

# Interrogating Tracked Mathematics Teacher Practices: A Logistic Regression Analysis

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*Although teacher tracking in mathematics is a phenomenon broadly recognized by practitioners, there is a dearth of empirical research examining the effects of mathematics teacher tracking. Education reformers and experts declare a need to de-track secondary teachers to balance teaching assignments. This study examines factors relevant to teachers' disposition toward teaching assignments and, in turn, student assignments, such as collective responsibility and self-efficacy in relation to course assignments when controlling for other teacher characteristics. To account for the unique realities of teacher settings, researchers further examine the influence of urban compared to non-urban teacher locales on self-efficacy and collective responsibility. This analysis examines the public High School Longitudinal Study of 2009 (HSLs:09) mathematics teacher survey data (n=17,882) using a logistic regression analysis. Results indicate that mathematics teacher track assignment has a significant influence on self-efficacy and collective responsibility, whereas the locale of urban setting shows no significant difference in teacher self-efficacy and collective responsibility. Through the lens of Expectancy Value Theory (EVT), these results suggest that future researchers should further investigate the nature of the relationship between teachers' course assignments and self-efficacy, collective responsibility, and expectations for students.*

**KEYWORDS:** tracking, teachers, self-efficacy, collective responsibility, Expectancy Value Theory

**M**athematics tracking in schools involves placing students in curricular sequences that either set them on an advanced-track trajectory toward advanced mathematics (i.e., AP Calculus, AP Statistics) in high school or a non-advanced-track trajectory (Figure 1). These sequences withhold access and opportunities to complete advanced mathematics courses (Galanti, 2021; Irizarry, 2021; Tyson & Roksa, 2016; Wronowski et al., 2022). As such, taking more advanced mathematics classes in high school situates students to garner higher lifetime earnings and STEM careers (Rose & Betts, 2004; Warne et al., 2019). Despite these benefits, some groups of students have traditionally been closed off from the advanced mathematics track to success. For instance, Black students, English Language Learners (ELL), and economically disadvantaged students are more likely to enter non-advanced track mathematics classes as early as middle school compared to their

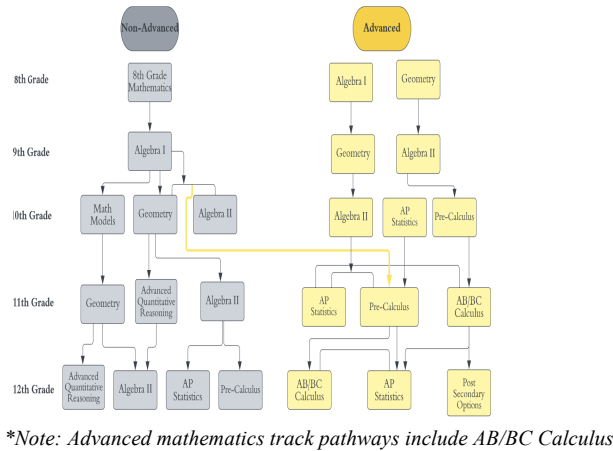
white middle-class peers (Batruch et al., 2019; Callahan & Shifrer, 2016; Faulkner et al., 2014; Irizarry, 2021; Tyson, 2013). The National Council of Teachers of Mathematics (NCTM) describes teacher tracking as the practice where schools assign the most experienced teachers, whom they see as most effective, to high-track advanced mathematics classes while giving the high-need students in low-track classes the least experienced teachers. Some research suggests that the lowered student outcomes for students in low-track classes could stem from lowered expectations from teachers and from teachers who are unprepared to support high-need students in lower tracks (NCTM, 2018). Although there are opportunities for students to move from a non-advanced to an advanced mathematics track, such as taking Geometry and Algebra II in tandem (Figure 1), it is not common. Furthermore, it is far less likely that marginalized racial groups such as Black and Latinx students take advantage of alternative trajectories to advanced tracks (Edosomwan et al., 2022; Irizarry, 2021).

Reformers and mathematics education experts, such as the president of the NCTM (Berry, 2018) and NCSM Leadership in Mathematics Education (2019), both declare a need to de-track secondary teachers to balance teaching assignments, with the more experienced teachers having both non-advanced track and advanced-track mathematics assignments. Although teacher tracking in mathematics is a phenomenon broadly recognized by practitioners (Leiberman, 2020), there is an absence of empirical support for the call to action. To this end, we seek to examine factors relevant to teachers' dispositions toward course assignments and, in turn, student assignments, such as collective responsibility and self-efficacy in relation to course assignments. For instance, in schools with high teacher collective responsibility, teachers attribute student learning to a sense of shared versus individual responsibility (Morales-Chicas & Agger, 2017). Thus, we believe that examining the factors of teacher self-efficacy and collective responsibility will provide further insight and support for detracking mathematics teachers.

In this paper, we will first explain our theoretical underpinnings of Expectancy Value Theory. Then, we will provide a literature review explaining student and teacher tracking, teacher collective responsibility, teacher self-efficacy, and urban context. We will give details on this present study, its data, and logistic regression analysis before investigating our results. Based on our results, this paper concludes that de-tracking mathematics teachers is important, suggesting negative effects on teacher self-efficacy and collective responsibility.

**Figure 1**

*Summary of Common Secondary mathematics Track Pathways*



## Theoretical Underpinnings

Wigfield and Eccles (1992) explain expectancy value theory (EVT) to analyze motivational factors regarding students’ academic achievement. According to EVT, achievement behaviors are products of the interplay between individuals’ subjective beliefs about their current competencies and value beliefs (Eccles & Wigfield, 1995; Wigfield & Eccles, 2000). Abrami et al. (2004) extended the EVT framework to examine teachers’ decision-making due to its relation to beliefs and anticipated effort. Teachers’ decision-making surrounding classroom management, instructional strategies, assessment, and careers has been examined (Foley, 2011; Henze et al., 2009; Ossman & Warner, 2020; Watt & Richardson, 2015; Turner et al., 2008). More specifically, teachers’ motivation to incorporate strategies learned through professional development has been explained through EVT (Andersson & Palm, 2018). The task value, or importance, that teachers assign to teaching strategies is influenced by factors such as campus culture, climate, and social norms (Jurasaitė-Harbišon & Rex, 2010). Therefore, EVT is a viable lens for examining teachers’ motivation in relation to their respective mathematics course assignments.

Our study utilizes EVT to examine the cultural milieu that shapes teachers’ beliefs regarding their competence and the perceived value of their course assignments, as teachers’ expectations vary by course assignment. Furthermore, in mathematics course assignments, less experienced novice teachers are placed in high-need, non-advanced tracks more frequently than their more experienced senior colleagues. The “less desirable” assignment may negatively impact their confidence in their professional abilities to teach their students successfully. In contrast, an advanced-track mathematics course assignment may bolster teachers’ beliefs regarding their content knowledge and teaching abilities, given the higher degree of prestige and respect associated with advanced mathematics. Moreover, teacher expectations for students across course assignments may vary, impacting their decision-making regarding curriculum and instruction.

Although many are familiar with the assumption of self-fulfilling prophecy at the student level, we further examine this phenomenon at the classroom or course level, as teacher expectations vary by course assignment. Jussim et al. (2009) propose a self-fulfilling prophecy model with three major steps: 1) formation of inaccurate student expectations; 2) differential treatment (low- versus high-ability learners); and 3) student reactions to teacher behavior that confirm initial expectations. Similarly, as teachers receive differential track assignments (i.e., intervention, on-level, advanced, etc.), they hold different expectations for their students in ways that can create self-fulfilling prophecies (Francis et al., 2020; Oakes, 2005). In urban schools, those collective expectations can have significant effects on student outcomes (Trinidad, 2021). Thus, EVT shows that expectations for students could influence teachers' perspectives on course assignments.

## **Literature Review**

### *Student Tracking*

Research has shown that student tracking decisions often involve characteristics like student race, home language, and socioeconomic status that place already marginalized student groups into lower tracks with lower outcomes and segregate classrooms. The United States uses course-by-course tracking, wherein secondary students are placed into different content course levels based on perceived ability levels (Chmielewski et al., 2013). Examples would be advanced, accelerated, Advanced Placement, or honors mathematics as higher track courses compared to regular, on-level, or remedial mathematics as lower track courses. Some scholars argue that the negative effects of tracking come from the lower expectations for students in lower track classrooms. Mayer and colleagues (2018) found that teachers usually created rules that conveyed lower expectations and less support to their students in low tracks. Similarly, Karlson (2015) hypothesized that high school students adjust their educational expectations based on school signals differing based on high track placements, and those expectations differ based on track. Even for the same student, teachers who taught them in high track classrooms had higher college expectations than teachers of the same student in lower track classrooms (Kelly & Carbonaro, 2012). This indicates that track placement influences teacher expectations in ways that disadvantage lower track students.

### *Teacher Tracking*

The NCTM (2018) defines teacher tracking as placing the most experienced or perceived effective teachers in the advanced or high-track mathematics classes and placing the least experienced teachers in non-advanced or beginning mathematics classes. Teacher tracking, like that of tracking students, involves assigning teachers to different levels of coursework. For example, a teacher could be assigned to teach only advanced mathematics classes, on-level mathematics classes, or remedial classes. They could also teach a mixture of those courses. While the previous section detailed the negative effects of low-track placement on students, this section provides potential explanations for those effects based on the different quality of teachers that non-advanced track classrooms receive (Karlson, 2015; Mayer et al., 2018; Van Houtte et al., 2013).

Some studies have found that teachers behave differently in their higher- compared to lower-track classrooms (Achinstein et al., 2004; Donaldson et al., 2017; Mayer et al., 2018; Wronowski et al., 2022). Achinstein et al. (2004) argued that policies created teacher tracks “distinguished by the nature of inputs, with teachers experiencing different levels of resources, learning opportunities, instructional control, and expectations that result in their beliefs and practices being aligned with lower or higher status” (p. 592). This is reflected in the differences between how teachers teach low-track and high-track classes, with teachers in low-track classes providing fewer opportunities to learn alongside less emotional, organizational, and instructional support (Donaldson et al., 2017; Wronowski et al., 2022).

One potential reason for the different instructional strategies used by teachers in low-compared to high-track classrooms is that non-advanced-track classes tend to have less experienced teachers. Lieberman (2020) explains that more experienced teachers often get the first pick of classes and choose the higher-level courses, leaving novice teachers to take the lower-level classes. In a historical ethnography of tracking, Finley (1984) saw teachers promote tracking structures to create situations where they could teach their preferred, usually middle-class White students. Kalogrides et al. (2013) have research that supports this, finding principals more likely to place novice teachers in low-track classrooms. In mathematics, a recent state-level study by Nirode and Boyd (2023) supports this conclusion, revealing significant differences, with teachers in the highest quintile of experience more likely to be assigned high-track mathematics courses. This leads to disadvantages for students in low-track mathematics classes, especially Black students. Clotfelter et al. (2005) studied North Carolina schools and found that novice teacher assignments disadvantaged Black students because of their over-representation in low tracks. More experienced teachers can lead to higher academic achievement for students (Ladd & Sorenson, 2017), which could explain some differences in the achievement of students in high compared to low tracks.

While the effects of tracking on teacher retention have not been extensively studied, some researchers have found evidence that tracking has negative effects on teacher satisfaction. In a case study of a suburban middle school, Stanley and Venzant Chambers (2018) found that teacher tracking had harmful effects on school climate and the retention of diverse teachers because Black faculty were disproportionately assigned to low-track classes. That is currently the only recent study to address this issue, but an older study by Kelly (2004) found that although teacher tracking was highly related to satisfaction, a quantitative analysis did not find differences in attrition rates correlated to tracking.

### *Collective Responsibility*

Teachers’ collective responsibility is the belief in a shared obligation and shared capacity to positively influence student learning (Watson & Lewis, 2008). For instance, a teacher in a school with low collective responsibility may view low student achievement as a function of student traits and school conditions versus their shared efforts and responsibility to the students (Lee & Loeb, 2000). Although the scope of research on teachers’ collective responsibility is limited (Morales-Chicas & Agger, 2017), the extant body of literature primarily focuses on the influence of teachers’ collective responsibility on student learning and achievement. As such, collective responsibility has a positive, significant relationship with student learning and achievement (LoGerfo &

Goddard, 2008; Morales-Chicas & Agger, 2017). Scales such as the HSLs:09 survey have been utilized to quantify teachers' collective responsibility.

For instance, using multiple regression analyses of the High School Longitudinal Study (HSLs:09), Morales-Chicas and Agger (2017) found that male students repeating algebra with teachers possessing high collective responsibility had statistically significantly higher grades than male students repeating algebra with teachers possessing low collective responsibility and male students who were taking algebra for the first time. Another strand of collective responsibility research in mathematics education is the influence of school leadership on teachers and, in turn, on student learning and achievement. Similar to Morales-Chicas and Agger (2017), Park et al. (2019) examine the HSLs:09 data source. However, Park et al.'s (2019) multilevel structural equation modeling reveals that school leadership positively predicted collective responsibility. To this end, we seek to further investigate factors influencing teachers' collective responsibility by looking at the teacher characteristic of mathematics track assignment to add to the previously researched strands.

### *Teacher Self-Efficacy*

Teacher self-efficacy has been defined as the extent to which the teacher believes that they can successfully influence their students' learning and behavior and fulfill their professional responsibilities in the ecology of the school, regardless of students' backgrounds (Friedmann & Kass, 2002; Williams, 2009; Zee & Kooman, 2016). Theoretical underpinnings from Rotter's (1966) locus of control and Bandura's (1977) social cognitive theory characterize the construct of teacher self-efficacy, emphasizing individuals' agency. Rotter's (1966) theory of locus of control posits that individuals view outcomes either as products of external sources of control or as products of their own efforts. Similarly, Bandura (1977) describes self-efficacy as individuals' beliefs in their own abilities to produce desired outcomes through organizing and implementing a course of action. Teacher self-efficacy has been split into two categories: teacher self-efficacy regarding beliefs in capabilities across the teaching profession—general teaching self-efficacy—and personal teacher self-efficacy (Ashton & Webb, 1986). In this study, we focus on teacher self-efficacy regarding teachers' personal beliefs in their own capabilities because of research regarding the benefits of teacher self-efficacy on student outcomes (Zee & Kooman, 2016).

Teacher self-efficacy has positive benefits for student outcomes (e.g., academic achievement, motivation) and teacher outcomes (e.g., job satisfaction, lower levels of stress and burnout) (Aloe et al., 2014; Cansiz & Cansiz, 2019; Midgley et al., 1989). Because of the aforementioned benefits, researchers have sought to quantify teachers' self-beliefs regarding their professional capabilities through measures such as the Teacher Efficacy Scale (Gibson & Dembo, 1984), the modified Teacher Efficacy Scale from Woolfolk and Hoy (1990), the Sources of Self-Efficacy Scale (Henson, 1999), and the Norwegian Teacher Self-Efficacy Scale (Skaalvik & Skaalvik, 2009). Measures of teacher self-efficacy include Likert-scale items that prompt teachers to self-report their belief in their abilities regarding effective classroom instruction, meeting the individual needs of students, managing student behaviors, collaborating with colleagues, and partnering with students' guardians (Gibson & Dembo, 1984; Henson, 1999; Skaalvik & Skaalvik, 2009; Woolfolk & Hoy, 1990).

Similar to tracking in mathematics, there is a strong emphasis on teacher self-efficacy in relation to student outcomes. Zee and Koomen (2016) synthesized forty years of research on teacher self-efficacy and found positive correlations between teachers' self-efficacy and classroom quality, alongside student academic adjustment. Teacher self-efficacy may be especially important for mathematics education, where Perera and John (2019) found mathematics teacher self-efficacy positively correlated with their class's average achievement and interaction quality, two potential sources of negative outcomes for differently tracked classrooms. However, there is limited empirical study directly connecting teacher efficacy and teacher tracking since Raudenbush et al.'s (1992) findings of lower self-efficacy in low-track classrooms, especially for mathematics and science teachers. A meta-analysis of 43 studies with 9,216 participants found that self-efficacy had a strong positive effect on teaching performance evaluations (Klassen and Tze, 2014). Further, Taylor (2015) found efficacy to play a key part in teacher resilience, and other scholars have also found self-efficacy to have a positive relationship with job satisfaction and fewer burnout factors (Perera and John, 2019; Zee and Koomen, 2016). Thus, our study aims to provide further analysis of teacher self-efficacy in relation to teacher tracking because of its aforementioned benefits.

### *Urban Settings*

The teaching and learning of mathematics hold a unique position of power as a critical filter to academic, social, and economic opportunities (NCTM, 1989). The magnitude of the critical filter may be influenced by inequities in mathematics, such as access to high-quality learning opportunities. As such, the geospatial environment of the school is a salient consideration for examining staffing mathematics teachers, teacher quality, and student achievement (Young et al., 2022). The criteria for the urbanicity of schools have shifted to include schools that are not only spatially adjacent to large cities but also schools facing challenges such as access to resources and qualifications of teachers (Milner, 2012). Schools classified as urban may face a scarcity of resources for large populations who endure issues with housing, poverty, and transportation that affect school environments (Kraft et al., 2015; Milner, 2012). Moreover, the historical and contemporary conditions that affect life in urban schools and communities extend specifically to mathematics education (Martin & Larnell, 2013).

For instance, teachers with less than five years of experience are more likely to work in urban schools (Barton & Coley, 2009; Lewis et al., 2012). Schools with high percentages of students qualifying for free and reduced lunch experience greater staffing shortages (Ingersoll & May, 2012; Nguyen & Redding, 2018). Further, compared to any other discipline, schools have the greatest difficulty staffing mathematics and science teachers, creating an urgency to hire and retain qualified teachers in urban schools (Ingersoll & Perda, 2010; U.S. Department of Education, 2016; Whitfield et al., 2021). Schools with a high percentage of Black and Latinx students have more than double the percentage of mathematics classes taught by out-of-field teachers (over 40%) compared to schools with low enrollment of students of color (15.5%) (Ingersoll, 2008). Moreover, tracking students in mathematics courses in urban settings further limits learning opportunities by withholding access to advanced courses with qualified teachers and concentrating traditionally unsuccessful students into the same classrooms (Boaler, 2011; James et al., 2016). To this end, Nomi and Allensworth (2013) argue that tracking makes it more difficult for mathematics teachers

to teach students effectively, which could further complicate the realities of teaching in urban contexts where novice and probationary certified teachers are overrepresented.

However, despite the challenges of working in public education and the realities of students' needs, teachers in urban schools continue to report high expectations and high commitment toward their students (Drury & Baer, 2011; Kraft et al., 2015). The unique realities that teachers in urban settings experience require a higher sense of collective responsibility to help their students and an awareness of structural barriers, such as tracking (Bartell, 2011; Gutiérrez, 2013). Furthermore, the same factors that fuel deficit narratives surrounding urban education environments have been reported by urban teachers as fuel for their high commitment to student learning and success (Kraft et al., 2015).

Another key factor in urban education is the role of teachers of color. Teachers of color tend to continue working in high-need urban schools longer than non-Hispanic White teachers (Hollins & Guzman, 2005; Zumwalt & Craig, 2005). Teachers of color's professional decision-making is complicated because of their commitment to not only the profession but also to communities of color and students (Gist, 2017). The tension between persisting in the teaching profession to advocate for educational equity and bearing school and district policies has been shown to stifle teachers of color (Achinstein & Ogawa, 2011; Machado, 2013; Malcom & Malcom, 2011). Thus, it is critical to interrogate, examine, and increase the representation of teachers of color because of their positive influence on all students (Carter Andrews et al., 2019; Bond et al., 2015; Carver-Thomas, 2018; Epstein & Gist, 2015; Woodson, 1937).

As such, successful instructional supports in urban learning environments include a flexible curriculum, a "push-in" approach to special education with dual teachers in the classroom, and designated, structured weekly team planning time for teachers (Choi et al., 2016; Kieran & Anderson, 2018; Kraft et al., 2015). Furthermore, mathematics-specific considerations include reframing urban mathematics to promote quantitative civic literacy for students (Young et al., 2022). Thus, urban mathematics teachers require knowledge of access, equity, social justice, and diversity in addition to mathematical pedagogical content knowledge (Larnell & Martin, 2013).

## **The Present Study**

Several scholars have provided evidence proving that the literature shows tracking has negative effects on students in general and that the high prevalence of mathematics tracking harms marginalized students (Giersch, 2018; Legette & Kurtz-Costes, 2021; Tyson, 2013; Werblow et al., 2013). However, information on the effects of tracking on teachers is lacking, and our study seeks to alleviate that lack to better understand the teacher aspect of tracking. Some limited research has found less experienced teachers assigned to lower-track classrooms and observed negative effects on self-efficacy in teachers assigned to low tracks (Kalogrides et al., 2013; Raudenbush et al., 1992). However, the current literature remains silent on other effects tracking could have on teachers and their feelings of belonging and self-efficacy. It also does not examine how urban settings could influence or control for those effects. All that data could help better explain the negative effects of tracking on students because of the close relationship between teacher characteristics and student outcomes.

Using data from the High School Longitudinal Survey of 2009 (HSLs:09), we explored how teaching different tracks of mathematics influenced teachers' feelings of belonging, measured

by their feelings of collective responsibility and their self-efficacy as teachers. The tracks are divided into accelerated and non-accelerated mathematics, as taking accelerated mathematics and earning calculus credit in high school has become a prerequisite for admission to the most prestigious universities (Bressoud, 2021). Our research aimed to answer the following questions:

*RQ1: How do mathematics teacher track and urban setting influence mathematics teachers' scale of collective responsibility when controlling for race/ethnicity, gender, and years of experience?*

*RQ2: How do mathematics teacher track and urban setting influence mathematics teachers' self-efficacy when controlling for race/ethnicity, gender, and years of experience?*

These questions are crucial in determining whether teacher perceptions could change based on student mathematics placements, a question that has not been addressed in recent literature about tracking in general or mathematics tracking since Rosenbaum et al. (1992) examined the self-efficacy of mathematics teachers in their historical study.

## **Method**

### *Survey & Dataset*

The HSLs:09 is a representative large-scale survey administered by the National Center for Education Statistics with a random selection of 9th graders from 944 out of 1,889 eligible schools and 21,444 students out of 25,206 eligible students. The public HSLs:09 data used for this analysis also involved a mathematics teacher survey associated with those students in the base year of 2009. The survey consisted of questions administered to students, teachers, parents, and administrators. We focus on the responses from mathematics teachers, where 17,882 out of the eligible 23,621 returned surveys.

We investigated scales and demographics from the mathematics teacher responses alongside the highest-level 9th-grade mathematics course of the associated student. Missing values for the variables of interest were removed from the sample, depending on the variables analyzed. For each analysis, there were 13,768 surveys with all the relevant variables filled, and 2,306 surveys with one or more missing data points were deleted. This was a cross-sectional study from the 2009 survey. However, that was accounted for by the use of the survey's balanced repeated replicate weights designed to be used with the public-use dataset to account for potential sample response bias when analyzing mathematics teacher survey items.

To account for the effect of urban status in the model, the school locale variable was dummy coded so that cities were 1 and all other locales were zero. Cities could have three separate definitions derived from NCEs categories and were not differentiated in the public-use data: large cities with populations greater than or equal to 250,000 in an urbanized area; midsize cities with populations between 250,000 and 100,000 in an urbanized area; and small cities with populations less than 100,000 inside an urbanized area. The scales for mathematics teachers in the HSLs:09 data of focus were the scale of mathematics teachers' self-efficacy, which collected Likert Scale responses ranging from 1 (highly agree) to 4 (highly disagree) from questions concerning teacher beliefs about their classroom management skills, ability to get through to students, and ability to

influence students regardless of student home background. The scale of the mathematics teachers' perception of collective responsibility came from Likert Scale questions ranging from 1 (highly agree) to 4 (highly disagree) about their perception of all the school's mathematics teachers' feelings of responsibility for school discipline, school improvement, student improvement, and the ability to teach students to self-regulate. Both scales were included within the original survey, where they were standardized with a mean of 0 and a standard deviation of 1. On both scales, higher values represented more positive thoughts. All this information comes from the base year survey in 2009 because that is the only year when mathematics teacher surveys were also collected. These scales are important because they can show how teaching accelerated compared to non-accelerated mathematics can correlate with teacher perceptions, which may, in turn, influence student outcomes depending on their mathematics course.

### *Data Screening and Analysis*

For this study, we used multiple logistic regression. Multiple logistic regression was the appropriate method of analysis because of the non-normality of the data and its categorical nature, which is easy to modify into binary variables (DeMaris & Selman, 2013). Logistic regression has also been found to be more reliable and valid than multiple regression in cases with non-normal data (Fang, 2013).

The teacher characteristics used as controls were years spent teaching high school mathematics, mathematics teacher race/ethnicity, and mathematics teacher gender. We also created a binary variable with 0 representing teachers with five or fewer years of experience and 1 representing teachers with more than five years of experience. This decision was based on research finding that attrition rates for teachers are highest during the first five years of teaching, with 40-50% of teachers resigning during that time frame (Borman & Dowling, 2008; Ingersoll, 2003). We created a binary variable for advanced mathematics, with students on track to take AP calculus their senior year labeled as advanced, and all other students labeled as non-advanced. This assumes the four-year high school sequence of geometry to algebra II to precalculus to calculus as advanced, with any sequence that does not end in calculus as non-advanced because that difference defines the difference in mathematics tracks (Irizarry, 2021). Figure 1 provides details about the potential trajectories. We used the median values for the scales of self-efficacy and collective responsibility and then made 0 results less than or equal to the median and 1 results greater than the median.

Our analysis used two multiple logistic regression models. In the first, the dependent variable was teacher self-efficacy; the independent variables were mathematics track (advanced vs. non-advanced) and urban locale; and the control variables were teacher race, gender, and high school math teaching experience. This had the following equation:

$$\text{Logit}(\text{Self-Efficacy}) = \beta_0 + \beta_1(\text{Track}) + \beta_2(\text{Urban}) + \beta_3(\text{Race}) + \beta_4(\text{Gender}) + \beta_5(\text{Experience})$$

In the second model, the dependent variable was feelings of collective responsibility; the independent variables were mathematics track (advanced vs. non-advanced) and urban locale; and the control variables were teacher race, gender, and high school math teaching experience. This had the following equation:

$$\text{Logit(Collective Responsibility)} = \beta_0 + \beta_1(\text{Track}) + \beta_2 (\text{Urban}) + \beta_3 (\text{Race}) + \beta_4 (\text{Gender}) + \beta_5 (\text{Experience})$$

Mathematics teacher track is the independent variable of interest, indicated as  $\beta_1(\text{Track})$ , with the binary options of advanced or non-advanced track based on the trajectories shown in Figure 1. The logistic regressions will result in odds ratios. Odds ratios of more than one mean the group is more likely to have more positive perceptions, odds ratios of less than one mean the group is less likely to have more positive perceptions, and odds ratios of one mean there is no difference.

## Findings

Our study sought to answer how mathematics teacher track, race/ethnicity, gender, years of experience, and urban setting influenced their feelings of collective responsibility and self-efficacy. The results revealed statistically significant differences in each category, although the significant factors differed for each outcome.

### *Collective Responsibility*

The first model explored differences in feelings of collective responsibility. When controlling for race/ethnicity, gender, and years of experience, advanced mathematics teachers were statistically significantly more likely to have higher perceptions of collective responsibility (OR = 1.20,  $p < 0.01$ ). Using those same controls, urban teachers were less likely to have higher feelings of collective responsibility, but those results were not statistically significant (OR = 0.96,  $p = 0.6$ ). Table 1 shows the detailed results for collective responsibility with 95% confidence intervals.

**Table 1**  
*Collective Responsibility Logistic Regression*

Teacher characteristic	OR	95% CI	p-value
More than five years teaching high school mathematics	1.20	1.06, 1.37	0.005
Race			
White, non-Hispanic	—	—	
Asian, non-Hispanic	0.73	0.50, 1.06	0.10
Black/African-American, non-Hispanic	0.92	0.67, 1.28	0.6
Hispanic	0.89	0.64, 1.24	0.5
More than one race, non-Hispanic	0.63	0.38, 1.04	0.069

*Interrogating Tracked Mathematics*

Other, non-Hispanic	0.21	0.05, 0.92	0.039
Gender			
Male	—	—	
Female	1.12	0.99, 1.28	0.077
Advanced mathematics assignment	1.20	1.06, 1.38	0.006
Urban locale	0.96	0.83, 1.12	0.6

*Self-Efficacy*

When controlling for race/ethnicity, gender, and years of experience, teachers of advanced mathematics had greater self-efficacy at a statistically significant level (OR = 1.15,  $p = 0.04$ ). With those same controls in place, urban teachers were less likely to have high self-efficacy, but those results were not statistically significant (OR = 0.92,  $p = 0.30$ ). Table 2 shows the detailed results with 95% confidence intervals.

**Table 2**  
*Teacher Self-Efficacy Logistic Regression*

Teacher characteristic	OR	95% CI	p-value
More than five years teaching high school mathematics	1.05	0.92, 1.19	0.5
Race			
White, non-Hispanic	—	—	
Asian, non-Hispanic	0.36	0.24, 0.56	<0.001
Black/African American, non-Hispanic	1.20	0.84, 1.71	0.3
Hispanic	1.18	0.85, 1.64	0.3
More than one race, non-Hispanic	0.82	0.47, 1.41	0.5
Other, non-Hispanic	16.0	3.63, 70.7	<0.001
Gender			

Male	—	—	
Female	1.64	1.44, 1.86	<0.001
Advanced mathematics assignment	1.15	1.01, 1.31	0.038
Urban locale	0.92	0.79, 1.08	0.3

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## **Discussion & Implications**

In this study, we explored how teaching different tracks of mathematics influenced teacher feelings of belonging, measured by their feelings of collective responsibility as well as their self-efficacy as teachers, using High School Longitudinal Survey of 2009 (HSLs:09) data through logistic regression analysis. Teacher characteristics such as collective responsibility and self-efficacy have been associated with student achievement (LoGerfo & Goddard, 2008; Morales-Chicas & Agger, 2017). Our findings answer the two research questions: 1) How do mathematics teacher track and urban setting influence their scale of collective responsibility when controlling for race/ethnicity, gender, and years of experience? and 2) How do mathematics teacher track and urban setting influence their self-efficacy when controlling for race/ethnicity, gender, and years of experience? Regarding the first research question, our results indicate that advanced mathematics course assignment status had statistically significant effects, while urban locale did not. The results were the same for our second research question. Thus, our findings contribute to the discussion of factors affecting teachers' collective responsibility and self-efficacy and raise further questions on teacher tracking and the influence of teaching in urban settings.

Our results indicate that advanced mathematics teachers had higher self-efficacy and feelings of collective responsibility than teachers assigned to non-advanced mathematics courses. Further, these two teacher characteristics are positively associated with student achievement (LoGerfo & Goddard, 2008; Morales-Chicas & Agger, 2017). Therefore, our findings indicate that tracking has negative associations with teachers' collective responsibility and self-efficacy. Previous research has found teacher self-efficacy and collective responsibility to have positive effects on student outcomes (LoGerfo & Goddard, 2008; Morales-Chicas & Agger, 2017; Zee & Kooman, 2016). Consequently, the negative correlations of tracking teachers into low-track classes may have negative correlations with student outcomes as well. This is in addition to the other negative associations tracking has with student outcomes (Legette, 2018; Oakes, 2005; Tyson, 2013; Werblow et al., 2013). This is an important finding, as no other research has quantitatively examined the effects of tracking on teacher self-efficacy since Raudenbush (1992), and no previously published research has investigated the effects of tracking on teacher feelings of collective responsibility.

The findings for urban locales demonstrate promising results with non-significant differences in teacher collective responsibility and self-efficacy. Previous research in mathematics settings in urban schools has found that successful mathematics teaching of urban students sometimes requires a higher emotional and pedagogical load (Bartell, 2011; Gutiérrez, 2013). Our

results indicate that despite this load, the collective responsibility and self-efficacy of teachers in urban settings are not statistically significantly influenced. Moreover, although there is nebulous quantitative tracking research regarding urban education settings for students besides James et al. (2016), quantitative studies on tracking that use urban locales in the model have been less common. However, our findings found no statistical significance of urban setting on self-efficacy or collective responsibility, contradicting the negative narrative and assumptions surrounding teachers in urban schools. Thus, these merits further investigation into how urban settings can affect teacher self-perceptions and perceptions of their teaching team. Because our category of urban included small, mid, and large-sized cities, it may not have accurately represented differences between different urban areas. Future research could use the restricted-use dataset of the HSL:09, which allows for differentiation between different city sizes.

Our study indicates that tracking negatively impacts teachers in terms of their self-efficacy and feelings of collective responsibility. These findings reflect the same negative outcomes found in Raudenbush's (1992) historical study of teacher self-efficacy in tracked mathematics and science classrooms. Lower expectations for their teaching role based on student track placement could explain some of the significant differences between teachers of advanced mathematics and non-advanced mathematics. EVT provides a potential justification for the differing expectations and perceptions of non-advanced mathematics teachers, who may see themselves as disadvantaged because of their teaching placement.

The lack of quantitative research concerning the effects of tracking on teachers needs to be addressed. This study provides one of the few approaches that offer a quantitative investigation into how teachers' feelings differ across tracks. Similarly, the last major quantitative study on the effects of tracking on teachers was by Raudenbush (1992), while only Kalogrides et al. (2013) and Kalogrides and Loeb (2013) have conducted recent studies looking quantitatively at teacher course placements in connection to tracking. With the changes in tracking systems to more course-by-course approaches, new studies must investigate this issue.

We also need more studies on what policies affect teacher placement regarding tracking. Besides Kalogrides et al.'s (2013) studies and the NCTM (2019) declaration, few have explicitly mentioned this issue. Furthermore, Kalogrides only studied one district. Studies that look at larger populations could provide better understandings of how these policies may differ across different districts, states, or locales (i.e., rural, suburban, urban). Another potentially interesting path would be examining how teacher track placements could differ based on teacher race and gender and how that could affect student outcomes, especially in STEM-related courses such as mathematics.

### *Detracking as a Potential Solution*

The National Council of Teachers of Mathematics (NCTM) recognizes the need to halt not only tracking students but also tracking teachers into “dead-end” course pathways (NCTM, 2018, p. 15). Efforts to detrack mathematics teacher placement involve methods such as rotating placements through all levels of courses in the department or providing a combination of placement assignments (Pre-AP, on-level, intervention). School districts that have ended these programs with the proper support have seen massive improvements in student outcomes (Domina et al., 2016). Disrupting a tradition of departmental seniority that entails exclusive placement for

advanced or upperclassmen students requires a cultural reset in collective responsibility and a mindset shift towards not only mathematics courses but also the respective students.

Detracking by placing all students in the most rigorous possible course has been found to have significant positive effects on the achievement of marginalized students when combined with the proper support. Tabron et al. (2021) explain that successful detracking requires an equity-oriented growth mindset alongside a historical understanding of how racism has led to tracked classrooms. Furthermore, Domina et al. (2012) analyzed detracking and found that it requires special attention to be paid to heterogeneous classrooms and differing skill levels of students while also considering student peer dynamics. This holds true even for some of the most rigorous and prestigious high school courses, like the International Baccalaureate. When placing all students together, the highest achievers continued to be successful, while the scores for the lower-achieving students stayed the same or increased after detracking (Atteberry et al., 2019).

The success of detracking is contingent on factors such as teachers' abilities to teach heterogeneous classrooms. There are programs and training that could help teachers alleviate worsened outcomes for students in low tracks. Yanisko (2016) used a case study to find that while mathematics teachers' expectations of tracked students first limited their self-efficacy, mentoring and reflections allowed them to modify their practice in ways that led to more rigorous mathematics instruction. Larger-scale programs such as this could provide wonderful benefits for students and teachers currently suffering from the lowered expectations of lower-track placement.

### **Limitations**

The number of missing values in the data set raises questions about its full generalizability. However, the large sample size should ease that concern. This is also a correlational, cross-sectional study that relies on self-reported data and cannot speak to the reasons behind the differences observed in the results. Additionally, because this used the public use file, it disallowed the use of multiple imputations to fully account for the missing data in the sample or to see more details about the urban setting size.

### **Conclusions**

Although teacher tracking in mathematics is a phenomenon broadly recognized by practitioners (Leiberman, 2020), and reformers and mathematics education experts such as the NCTM (2018) and the NCSM Leadership in Mathematics Education (2019) declare a need to de-track secondary teachers to balance teaching assignments, there is a dearth of empirical research examining the effects of mathematics teacher tracking. Our study furthers the work of Nirode and Boyd (2023), who highlight the prevalence of teacher tracking in mathematics by examining the influence of teacher track assignment and school locale on affective outcomes (i.e., self-efficacy and collective responsibility). Our study contextualizes mathematics tracking by examining school locale due to the challenges of staffing mathematics positions in urban schools with qualified mathematics teachers. In this sample, school urbanicity was not a statistically significant predictor; however, examining more recent data is essential to analyze contemporary mathematics teacher tracking trends and compare over time. Our results indicate that low mathematics teacher track assignment has a significant negative correlation with self-efficacy and collective responsibility, which have been shown to influence student outcomes. Through the lens of EVT, deficit views

regarding mathematics teaching track assignment can have negative impacts on the ways in which teachers view their students, students' abilities, and make instructional decisions. Thus, it is critical to further examine the phenomenon of mathematics teacher tracking and the affective outcomes for teachers.

## References

- Abrami, P. C., Poulsen, C., & Chambers, B. (2004). Teacher motivation to implement an educational innovation: Factors differentiating users and non-users of cooperative learning. *Educational Psychology, 24*(2), 201-216. <https://doi.org/10.1080/0144341032000160146>
- Achinstein, B., & Ogawa, R. T. (2011). *Change(d) agents: New teachers of color in urban schools*. New York, NY: Teachers College Press.
- Aloe, A. M., Amo, L. C., & Shanahan, M. E. (2014). Classroom management self-efficacy and burnout: A multivariate meta-analysis. *Educational psychology review, 26*, 101-126. <https://doi.org/10.1007/s10648-013-9244-0>
- Andersson, C., & Palm, T. (2018). Reasons for teachers' successful development of a formative assessment practice through professional development: A motivation perspective. *Assessment in Education: Principles, Policy & Practice, 25*(6), 576-597. <https://doi.org/10.1080/0969594X.2018.1430685>
- Anderson, R. K., West, H., & Kates, A. (2022). Learning to subvert: How online learning communities can promote acts of creative insubordination. *Journal of mathematics Teacher Education*. <https://doi.org/10.1007/s10857-022-09543-6>
- Ashton, P. & Webb, B. (1986). Making a difference: teachers' sense of efficacy and student achievement.
- Atteberry, A., Lacour, S. E., Burris, C., Welner, K., & Murphy, J. (2019). Opening the Gates: Detracking and the International Baccalaureate. *Teachers College Record: The Voice of Scholarship in Education, 121*(9), 1–63. <https://doi.org/10.1177/016146811912100908>
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215.
- Bartell, T. (2011). Caring, race, culture, and power: A research synthesis toward supporting mathematics teachers in caring with awareness. *Journal of Urban Mathematics Education, 4*(1), 50-74. <https://doi.org/10.21423/jume-v4i1a128>
- Barton, P. E., & Coley, R. J. (2009). *Parsing the achievement gap II*. Princeton, NJ: Educational Testing Services
- Batruch, A., Autin, F., Bataillard, F., & Butera, F. (2019). School selection and the social class divide: How tracking contributes to the reproduction of inequalities. *Personality and Social Psychology Bulletin, 45*(3), 477–490. <https://doi.org/10.1177/0146167218791804>
- Berry, R. (2019). *Initiating critical conversations on the discontinuation of tracking*. National Council of Teachers of Mathematics (NCTM). [https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Robert-Q\\_-Berry-III/Initiating-Critical-Conversations-on-the-Discontinuation-of-Tracking/](https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Robert-Q_-Berry-III/Initiating-Critical-Conversations-on-the-Discontinuation-of-Tracking/)
- Boaler, J. (2011). Changing students' lives through the de-tracking of urban mathematics classrooms. *Journal of Urban Mathematics Education, 4*(1), 7-14. <https://doi.org/10.21423/jume-v4i1a138>
- Bond B., Quintero E., Casey L., Di Carlo M. (2015). *The state of teacher diversity in American education*. Washington, DC: Albert Shanker Institute.
- Borman, G. D., & Dowling, N. M. (2008). Teacher attrition and retention: A meta-analytic and narrative review of the research. *Review of Educational Research, 78*(3), 367-409. <https://doi.org/10.3102/0034654308321455>

- Bressoud, D. M. (2021). The strange role of calculus in the United States. *ZDM – mathematics Education*, 53(3), 521–533. <https://doi.org/10.1007/s11858-020-01188-0>
- Callahan, R. M., & Shifrer, D. (2016). Equitable access for secondary English learner students: Course taking as evidence of EL program effectiveness. *Educational Administration Quarterly*, 52(3), 463–496. <https://doi.org/10.1177/0013161X16648190>
- Cansiz, M., & Cansiz, N. (2019). How do sources of self-efficacy predict preservice teachers' beliefs related to constructivist and traditional approaches to teaching and learning? *Sage Open*, 9(4). <https://doi.org/10.1177/2158244019885125>
- Carter Andrews, D. J., Castro, E., Cho, C. L., Petchauer, E., Richmond, G., & Floden, R. (2019). Changing the narrative on diversifying the teaching workforce: A look at historical and contemporary factors that inform recruitment and retention of teachers of color. *Journal of Teacher Education*, 70(1), 6–12. <https://doi.org/10.1177/0022487118812418>
- Carver-Thomas, D. (2018). *Diversifying the teaching profession: How to recruit and retain teachers of color*. Palo Alto, CA: Learning Policy Institute. Retrieved from <https://learningpolicyinstitute.org/product/diversifying-teaching-profession-report>
- Chmielewski, A. K., Dumont, H., & Trautwein, U. (2013). Tracking effects depend on tracking type: An international comparison of students' mathematics self-concept. *American Educational Research Journal*, 50(5), 925–957. <https://doi.org/10.3102/0002831213489843>
- DeMaris, A., & Selman, S. H. (2013). Logistic Regression. In A. DeMaris & S. H. Selman (Eds.), *Converting Data into Evidence: A Statistics Primer for the Medical Practitioner* (pp. 115–136). Springer New York. [https://doi.org/10.1007/978-1-4614-7792-1\\_7](https://doi.org/10.1007/978-1-4614-7792-1_7)
- DeMaris, A., Selman, S. H., DeMaris, A., & Selman, S. H. (2013). Logistic regression. In *Converting Data into Evidence: A Statistics Primer for the Medical Practitioner*, 115-136.
- Domina, T., Hanselman, P., Hwang, N., & McEachin, A. (2016). Detracking and tracking up: mathematics course placements in California middle schools, 2003-2013. *American Educational Research Journal*, 53(4), 1229–1266. <https://doi.org/10.3102/0002831216650405>
- Domina, T., McEachin, A., Hanselman, P., Agarwal, P., Hwang, N., & Lewis, R. W. (2019). Beyond tracking and detracking: The dimensions of organizational differentiation in schools. *Sociology of Education*, 92(3), 293–322. <https://doi.org/10.1177/0038040719851879>
- Domina, T., McEachin, A., Hanselman, P., Agarwal, P., Hwang, N., & Lewis, R. W. (2019). Beyond tracking and detracking: The dimensions of organizational differentiation in schools. *Sociology of Education*, 92(3), 293–322. <https://doi.org/10.1177/0038040719851879>
- Domina, T., Penner, A. M., Penner, E. K., Conley, A., & Society for Research on Educational Effectiveness (SREE). (2012). Does Detracking Work? Evidence from a mathematics Curricular Reform. In *Society for Research on Educational Effectiveness*. Society for Research on Educational Effectiveness.
- Donaldson, M., LeChasseur, K., & Mayer, A. (2017). Tracking instructional quality across secondary mathematics and English Language Arts classes. *Journal of Educational Change*, 18(2), 183–207. <https://doi.org/10.1007/s10833-015-9269-x>
- Drury D., & Baer J. (2011). *The American public school teacher: Past, present, and future*. Harvard Education Press.
- Edosomwan, K., Young, J., Young, J., & Tholen, A. (2022). Mathematics mobility in the middle grades: Tracking the odds of completing calculus. *Middle Grades Review*, 8(1), 1–17.
- Epstein, T., & Gist, C. (2015). Teaching racial literacy in secondary humanities classrooms: Challenging adolescents' of color concepts of race and racism. *Race Ethnicity and Education*, 18(1), 40-60.
- Eccles, J. (2009). Who am I and what am I going to do with my life? Personal and collective identities as motivators of action. *Educational Psychologist*, 44(2), 78–89. <https://doi.org/10.1080/00461520902832368>.

- Eccles, J. S., & Wigfield, A. (1995). In the mind of the achiever: The structure of adolescents' academic achievement related-beliefs and self-perceptions. *Personality and Social Psychology Bulletin*, 21, 215-225.
- Fang, J. (2013). Why logistic regression analyses are more reliable than multiple regression analyses. *Journal of Business and Economics*, 4(7), 620-633.
- Faulkner, V. N., Stiff, L. V., Marshall, P. L., Nietfeld, J., & Crossland, C. L. (2014). Race and teacher evaluations as predictors of algebra placement. *Journal for Research in Mathematics Education*, 45(3), 288–311. <https://doi.org/10.5951/jresmatheduc.45.3.0288>
- Fletcher, E. C., & Haynes, D. D. (2020). Traditional students as second class citizens through modern day tracking. *Journal of Education for Students Placed at Risk*. <https://doi.org/10.1080/10824669.2020.1768857>
- Foley, L. S. (2011). Exploring K-3 teachers' implementation of comprehension strategy instruction (CSI) using expectancy-value theory. *Literacy Research and Instruction*, 50(3), 195-215. <https://doi.org/10.1080/19388071.2010.505680>
- Francis, B., Craig, N., Hodgen, J., Taylor, B., Tereshchenko, A., Connolly, P., & Archer, L. (2020). The impact of tracking by attainment on pupil self-confidence over time: Demonstrating the accumulative impact of self-fulfilling prophecy. *British Journal of Sociology of Education*, 41(5), 626–642. <https://doi.org/10.1080/01425692.2020.1763162>
- Friedman, I. A., & Kass, E. (2002). Teacher self-efficacy: A classroom-organization conceptualization. *Teaching and teacher education*, 18(6), 675-686.
- Galanti, T. M. (2021). “Just solving for x”: Retrospective narratives of opportunities of learn on hyper-accelerated algebra I pathways. *Journal of mathematical Behavior*, 62. <https://doi.org/10.1016/j.jmathematics.2021.100860>
- Gentrup, S., Lorenz, G., Kristen, C., & Kogan, I. (2020). Self-fulfilling prophecies in the classroom: Teacher expectations, teacher feedback and student achievement. *Learning and Instruction*, 66, 1-17. <https://doi.org/10.1016/j.learninstruc.2019.101296>
- Giersch, J. (2018). Academic tracking, high-stakes tests, and preparing students for college: How inequality persists within schools. *Educational Policy*, 32(7), 907–935. <https://doi.org/10.1177/0895904816681526>
- Gist, C. D. (2017). Voices of aspiring teachers of color: Unraveling the double bind in teacher education. *Urban Education*, 52(8), 927-956. <http://doi.org/10.1177/0042085915623339>
- Gutiérrez, R. (2013). Why (urban) mathematics teachers need political knowledge. *Journal of Urban mathematics Education*, 6(2), 7-19. <https://doi.org/10.21423/jume-v6i2a223>
- Henson, R. K. (1999). The sources of self-efficacy inventory (Unpublished Instrument). Hattiesburg: The University of Southern Mississippi.
- Henze, I., Van Driel, J., & Verloop, N. (2009). Experienced science teachers' learning in the context of educational innovation. *Journal of Teacher Education*, 60, 184-199. <https://doi.org/10.1177/0022487108329275>.
- Hollins, E. R., & Guzman, M. T. (2005). Research on preparing teachers for diverse populations. In M. Cochran-Smith & K. M. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education* (pp. 477-548). Mahwah, NJ: Lawrence Erlbaum.
- Ingersoll, R. M. (2008). *Core problems: Out-of-field teaching persists in key academic courses and high poverty schools*. Washington, DC: Education Trust.
- Ingersoll, R. (2003). *Is there really a teacher shortage?* Center for the Study of Teaching and Policy. [https://repository.upenn.edu/gse\\_pubs/133/](https://repository.upenn.edu/gse_pubs/133/)
- Ingersoll, R. M., & May, H. (2012). The magnitude, destinations, and determinants of mathematics and science teacher turnover. *Educational Evaluation and Policy Analysis*, 34(4), 435–464. <https://doi.org/10.3102/0162373712454326>

- Ingersoll, R. M., & Perda, D. (2010). Is the supply of mathematics and science teachers sufficient? *American Educational Research Journal*, 47(3), 563–594.
- Irizarry, Y. (2021). On track or derailed? Race, advanced mathematics, and the transition to high school. *Socius: Sociological Research for a Dynamic World*, 7, 1–21. <https://doi.org/10.1177/2378023120980293>
- James, M. C., Nichols, J. A., Nichols, W. D., Rupley, W. H., Franks, A., Rasinski, T. V., & Paige, D. D. (2020). Tracking exposed: The potential for undermining urban high school students' academic success through course placement practices. *International Journal of Research & Method in Education*, 6(3), 2320-2737.
- Jurasaitė-Harbiton, E., & Rex, L. A. (2010). School cultures as contexts for informal teacher learning. *Teaching and Teacher Education*, 26(2), 267-277. <https://doi.org/10.1016/j.tate.2009.03.012>.
- Jussim, L., Robustelli, S. L., & Cain, T. R. (2009). Teacher expectations and self-fulfilling prophecies. In K. R. Wenzel & A. Wigfield (Eds.), *Handbook of motivation at school* (pp. 349–380). Routledge/Taylor & Francis Group.
- Kalogrides, D., Loeb, S., & Béteille, T. (2013). Systematic sorting: Teacher characteristics and class assignments. *Sociology of Education*, 86(2), 103–123. <https://doi.org/10.1177/0038040712456555>
- Kanno, Y., & Kangas, S. E. N. (2014). “I’m not going to be, like, for the AP”: English language learners’ limited access to advanced college-preparatory courses in high school. *American Educational Research Journal*, 51(5), 848–878. <https://doi.org/10.3102/0002831214544716>
- Karolson, K. B. (2015). Expectations on track? High school tracking and adolescent educational expectations. *Social Forces*, 94(1), 115–141. <https://doi.org/10.1093/sf/sov006>
- Karolson, K. B. (2015). Expectations on Track? High School Tracking and Adolescent Educational Expectations. *Social Forces*, 94(1), 115–141. <https://doi.org/10.1093/sf/sov006>
- Kelly, S., & Carbonaro, W. (2012). Curriculum tracking and teacher expectations: Evidence from discrepant course taking models. *Social Psychology of Education*, 15(3), 271–294. <https://doi.org/10.1007/s11218-012-9182-6>
- Klassen, R. M., & Tze, V. M. (2014). Teachers’ self-efficacy, personality, and teaching effectiveness: A meta-analysis. *Educational Research Review*, 12, 59-76. <https://doi.org/10.1016/j.edurev.2014.06.001>
- Kraft, M. A., Papay, J. P., Johnson, S.M., Charner-Laird, M., Ng, M., & Reinorn, S. (2015). Educating amid uncertainty: The organizational supports teachers need to serve students in high-povert, urban schools. *Educational Administration Quarterly*, 51(5), 753-790. <https://doi.org/10.1177/0013161X15607617>
- Lewis, C., Venzant-Chambers, T., & Butler, B. (2012). Urban education in the 21st century: An overview of selected issues that impact African American student outcomes. In J. L. Moore III & C. W. Lewis (Eds.), *African American students in urban schools: Critical issues and solutions for achievement* (pp. 11–30). New York: Peter Lang.
- Machado, A. (2013, December 23). Why teachers of color quit: Low pay and high stress drive black and Latino teachers to leave the profession at higher rates than their white peers. *The Atlantic*. Retrieved from <http://www.theatlantic.com/education/archive/2013/12/why-teachers-of-color-quit/282007/>
- Malcom, L. E., & Malcom, S. M. (2011). The double bind: The next generation. *Harvard Educational Review*, 81(2), 162-171.
- Mayer, A., LeChasseur, K., & Donaldson, M. (2018). The structure of tracking: Instructional practices of teachers leading low- and high-track classes. *American Journal of Education*, 124(4), 445–477. <https://doi.org/10.1086/698453>
- Midgley, C., Feldaufer, H., & Eccles, J. S. (1989). Change in teacher efficacy and student self- and task-related beliefs in mathematics during the transition to junior high school. *Journal of Educational Research*, 106(2), 157-168. <https://doi.org/10.1037/0022-0663.81.2.247>

- Lee, V. E., & Loeb, S. (2000). School size in Chicago elementary schools: Effects on teachers' attitudes and students' achievements. *American Educational Research Journal*, 37(1), 3–31. <https://doi.org/10.2307/1163470>
- Legette, K. (2018). School tracking and youth self-perceptions: Implications for academic and racial identity. *Child Development*, 89(4), 1311–1327. <https://doi.org/10.1111/cdev.12748>
- Legette, K. B., & Kurtz-Costes, B. (2020). mathematics track placement and reflected classroom appraisals are related to changes in early adolescents' mathematics self-concept. *Educational Psychology*, 0(0), 1–16. <https://doi.org/10.1080/01443410.2020.1760212>
- Legette, K. B., & Kurtz-Costes, B. (2021). Curricular tracking, students' academic identity, and school belonging. *The Journal of Early Adolescence*, 41(7), 961–981. <https://doi.org/10.1177/0272431620977659>
- Lewis, A. E., & Diamond, J. B. (2015). *Despite the best intentions: How racial inequality thrives in good schools*. Oxford University Press.
- Lieberman, M. (2020, May 5). Stop giving inexperienced teachers all the lower-level mathematics classes, reformers argue. *Education Week*. <https://www.edweek.org/teaching-learning/stop-giving-inexperienced-teachers-all-the-lower-level-mathematics-classes-reformers-argue/2020/05>
- Little, J. W. (1982). Norms of collegiality and experimentation: Workplace conditions of school success. *American Educational Research Journal*, 19(3), 325–340.
- LoGerfo, L. F., & Goddard, R. D. (2008). Defining, measuring, and validating teacher and collective responsibility. In W. K. Hoy & M. F. DiPaola (Eds.), *Improving schools: Studies in leadership and culture* (pp. 73–97). Information Age.
- Loveless, T. (2013). *The resurgence of ability grouping and persistence of tracking*. Brookings. <https://www.brookings.edu/research/the-resurgence-of-ability-grouping-and-persistence-of-tracking/>
- Martin, D. B., & Larnell, G.V. (2013). Urban mathematics education. In H. R. Milner IV & K. Lomotey (Eds.), *Handbook of urban education* (pp. 373–393). Routledge.
- Mayer, A., LeChasseur, K., & Donaldson, M. (2018). The structure of tracking: Instructional practices of teachers leading low- and high-track classes. *American Journal of Education*, 124(4), 445–477. <https://doi.org/10.1086/698453>
- Mayer, A., LeChasseur, K., & Donaldson, M. (2018). The Structure of Tracking: Instructional Practices of Teachers Leading Low- and High-Track Classes. *American Journal of Education*, 124(4), 445–477. <https://doi.org/10.1086/698453>
- Milner, H. R. (2012). But What is Urban Education? *Urban Education*, 47(3), 556–561. <https://doi.org/10.1177/0042085912447516>
- Modica, M. (2015). “My skin color stops me from leading”: Tracking, identity, and student dynamics in a racially mixed school. *International Journal of Multicultural Education*, 17(3), 76–90. <https://doi.org/10.18251/ijme.v17i3.1030>
- Morales-Chicas, J., & Agger, C. (2017). The effects of teacher collective responsibility on the mathematics achievement of students who repeat algebra. *Journal of Urban mathematics Education*, 10(1), 52–73. <https://doi.org/10.21423/jume-v10i1a287>
- National Center For Education Statistics. (2016). *High School Longitudinal Study, 2009-2013* [United States]: Version 1 (Version v1) [Data set]. ICPSR - Interuniversity Consortium for Political and Social Research. <https://doi.org/10.3886/ICPSR36423.V1>
- National Council of Teachers of Mathematics (1989). *Curriculum and Evaluation Standards for School Mathematics*. Reston, VA: NCTM.
- NCSM: Leadership in Mathematics Education. (2019). *Closing the opportunity gap: A call for detracking mathematics*. <https://www.mathedleadership.org/docs/resources/positionpapers/NCSMPositionPaper19.pdf>

- Nirode, W., & Boyd, B. (2023). The prevalence of teacher tracking in high school mathematics departments. *Journal for Research in Mathematics Education*, 54(1), 7–23. <https://doi.org/10.5951/jresmetheduc-2020-0296>
- Nguyen, T. D., & Redding, C. (2018). Changes in the demographics, qualifications, and turnover of American STEM teachers, 1988–2012. *AERA Open*, 4(3), <https://doi.org/10.1177/2332858418802790>
- Nomi, T., & Allensworth, E. M. (2013). Sorting and supporting: Why double-dose algebra led to better test scores but more course failures. *American Educational Research Journal*, 50(4), 756–788. <https://doi.org/10.3102/0002831212469997>
- Oakes, J. (2005). *Keeping track: How schools structure inequality*. Yale College Press.
- Osman, D. J., & Warner, J. R. (2020). Measuring teacher motivation: The missing link between professional development and practice. *Teaching and Teacher Education*, 92. <https://doi.org/10.1016/j.tate.2020.103064>
- Park, J. H., Lee, I. H., & Cooc, N. (2019). The role of school-level mechanisms: How principal support, professional learning communities, collective responsibility, and group-level teacher expectations affect student achievement. *Educational Administration Quarterly*, 55(5), 742–780. <https://doi.org/10.1177/0013161X18821355>
- Raudenbush, S. W., Rowan, B., & Cheong, Y. F. (1992). Contextual effects on the self-perceived efficacy of high school teachers. *Sociology of Education*, 65(2), 150–167. <https://doi.org/10.2307/2112680>
- Rose, H., & Betts, J. R. (2004). The effect of high school courses on earnings. *The Review of Economics and Statistics*, 86(2), 497–513. <https://doi.org/10.1162/003465304323031076>
- Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs*, 80(1), 1e28. <https://doi.org/10.1037/h0092976>
- Smith, T. J., Walker, D. A., Chen, H.-T., Hong, Z.-R., & Lin, H. (2021). School belonging and mathematics attitudes among high school students in advanced mathematics. *International Journal of Educational Development*, 80, 102297. <https://doi.org/10.1016/j.ijedudev.2020.102297>
- Tabron, L. A., Kitchen, R., & Mestas, B. (2021). Moving Beyond Equal Access: Detracking a High School’s Mathematics Program. *Eurasia Journal of mathematics, Science and Technology Education*, 17(9), 1–13. <https://doi.org/10.29333/ejmste/11131>
- Tan, P., & Thorius, K. K. (2019). Toward equity in mathematics education for students with dis/abilities: A case study of professional learning. *American Educational Research Journal*, 56(3), 995–1032. <https://doi.org/10.3102/0002831218811906>
- Taylor, J. (2015). The power of resilience: A theoretical model to empower, encourage and retain teachers. *The Qualitative Report*. <https://doi.org/10.46743/2160-3715/2013.1474>
- Trinidad, J. E. (2021). Structural limitations and functional alternatives reducing suspensions and preserving racial suspension gaps. *Race Ethnicity and Education*, 24(1), 96–111. <https://doi.org/10.1080/13613324.2018.1538119>
- Turner, J. E., Waugh, R. M., Summers, J. J., & Grove, C. M. (2009). Implementing high quality educational reform efforts: An interpersonal circumplex model bridging social and personal aspects of teachers’ motivation. In P. A. Schutz, & M. Zembylas (Eds.), *Advances in teacher emotion research: The impact on teachers’ lives* (pp. 253e271). Springer. [https://doi.org/10.1007/978-1-4419-0564-2\\_13](https://doi.org/10.1007/978-1-4419-0564-2_13)
- Tyson, K. (2013). Tracking, segregation, and the opportunity gap. In *Closing the opportunity gap: What America must do to give every child an even chance* (pp. 169–180).
- Tyson, W., & Roksa, J. (2016). How schools structure opportunity: The role of curriculum and placement in mathematics attainment. *Research in Social Stratification & Mobility*, 44, 124–135. <https://doi.org/10.1016/j.rssm.2016.04.003>

- U.S Department of Education Office of Postsecondary Education. (2016). Teacher shortage areas nationwide listing 1990-1991 through 2016-2017. Washington, DC: Author. Retrieved from <https://www2.ed.gov/about/offices/list/ope/pol/tsa.doc>
- Van Houtte, M., Demanet, J., & Stevens, P. A. J. (2013). Curriculum tracking and teacher evaluations of individual students: Selection, adjustment or labeling? *Social Psychology of Education, 16*(3), 329–352. <https://doi.org/10.1007/s11218-013-9216-8>
- Warne, R. T., Sonnert, G., & Sadler, P. M. (2019). The relationship between advanced placement mathematics courses and students' STEM career interest. *Educational Researcher, 48*(2), 101–111. <https://doi.org/10.3102/0013189X19825811>
- Watt, H. M. G., & Richardson, P. W. (2015). Teacher motivation. In J. D. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (2nd ed., pp. 64e71). Elsevier. <https://doi.org/10.1016/B978-0-08-097086-8.26082-0>
- Werblow, J., Urick, A., & Duesbery, L. (2013). On the wrong track: How tracking is associated with dropping out of high school. *Equity & Excellence in Education, 46*(2), 270–284. <https://doi.org/10.1080/10665684.2013.779168>
- Whitfield, J., Banerjee, M., Waxman, H. C., Scott, T. P., & Capraro, M. M. (2022). Recruitment and retention of STEM teachers through the Noyce Scholarship: A longitudinal mixed methods study, *Teaching and Teacher Education, 103*. <https://doi.org/10.1016/j.tate.2021.103361>
- Wigfield, A., & Eccles, J. (1992). The development of achievement task values: A theoretical analysis. *Developmental Review, 12*(3), 265-310.
- Wigfield, A., & Eccles, J. S. (2000). Expectancy value theory of achievement motivation. *Contemporary Educational Psychology, 25*(1), 68–81. <https://doi.org/10.1006/ceps.1999.1015>
- Williams, R. (2009). Gaining a degree: the effect on teacher self-efficacy and emotions. *Professional Development in Education, 35*(4), 601-612. <https://doi.org/10.1080/19415250903059558>
- Woodson C. G. (1937). *The mis-education of the Negro*. Sauk Village, IL: African American Images.
- Wronowski, M. L., Thornton, M., Razavi-Maleki, B., Witcher, A. W., & Duarte, B. J. (2022). Beyond tracking: The relationship of opportunity to learn and diminished mathematics outcomes for U.S. high school students. *Teachers College Record, 124*(6), 196–224. <https://doi.org/10.1177/01614681221113473>
- Yanisko, E. J. (2016). Negotiating perceptions of tracked students: Novice teachers facilitating high-quality mathematics instruction. *Journal of Urban Mathematics Education, 9*(2), 153–184.
- Young, J. R., Raygoza, M. C., Madkins, T. C., Lawler, B. R., & Roberts, T. (2022). Revisiting urban mathematics education: Towards robust theoretical, conceptual, and analytical models. *Journal of Urban Mathematics Education, 15*(2), 1-7. <https://doi.org/10.21423/jume-v15i2a511>
- Zee, M., & Koomen, H. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being. *Review of Educational Research, 86*, 1015-1981. <https://doi.org/10.3102/0034654315626801>
- Zumwalt, K., & Craig, E. (2005). Teachers' characteristics: Research on the demographic profile. In M. Cochran-Smith & K. M. Zeichner (Eds.), *Studying teacher education: The report of the AERA panel on research and teacher education* (pp. 111–156). Mahwah, NJ:

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