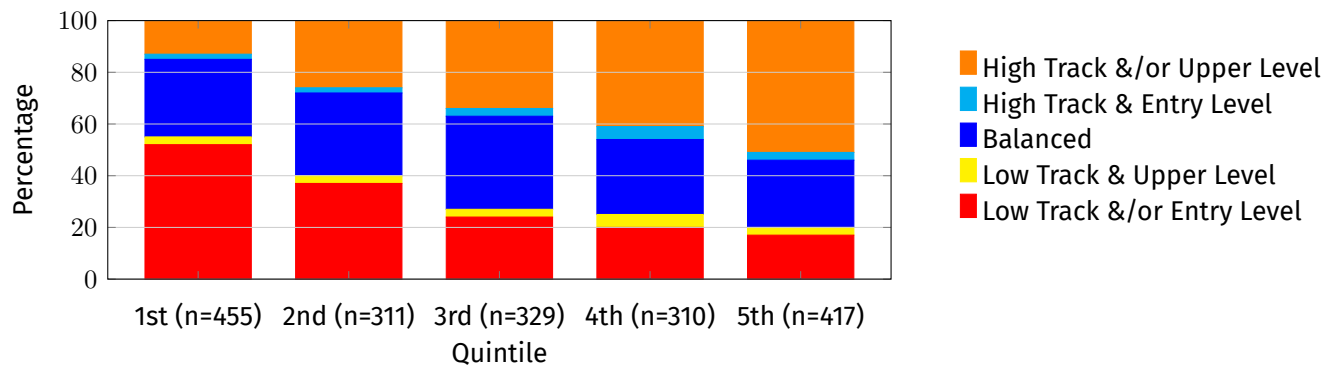
Across all five quintiles, approximately 31% of teachers have balanced schedules and are not tracked, but again the 69% who are tracked are tracked very differently across quintiles. In particular, 52% of first quintile teachers (n = 235) are tracked by low track, entry-level, or both, but only 17% of fifth quintile teachers (n = 69). Thus, first quintile teachers are 5.4 times more likely than fifth quintile teachers to be tracked in this way. In contrast, 51% of fifth quintile teachers (n = 214) are tracked by high track, upper-level, or both, but only 13% of first quintile teachers (n = 61). Thus, fifth quintile teachers are 6.8 times more likely than first quintile teachers to be tracked in this way.

4   Issues with Teacher Tracking

The results of our research suggest that teacher tracking in high school mathematics departments is a pervasive systemic issue that can perpetuate inequities. In particular, we want to draw attention to issues from both a teacher perspective and a student perspective. Teachers who are the least experienced in the school (and most likely also new to teaching or with only a few years of prior teaching experience) often are put in a double bind of learning content and pedagogy as well as keeping students engaged and on task. Low track and entry-level courses typically have a higher proportion of students disenfranchised with school mathematics compared to students in high track or upper-level courses. Thus, we take an already complex job and make it more difficult for early-career teachers to develop the necessary skills to be successful. This only exacerbates the issue of teacher burnout and teachers leaving the profession early in their careers.

Because students in the low track often have a history of struggling with school mathematics, they have a demonstrated need for the most skilled teachers. Because teacher quality is positively correlated with years of experience (Francis et al., 2019; Papay & Kraft, 2016), then teacher tracking often limits these students' access to the most skilled teachers. Access also is restricted for students in entry-level courses. This is an issue because the student populations in entry-level courses compared to upper-level courses often have different com-

positions. For example, because of acceleration in junior high with algebra and sometimes geometry, some students only take one (or zero) entry-level course(s) at the high school. In contrast, some students never take upper-level courses at their home school because they leave after two years to attend a career center; others take their classes in an alternative setting (e.g., credit recovery) separate from the main student population. Thus, these students often never have access to the most skilled teachers at their home schools.

5   Call to Action

Even though building principals typically have the final say in assigning courses to teachers, we know from research (Grissom et al., 2015; Siskin, 1994) as well as our experience as former high school mathematics teachers, department chair (Nirode), and principal (Boyd) that teachers have varying degrees of agency when it comes to their schedule. Typically, this agency is in the form of micropolitical capital that teachers accrue the longer they teach in their building. Veteran teachers often are able to leverage their professional relationships with colleagues, the department chair, and building administrators for more favorable work conditions (from their point of view). For example, teachers jockey for resources such as a particular classroom, funds for professional development, a planning period at a certain time, classroom furniture, teaching supplies, etc. But no other resource directly influences a teachers' work as much as decisions about their teaching schedule—who teaches "which courses, when, where, and to which students" (Siskin, 1994, p. 133).

Our goal in writing this article is to spur a critical conversation among mathematics teachers at your high school. First, you might look at whether all teachers have a balanced schedule according to track and level. To do this, you could apply our measure of teacher tracking to quantify which teachers are tracked and how (contact us if you want help with this). Or more simply, you could ask each teacher in the department whether they would be willing to teach every other teacher's schedule. And if not, why not? Second, we provide some additional questions below to help guide this important conversation.

1. What are the most challenging courses to teach? Why? Who teaches these courses? Why?

2. Once a course is assigned to a teacher, is it that teacher's course forever?

3. Which students are in need of the most skilled teachers?

4. What allowances and constraints are there in assigning all teachers a balanced schedule?

5. How can we make teaching assignments that are equitable to both teachers and students?

Although there are many aspects to consider when developing a department teaching schedule, we want to add teacher tracking and its ramifications as another facet to consider. In particular, we encourage teachers with micropolitical capital to scrutinize their individual teaching schedules within the context of the collective common good of all teachers and all students—especially teachers who are less experienced and students who have a demonstrated need for the most skilled teachers. We hope that the outcome of this will be an increase in both supporting all mathematics teachers in their instructional practice and supporting all students in accessing a high-quality learning experience with mathematics.

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