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Skill-Based Sorting in the Era of College Prep for All

Costs and Benefits

Takako Nomi and Elaine Allensworth

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Beyond Tracking

Whether or not to sort students by incoming skills has been a contentious issue. This brief shows that there are potential costs and benefits to both approaches. Even with the same curriculum, the consequences of sorting depend on students' incoming skills and the outcomes being considered.

Tracking has been a contentious issue in U.S. education. On the one hand, tracking can be seen as an efficient strategy to address the academic diversity of the student body in large, comprehensive high schools. It allows schools to differentiate curriculum and instruction according to students' skills, interests, and occupational paths. On the other hand, tracking has been widely criticized because students with weak skills often end up in classes with poor instructional environments, with little academic challenge, and with little alignment with college expectations.[1] This is problematic at a time when the vast majority of students aspire to attain a four-year college degree.[2] Moreover, minority and low-income students tend to be overrepresented in these low-track classes, leading to concerns that tracking reinforces economic and racial disparities in educational achievement.

Criticisms of tracking have led many districts to detrack their high schools, placing students in mixed-skill classrooms and exposing all students to the same curriculum. In theory, detracking offers rigorous content to all students in mixed-skill classrooms.[3] Detracking has its own challenges, however. Teachers often find it difficult to instruct mixed-skill classes, and tend to aim instruction at the average students in their classroom. It is difficult for teachers to differentiate instruction based on students' skills, despite a general consensus that it is important to do so. This can lead to high-performing students becoming bored because teachers change instruction to accommodate students with lower skill levels.[4] Detracking may be particularly difficult to implement in urban schools, where high-achieving students lack support for learning outside of the classroom and are greatly outnumbered by low-achieving peers.[5] There are also concerns about the ability of low-skill students to succeed with challenging material for which they may not be prepared, and that detracking will increase the likelihood that they will fail.[6]

An alternative approach—skill-based sorting with a uniform curriculum—involves just one of the two components that define tracking: sorting by skill, while not differentiating the curriculum based on students' skills. Skill-based sorting requires all students to take the same college-preparatory curriculum, but students are placed in classes based on their incoming skills. Unlike tracking, skill-based sorting is consistent with the current movement to expose all students to a rigorous curriculum. Concerns about tracking

were not just based on differences in curriculum, however, but also on differences in the quality of instruction. Skill-based sorting itself may result in lower-quality instruction for low-skilled students if there is inequitable placement of teachers across classrooms or if students' classroom peers influence the overall quality of instruction in a classroom.

More and more, states and districts now require a college-prep curriculum for *all* students. The new Common Core State Standards also attempt to strengthen academic curriculum across the board, reducing the differences in students' curriculums. Yet these policies provide little guidance about how students should be organized to engage with that curriculum—whether they should be sorted into like-skill groups (to target instruction at students' skill levels) or mixed together (to ensure equal exposure to the same instruction). Schools need to know how to effectively organize instruction for students with varying skill levels while offering a *common*, rigorous academic curriculum. How schools organize students into classes has implications for the types of supports necessary for students and their teachers to make the common curriculum successful for improving the achievement of all students—those with stronger and weaker skills.

This brief highlights a critical role skill-based sorting plays in shaping students' academic achievement, given a common curriculum for all students. It summarizes findings from a number of prior studies to show what happened after Chicago Public Schools (CPS) introduced two curricular reforms that drastically changed how schools sorted students into classrooms while aiming to teach the same curricular content (Algebra I) to everyone. One policy reduced skill-based sorting

Studies of the College Prep for All and Double-Dose Algebra Policies in Chicago

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Academic differentiation, instructional reform, and inequality: Evidence from a natural experiment in 60 urban high schools.

and the other increased skill-based sorting. As discussed below, these policies showed that how schools sort students into classrooms is as important as the content students are exposed to in those classrooms—for students' learning gains, for the grades they receive, and for their pass rates.

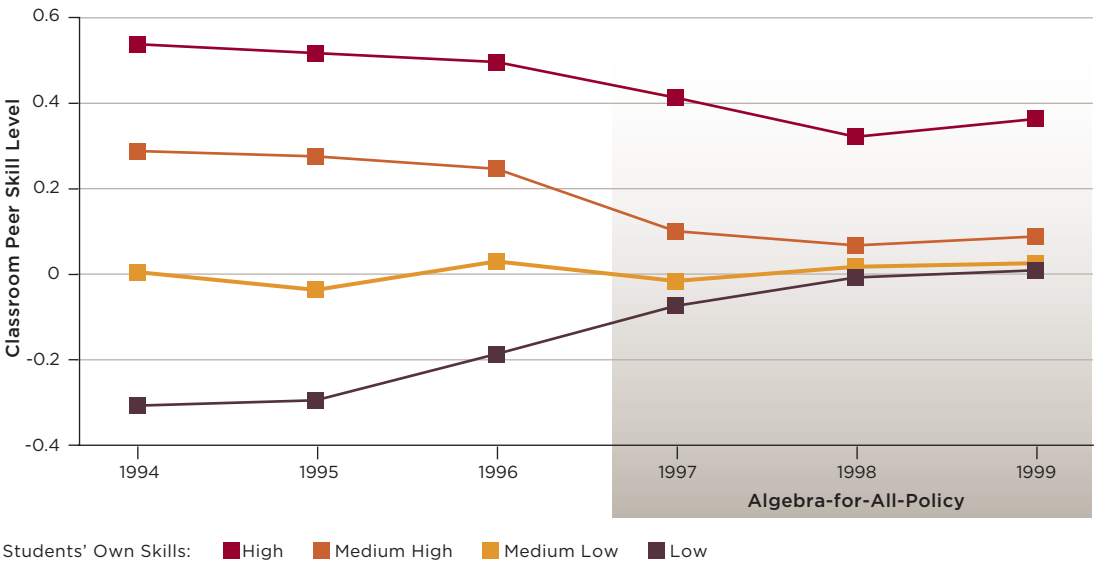
Two Algebra Policies in Chicago and Their Consequences on Skill-Based Sorting

In 1997 CPS instituted a new curriculum policy, requiring all entering ninth- grade students to enroll in algebra or a higher-level course in the math sequence (e.g., geometry). Prior to the policy, known as "algebra-for-all," many students with weak academic skills took remedial math, while most students with higher skills took algebra. After the policy, almost all students enrolled in algebra in ninth grade.[7] The algebra-for-all policy, therefore, successfully equalized curricular opportunity for all students. At the same time, the elimination of remedial courses led algebra classes to incorporate more low-skill students than before, leading to more mixed-skill classrooms. Students entering ninth grade with low math skills had higher-skilled peers than they would have in the absence of the policy. Meanwhile, higher-performing students, who would have enrolled in algebra irrespective of the policy, experienced considerable declines in classroom peer skill levels (**see Figure 1**).

The district subsequently introduced a "double- dose algebra" policy in 2003. The goal was to enhance algebra instruction for low-performing students by requiring them to take two periods of algebra. All students with incoming math skills below the national average were required to take support algebra in addition to regular algebra. These students received twice as much instruction in algebra, and their teachers received professional development and curricular resources to help them use the additional instructional time.[8] Unlike the algebra-for-all policy, the double-dose algebra policy induced skill-based sorting; schools sorted below-average students into double-dose algebra classes and above-average students into regular algebra

FIGURE 1

Math classrooms were less likely to be sorted after the algebra-for-all policy

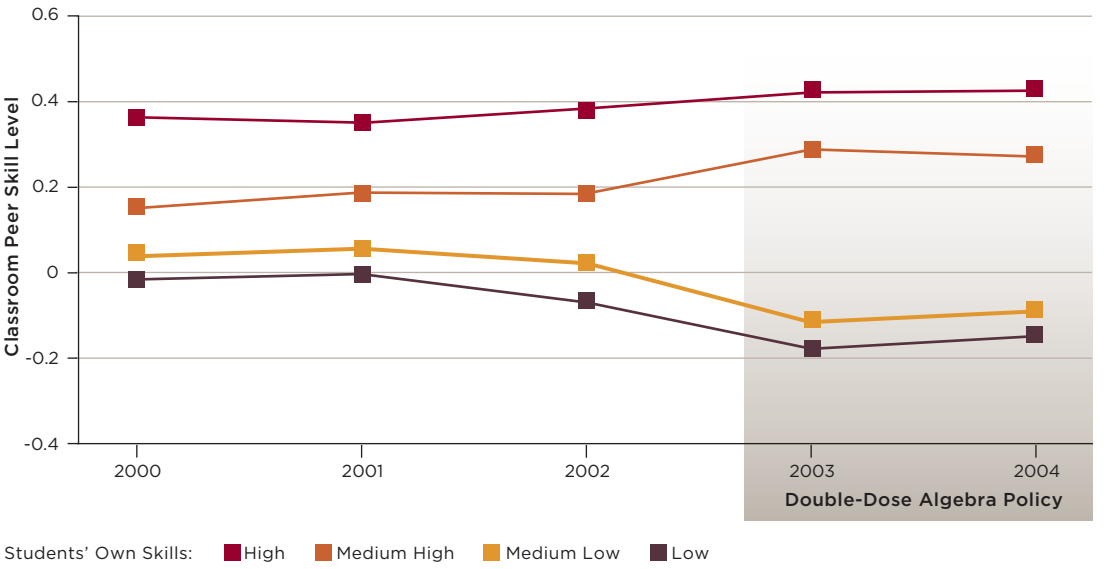


Note: Classroom peer skill level is the average incoming math score of each student's classroom peers in their ninth grade math class. The scores are standardized so that a value of "zero" means students' peers have scores that are average for the district.

FIGURE 2

Algebra classes were sorted by skill after the double-dose algebra policy

Changes in Classroom Peer Skill Level



Students' Own Skills: High Medium High Medium Low Low

Note: Classroom peer skill level is the average incoming math score of each student's classroom peers in their ninth grade math class. The scores are standardized so that a value of "zero" means students' peers have scores that are average for the district.

classes.[9] Thus, for students with below-average math skills, their classroom peers had lower skill levels, on average, than they would have had without the policy. In contrast, peer skill levels improved post-policy for above-average students (**see Figure 2**). In short, six years after the algebra-for-all policy detracked Chicago high schools, the double-dose algebra policy reintroduced skill-based sorting.

Summary of Findings

Sorting Has Consequences for Student Achievement, Even When Students Take the Same Curriculum

This research brief summarizes the findings from a number of studies that document, in detail, the ways in which skill-based sorting brought about by the policies affected students' achievement. Sorting affected students' learning gains and their course grades through a number of mechanisms: changes in the average skill level of students' classroom peers; changes in the number of peers with behavior problems; and changes in students' skill levels relative to their classroom peers—whether they were at the bottom, middle, or high end of their classroom skill level. Whether schools choose to sort students by skill or to mix students of differing skills together in the same classrooms has implications for the kinds of supports that are needed if schools are to maximize students' test gains and grades for both high- and low-skilled students.

Average test scores are higher when classes are sorted by skills due to large benefits for high-skilled students' learning gains.

In Chicago, high-skilled students' algebra course-taking was not affected either by the algebra-for-all policy or by the double-dose policy; they took single-period algebra throughout both policy periods, as well as before either policy was enacted. While the policies did not result in high-skilled students enrolling in different math classes, it did result in them attending algebra class with a different set of peers. Classroom peer skill levels declined for high-

achieving students after the algebra-for-all policy, when low-achieving students were scheduled into algebra classes. In that year, the test scores of high-achieving students also declined.[10] In contrast, algebra scores improved for high-skilled students when classes were re-sorted by skill with the double-dose algebra policy.[11] These changes in test scores were directly related to the changes in the skill levels of students' classroom peers.[12]

We examined some of the reasons classroom peer skill levels affected high-skilled students' test score gains. After the double-dose algebra policy, higher-achieving students reported that their classes were more academically challenging than similar students reported prior to the policy. There were also fewer students with behavior and attendance problems in the classrooms of high-achieving students. The increases in academic demands, and especially the decreases in peers with behavior problems that occurred with the double-dose policy, were related to higher algebra test scores for high-achieving students.[13]

Not all students' test scores benefit equally from having higher-achieving classroom peers. There is increasing evidence that high-achieving students' learning gains are more sensitive to increases and decreases in the skills of their classroom peers. This makes some intuitive sense. A high-skilled student with the potential to find work too easy will notice if a class becomes more challenging, and higher-skilled peers may result in better targeting of instruction at her skill level. But for a low-skilled student who is likely to find algebra to be challenging regardless of peers, increasing the skill level of her peer group may do little to increase learning.

Between 1998 and 2002, both low-skilled and high-skilled students took single-period algebra. This is the only time period in which we can compare the relationship of peer skill levels with test score gains for low-skilled students to that of high-skilled students, without differences in their curriculum. Comparing students with similar initial skills in different types of classrooms, we found that there is a very strong relationship between the average skill level of classroom peers and test gains among students with above-average math skills. However, among students with below-average skills, the relationship between classroom peer skill level and test score gains was small.[14]

This suggests that sorting leads to higher average achievement overall; low-skilled students have *slightly lower* test scores with sorting, while high-skilled students have *substantially higher* test scores, leading to higher average test scores with sorting. Several studies outside of Chicago also have provided evidence that test scores are higher, overall, when students are sorted into classes based on their skill levels, although these studies do not necessarily differentiate between curricular differentiation and sorting by skill.[15]

When examining the effects of sorting induced on low-skilled students by the two Chicago policies, it is difficult to disentangle the effects of peer skill levels from those of curricular changes; peer skill levels and curriculum were both affected.[16] However, the algebra-for-all policy did not lead to higher math scores for low-skilled students, even though the policy led them to take math with higher-skill peers.[17] This is consistent with the finding that low-skilled students' test gains are less sensitive to peer skill level than high-skilled students' test gains. It also could be that the curricular changes (i.e., taking algebra as opposed to remedial math) had negative effects, counteracting any potential benefits of taking classes with higher skilled peers; the content of coursework may have been inappropriate for students' skill levels.

Likewise, low-skilled students' test scores did not decline with the double-dose policy, even though they took algebra with lower-skilled peers.[18] In the case of the double-dose policy, low-skilled students' test scores actually

increased considerably; however, they received more and better math instruction than before the policy. The professional development their teachers received, along with additional instructional time that gave teachers the flexibility to try out more student-centered instructional practices, led to better overall quality of instruction for low-skilled students.

Skill-based sorting has different effects on grades and pass rates than on test scores.

When classes are sorted by skill level, the grades of high-skilled students decline, while the grades of low-skilled students improve. It may seem counterintuitive that school practices could lead to higher test scores but lower grades. However, grades are based on much more than the demonstration of specific, tested skills—they reflect effort, participation, homework completion, attendance, and the overall quality of work measured through different types of assignments.[19] Whether students put in effort depends to a large extent on their mindsets about the work (e.g., whether they think they can succeed, whether the work has meaning), and their study habits and work strategies.[20] Because they reflect a broader range of performance than test scores, grades are actually more predictive of college persistence and graduation than test scores.[21] Passing classes is also necessary for accruing the credits needed to graduate from high school, while good grades are important for gaining access to college and scholarships. Thus, practices that improve test scores at the expense of grades and pass rates may not benefit students' educational attainment in the long run.

Even though the double-dose algebra policy improved algebra scores of high-skilled students, their algebra pass rates and algebra grades declined. This happened partly because teachers demanded more from students in classes with higher-achieving students, making it more difficult to pass.[22] More critically, the double-dose algebra policy caused some high-skilled students to become the lowest-skilled students in their class—particularly if their math skills were just above the national average. Students with skills at the bottom of their class were much more likely to fail.[23] This might be due to teachers' grading practices, or reduced effort among students who feel frustrated from falling behind.[24] Thus, while students tend to learn more in classes with higher achieving peers, on average, it can negatively affect the grades they receive and their likelihood of passing.

No Long-Term Benefits from Requiring College-Prep Coursework for All

If we look beyond ninth-grade algebra to the broader effects of the college prep for all policy in Chicago, which changed requirements at multiple grade levels in multiple subjects, the effects of mixing students together with the same college-preparatory curriculum are mostly negative. The policy led low-skilled students to take higher-level math, science, and English classes with higher-skilled peers than before the policy, while lowering the average skill level in the classes taken by high-skilled students.

Low-skilled students became more likely to fail their ninth-grade classes after being put into college-prep classes with higher-skilled peers, rather than taking remedial classes with lower-skilled peers. After four years, they were less likely to graduate from high school than students who began high school with similar skills before the policy. They were not more likely to go to college. Students with high skills were less likely to take very high levels of math and science after the policy, and they were less likely to go to college than students who had entered high school with similar skills before the policy.[A]

In contrast, under the double-dose algebra policy, students with below-average skills were less likely to be at the bottom of their class in terms of math skills relative to classroom peers. Students with test scores just below the national average became the highest-skilled students in their math class. This change was associated with higher pass rates.[25]

Improvements in pass rates are critically important for graduation—each F a student receives in ninth grade is associated with a 15 percentage point drop in their likelihood of eventually obtaining a diploma.[26] Receiving a failing grade not only puts students behind for graduation but it can also affect students' mindsets about themselves as learners with the result that they put in less effort in subsequent classes.[27] In fact, students with eighth-grade scores just below the double-dose eligibility cut-score (the 50th percentile), whose failure rates decreased, ended up more likely to graduate high school than students with eighth-grade scores just above the cut-score—those whose risk of failure increased with the sorting induced by the policy.[28] Thus, while it may be beneficial for students' test score gains to be in classes with higher-achieving peers, it can be detrimental to their eventual educational attainment because they are at a higher risk of failing and receiving low grades if their skills are low relative to their classroom peers.

When classes are sorted by skill level, low-skilled students are at higher risk of being in disruptive classrooms.

Greater sorting with the double-dose algebra policy led to a greater concentration of students with behavior problems in double-dose classes, and fewer students with behavior problems in single-period algebra classes.[29] Having fewer peers with behavior problems, along with an increase in challenging instruction, contributed to the increase in test scores among students with above-average skills. At the same time, students with below-average skills had more students with attendance and discipline problems in their classes. Discipline problems in the classroom can influence the quality of instruction, as teachers who are concerned about student behavior may be more reluctant to engage in student-centered work, or be afraid to assign challenging work that might lead students to get frustrated or withdraw. Sorting classes by skill level requires teachers in the low-skill classes to be highly skilled at engaging students and maintaining order in the classroom. Low-track classes tend to have more behavior problems and little academic challenge; this results, in part, because of real instructional challenges for teachers.[30]

To summarize, neither sorting by skills nor mixing students by skills is clearly preferential for any group of students—either high- or low-achieving. Sorting leads students with high entering skills to show larger test gains than in mixed classes, but their grades and pass rates are lower. Sorting leads students with low entering skills to have a weaker instructional environment than in mixed-skill classes, but they also are less likely to fail and get low grades. Given that neither method is clearly preferential for all outcomes, the question becomes how to address the weaknesses in each approach to produce the best outcomes for all students.

Implications for Practice

As current national policy calls for a universal academic curriculum to prepare all students for college and the workforce, an important question is how to organize instruction effectively to accommodate curricular changes, while providing sufficient supports for struggling students. Which students and teachers are in need of extra support depends on how schools organize students into classrooms by their skill level.

Neither sorting by skill nor mixing students by skill is clearly preferential for any group of students—either high- or low-skilled. The question then becomes how to address the weaknesses in each approach to produce the best outcomes for all students.

Students with weak skills relative to classroom peers need close monitoring and extra support. Students get frustrated if they feel like the teacher is moving too fast and they do not understand what is being taught; this can lead them to be less engaged. Low-skilled students in mixed-skill classes are very likely to feel discouraged. But even students with average- or high-skills can feel discouraged if they are struggling relative to their classroom peers. In schools that mix students by skill level, it is mostly students with low skills who are likely to struggle. In schools that sort students by skill level, the lowest-skilled students are still likely to struggle, but students with higher skills also can be at risk if they are the lowest-skilled students in the class.

With the data systems increasingly available to schools to monitor student progress, teachers do not need to wait until late in the school year to know who is likely to struggle in their class. Teachers can make a special effort to monitor and assist students who are likely to need extra support from the first day of class, before they get frustrated. If schools proactively schedule time in students' and teachers' day for extra help—not just relying on students to show up on their own, or waiting until students are already frustrated—they can prevent students with weaker skills from falling far behind, getting frustrated, giving up, or slowing down the pace of the class.

Under the double-dose algebra policy in Chicago some students with weak algebra skills continued to take algebra in mixed-skill classes, but they received an extra period of instruction from their teachers outside of the regular class. Their learning improved, and their peers' learning improved, because they did not slow down the rest of the class. Setting aside more instructional time for students with weaker skills, relative to classroom peers, benefited the learning of everyone in the class.[31]

Schools should anticipate behavioral problems in classrooms with low-skilled students and provide sufficient support to teachers. Sorting classes by skill level tends to concentrate students with the weakest attendance and behavior in the classes serving the lowest-skilled students. As teachers of low-skill classes struggle with behavioral issues, they are likely to have difficulty successfully implementing student-centered and challenging curricula. Schools need to be aware that classroom management s a particularly likely problem in low-skill classrooms and think about strategies for providing extra support and resources to teachers in such classrooms around *both* student behavior and strong pedagogy. In Chicago, implementation of double-dose algebra was successful at improving test scores and pass rates among low-skilled students because it also provided instructional supports for struggling students and their teachers. Teachers had extra instructional time, professional development around instruction, and curricular resources. It fell short of providing supports for classroom management, however. Teachers reported feeling that they had significant struggles around students' behavioral issues.

A universal curriculum with unsorted classrooms can increase, rather than diminish, inequities by race and income if teachers are unable to differentiate instruction and maintain classroom control.

Concerns about tracking often focus on the disproportionate representation of low-income and minority students in low-skilled classrooms. While prior concerns about inequity were based largely on mixed-race suburban schools, urban schools that mostly serve low-income minority students have been more likely to detrack their curricula than suburban schools. In an urban district like Chicago where almost all students are low-income, minority students, detracking/desorting classes with the college prep for all policy meant that high-achieving low-income minority students were less likely to be in classrooms with a strong learning climate than similarly high-achieving, low-income, minority students before the policy. Those low-income minority students with the most potential to succeed in college were less likely to get a strong instructional environment when the curriculum was detracked, accentuating differences in opportunities between suburban schools where high-skilled students often are in classrooms with other high-skilled peers.

If schools decide not to sort students by skill level, they need teachers to have strong skills and strategies around individualizing instruction and timely, sensitive mechanisms for monitoring students' comprehension and engagement to make sure students are not frustrated or bored. Successful detracking examples tend to come from well-resourced schools that have specific characteristics—a shared belief among staff, successful professional development around inclusive pedagogical practices, and additional supports for struggling students.[32] In contrast, case studies of urban schools have generally shown negative effects of detracking for high-achieving minority students.[33]

If schools decide to sort students by skill level, there are reduced demands on teachers' abilities to individualize instruction and closely monitor students. These schools, however, need to pay particular attention to the quality of instruction in low-skilled classrooms, where teachers will need strong skills for maintaining classroom control and engaging students in challenging tasks. Along with providing challenging work, low-skill classrooms might be structured in ways that make it easier for teachers to have strong classroom control and personalization—such as smaller class sizes, more coordination with support staff, or more time for instruction.

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Endnotes

1 Gamoran (1987); Oakes (1985, 2005); Powell, Farrar, and Cohen (1985); Rosenbaum (1976).

2 NCES (2007); Roderick et al. (2008).

3 Oakes (1985); Wheelock (1992).

4 Rosenbaum (1999).

5 Gamoran (2010).

6 Loveless (1999).

7 After the policy, 97 percent of first-time ninth graders enrolled in algebra. Prior to the policy, 81 percent did so. Teachers were also much less likely to report spending considerable time on pre-algebra or remedial topics after the policy than before (Allensworth et al. 2009).

8 A policy brief that focuses on the consequences of the double-algebra policy was published in 2010: *Are two algebra classes better than one? The effects of double-dose instruction in Chicago* (Durwood, Krone, and Mazzeo 2010).

9 Nomi and Allensworth (2013).

10 Nomi (2012).

11 Nomi and Allensworth (2009).

12 Nomi (2012); Nomi and Allensworth (2013); Nomi and Raudenbush (2013).

13 Nomi and Allensworth (2013).

14 The relationship of peer skill level to test score gains was one-third as large among low-skilled students as among high-skilled students (Nomi and Allensworth 2013). However, we suspect that the true effect of peer skills would be even smaller than these observed associations due to selection bias: students enrolled in higher-skilled classes likely had characteristics associated with higher test gains—such as high motivation or parental support—and that is why they ended up in those classes. As discussed in the text, we can use the policy changes to measure the peer effects on test gains among high-achieving students, but not among low-achieving students. However, this comparison suggests that the effect for low-achieving students is likely very small, if it exists at all.

15 Argys, Rees, and Brewer (1996); Loveless (1999).

16 Before the college prep for all policy, many low-skilled students took remedial math or pre-algebra instead of algebra. After the double-dose algebra policy, low-skilled students also received more instructional time and better pedagogy.

17 Allensworth et al. (2009).

18 Nomi and Allensworth (2009). For students with average skills (at the eligibility cut-off for the double-dose algebra classes), higher peer skill level was associated with higher gains. However, for students with skills just below the cut-off, the negative effects of declining peer skill level were more than offset by the positive effects of increased instructional time and better pedagogy (Nomi and Raudenbush 2013).

19 Allensworth and Easton (2007); Cooper (1989); Keith et al. (1993); Keith (1982); Peng and Wright (1994).

20 Farrington et al. (2012).

21 Bowen, Chingos, and McPherson (2009); Geiser and Santelices (2007); Roderick, Nagaoka, and Allensworth (2006).

22 Nomi and Allensworth (2013).

23 Nomi and Allensworth (2013).

24 When students get frustrated, they often withdraw and put less effort into work (Rosenkranz et al. Forthcoming).

25 Nomi and Allensworth (2013).

26 Allensworth and Easton (2007).

27 Farrington et al. (2012).

28 Cortes, Goodman, and Nomi (Forthcoming).

29 Behavior was measured through students' absences in their other (non-math) classes and through their disciplinary records (Nomi and Allensworth 2013).

30 Oakes (2005); Page (1991); Rosenbaum (1976); Allensworth et al. (Forthcoming).

31 Nomi and Allensworth (2013).

32 Boaler and Staples (2008); Oakes (2005); Rubin (2008).

33 Rosenbaum (1999); Rubin (2008); Gamoran and Weinstein (1998).

A Montgomery and Allensworth (2010).

ABOUT THE AUTHORS

ELAINE M. ALLENSWORTH is the Lewis-Sebring Director at UChicago CCSR where she has conducted research on educational policy for the last 15 years. She is best known for her studies of high school graduation and college readiness, and also conducts research in the areas of school leadership and school organization. Her work on early indicators of high school graduation has been adopted for tracking systems used in Chicago and other districts across the country. She is one of the authors of the book *Organizing Schools for Improvement: Lessons from Chicago*, which provides a detailed analysis of school practices and community conditions that promote school improvement. Dr. Allensworth holds a PhD in Sociology and an MA in Urban Studies from Michigan State University. She was once a high school Spanish and science teacher.

TAKAKO NOMI Takako Nomi is an assistant professor of Education at St. Louis University and a CCSR affiliated researcher. Her recent studies have examined the effect of a series of curricular reforms, the policy mechanisms, their unintended consequences, and the long-term impacts on post high school outcomes. She is also on a research team studying the effects of summer algebra credit recovery through online versus face-to-face approaches.

She holds a PhD in Educational Theory and Policy from Pennsylvania State University. Her research interests include educational stratification, education policy, and quantitative research methodology.

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1313 East 60th Street
Chicago, Illinois 60637
T 773-702-3364
F 773-702-2010

ccsr.uchicago.edu

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