THE HAMILTON PROJECT

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Improving Academic Outcomes for Disadvantaged Students: Scaling Up Individualized Tutorials

Roseanna Ander, Jonathan Guryan, and Jens Ludwig

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Improving Academic Outcomes for Disadvantaged Students: Scaling Up Individualized Tutorials

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BROOKINGS

Abstract

Improving the educational outcomes of economically disadvantaged children is a policy priority in the United States, and yet relatively little progress has been made in recent decades. Education reforms that aim to help economically disadvantaged students often focus on improving the quality with which grade-level material is taught, or the incentives that students have to learn it. Yet such efforts may not adequately account for important differences within a classroom of students—differences in knowledge, in learning styles, or the rate at which students learn. As a result, in spite of these efforts, students who fall behind grade-level material tend to stay behind. When these students miss developing crucial foundational skills, they can have major difficulties in subsequent learning tasks, which worsens the gap between them and their grade-level peers as they move from one grade to the next. This persistent mismatch between the learning needs of students and what classroom instruction delivers can seriously undermine students' chances of success in the workforce and beyond. We propose scaling up a daily, individualized tutorial program that would allow students who have fallen behind grade level in math to reengage with regular classroom instruction, likely increasing their chances of graduating high school and achieving the many long-term economic benefits that go along with academic success.

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Chapter 1. Introduction

What if there were a way to help economically disadvantaged children attending under-resourced schools do better in math, narrow the black–white test score gap, reduce the achievement gap between poor and rich children, improve high school graduation rates in the country's most disadvantaged neighborhoods, and reduce income inequality? And what if it were possible to do all of this without any additional government spending? It sounds too good to be true, but that skeptical reaction probably reflects the narrow view that many of us have adopted about how best to organize schools. By breaking out of our implicit assumptions about the optimal organization of schools, we can help children left behind by the traditional school model to learn and thrive.

Consider the way that schools are organized for instruction: students are assigned to a grade level based on their age, and teachers are assigned some portion of these students as their class. Classrooms and grades are not well set up to handle differences among students—differences in knowledge at a point in time, differences in learning styles, or differences in the rate at which kids learn. These differences make it difficult to individualize instruction in a classroom setting where students have widely varying skills, knowledge, and educational needs. When these challenges are combined with the high levels of disadvantage that so many children in American cities face, it is perhaps not surprising that many struggle to keep up in school, although there is substantial variation in the degree to which children fall behind.

Most education reforms focus on either improving the quality with which grade-level material is taught or the incentives students have to learn it. Yet such efforts may have little effect on students who are far behind grade level—"saying it louder" will not help these students. Despite the $590 billion the United States spends each year on public K–12 schooling, most urban school systems lack adequate safety nets to intensively help those who have fallen behind, which remains a key systemic challenge.

To see why this type of mismatch can make learning in a regular classroom seem close to impossible, imagine that someone transported you right now into a doctorate-level class on advanced aspects of molecular engineering. You sit down at your desk, eager to learn, and determined to do your best to follow along. Then the professor begins to lecture, talking about "evolutionary optimization of directed self-assembly of triblock copolymers on chemically patterned substrates," before transitioning to a discussion of "chirality-selected phase behavior in ionic polypeptide complexes," and then closes with an extended discussion of the finer points of "orientational anisotropy in simulated vapor-deposited molecular glasses." Who (aside from the five people on the planet who actually understand molecular engineering) would not become frustrated? Would you receive any benefit from sitting through such a class without adequate prior knowledge?

The way that schools are typically organized creates the same problem. Imagine being a teacher tasked with teaching math to a classroom of 30 ninth-grade students. Some of those students have math skills and knowledge at the ninth- and tenth-grade levels, but others have math skills at only a fourth-grade level. How do you teach without either causing the advanced students to become bored or leaving the struggling students behind?

We propose addressing this problem by expanding a tutorial program that pairs two students who have fallen behind in math with a single tutor for daily instruction. The tutorials take place during the school day, and are in addition to a student's regular math class. The small student-to-tutor ratio means that a tutor can individualize instruction to the level of each student's knowledge. A student who has not yet mastered multiplying two-digit numbers can start there, while another student in the same room who is comfortable with basic algebra can work on more-advanced topics. The two-to-one ratio also allows the tutor to develop a relationship with each student, provide instruction to help get past stumbling blocks, and offer encouragement to keep moving forward after successes.

The challenge of this approach is not one of *pedagogy* but rather one of *economics*. Many public school systems, especially those in big cities, struggle to balance their books running systems that have 20 or 30 students, or even more, per class. Given these fiscal constraints, how can we provide the benefits of individualized tutorials at prices that are realistic for urban public schools?

The key insight behind our proposal is that intensive, personalized tutorial instruction can be delivered at a manageable cost by recognizing that tutoring is a task that is *fundamentally different from regular classroom teaching.* To become a licensed and expert classroom teacher in a traditional public school requires extensive formal training or specialized degrees, demonstrations of content knowledge on standardized exams, as well as several years of on-the-job learning. But many of the tasks associated with successful classroom teaching—such as classroom management—are not relevant for teaching just one or two children at a time. Tutors must be knowledgeable in the subject they teach, they must be good at explaining things, and they must have a positive attitude about every child's potential to learn. An intervention built around small-group instruction need not depend on expert regular-classroom teachers and can tolerate high levels of instructor turnover because on-the-job experience is not as critical as it is for classroom teachers.

This insight led Boston's Match Education (Match), and now SAGA Innovations (SAGA), to develop a model in which talented people—such as recent college graduates or others interested in public service—work as math tutors for one year as a public service for a stipend of about $19,000 for a 10 ½-month contract covering the school year and preservice training. This low cost enabled Match, and now SAGA, to provide students who have fallen behind in math with a substantial dose of individualized instruction in a tutorial setting in one 50-minute class period each school day, with two students at a time per instructor. This program is different from many tutoring programs in that it is delivered during the school day as a credit-bearing elective course with a structured curriculum.

We evaluated this tutorial program using a randomized controlled trial involving more than 2,700 students attending 12 Chicago Public Schools (CPS) high schools. Because we used a fair lottery to determine which students to invite to participate, we were able to measure the effect of the tutorial program (hereafter "Match/SAGA" tutorials) on test scores and grades holding constant any outside factors that might have affected kids' school performance. This evaluation was done essentially the same way that the medical field tests the effectiveness of new drugs and therapies.

Data from our large-scale randomized controlled trial shows that by the end of one school year the students who were randomly assigned to have a chance to participate in the Match/SAGA tutorials had significantly higher test scores, math grades, and grades in their other classes, as well as fewer course failures. The effects were large: we estimate that the tutorials helped students learn one to two additional years of math in a single school year above and beyond what kids typically learn in a year. The tutorials effectively narrowed the black–white test score gap by almost a third in just one year.

In what follows we outline a proposal to begin scaling up this type of intervention in school systems all across the country for students who are substantially behind grade level. Eventually, we envision the possibility that school districts around the country might have tutorials integrated into the regular school day on a wide scale. Tutorials might serve as a safety net for students who fall behind grade level at any age. By bringing students to the point where they can engage with grade-level material, tutorials could help to make classrooms and classroom teachers more effective, and could narrow achievement gaps to the point where they become the exception, not the rule.

Chapter 2. The Challenge

Improving the schooling outcomes of economically disadvantaged children is a policy priority in the United States, and has been for decades, and yet too little progress has been made. While the black–white test score gap narrowed during the 1980s, in the past decade white students scored, on average, about 0.8 standard deviations higher than black students on the National Assessment of Educational Progress, also known as the "Nation's Report Card" (Chay, Guryan, and Mazumder 2009; Loveless 2012).[1] This test score gap is similar to what the typical American teenager learns from eighth grade through the end of high school (Reardon 2011, 97). Such patterns are not limited to test scores: black and Hispanic youth are about 60 percent more likely to drop out of high school than are their white counterparts (Murnane 2013). Another way to think about the size of this test score gap is in terms of its impact on future labor market outcomes: a change in test scores of 0.8 standard deviations would be expected to translate into a difference in annual earnings of 22 percent (Hanushek et al. 2013). The achievement gap between rich and poor students has increased substantially since the 1940s and now exceeds the black–white gap (Reardon 2011).

Some have come to believe that the effects of poverty are too powerful for teachers and schools to substantially improve the academic outcomes of disadvantaged children. This pessimism stems partly from the limited number of educational interventions that have been shown to improve children's learning. While evaluations of a number of early childhood programs show that interventions can improve outcomes, there are fewer success stories for interventions that work with disadvantaged children of school age, particularly adolescents.

It is possible, though, that these interventions have failed to target a key part of the problem. As they currently operate, schools are not structured properly to help many disadvantaged children master foundational concepts that subsequent grades build on. The underlying challenge is nicely illustrated by the observation of Sal Khan, the founder of Khan Academy, in his book *The One World Schoolhouse* (2012):

> Let's consider a few things about that inevitable test. What constitutes a passing grade? In most classrooms in most schools, students pass with 75 or 80 percent. This is customary. But if you think about it even for a moment, it's unacceptable if not disastrous. Concepts build on one another. Algebra requires arithmetic. Trigonometry flows from geometry. Calculus and physics call for all of the above. A shaky understanding early on will lead to complete bewilderment later. And yet we blithely give out passing grades for test scores of 75 or 80. For many teachers, it may seem like a kindness or perhaps merely administrative necessity to pass these marginal students. In effect, though, it is a disservice and a lie. We are telling students they've learned something that they really *haven't* learned. We wish them well and nudge them ahead to the next, more difficult unit, for which they have not been properly prepared. We are setting them up to fail. (Khan 2012, 83–84; emphasis in original)

One way this plays out in practice is that the differences across students in what students can do academically—and what they need to learn—grow each year as children progress in school (Cascio and Staiger 2012). As a result, students who miss developing crucial foundational skills can have major difficulties understanding subsequent learning tasks. One consequence is that by high school many students in distressed communities can be many years behind grade level, especially in math. In the 2011 National Assessment of Educational Progress, for example, 40 percent of Chicago eighth graders were below basic level in math. The challenge may be particularly pronounced in urban areas where many students come from very economically disadvantaged backgrounds. Youth in Chicago who were at highest risk for school failure and crime (i.e., those who had been arrested and sent to the Cook County Jail) were on average four—and up to ten—years behind grade level in math (Keeley 2011). Teaching an entire classroom of students with such varying needs is an extraordinarily complicated task. The shift in the focus of policy toward accountability reforms places increasing pressure on teachers to demonstrate that students are mastering grade-level content, which in turn tends to drive curriculum decisions, yet time and resource constraints make it difficult within a typical classroom setting to individualize instruction. The result for many students is a mismatch between what regular classroom instruction delivers and what they need to succeed. A major structural challenge is that few urban school systems have adequate capacity to provide a safety net to students as they fall farther and farther behind.

Chapter 3. The Proposal

For decades, education researchers have understood that small-group tutoring generates "the best learning conditions we can devise," in part by individualizing instruction (Bloom 1984, 4). Compared to regular classroom instruction, tutoring also increases time on task (90+ percent versus 65 percent) and improves student attitudes and interest. Tutoring has been shown to increase the amount of feedback and correction between student and instructor, a key characteristic of effective teaching, and also ensures that students—including those who are struggling in school—receive the kind of individual attention they need. The key challenge for the field has been implementing tutoring in a cost-effective way; small-group tutoring by regular teachers has been widely viewed as "too costly for most societies to bear on a large scale" (Bloom 1984, 4).

We provide results from a randomized controlled trial in which low-cost, individualized math tutorials were offered to CPS high school students, many of whom were behind grade level in math. Based on these promising results, we outline a proposal to scale up the program to serve more students in a cost-effective manner.

THE MATCH/SAGA TUTORIALS

Match Education originally developed this tutorial model at its high school in 2004, implementing it at all of its charter schools in Boston, for all grade levels. In 2014 executives from Match spun off to form SAGA Innovations, the enterprise that would expand this model into traditional public school systems across the country. SAGA provides two-to-one individualized instruction with substantial contact time—one class period of about 50 minutes each day. In the CPS system, with 180 school days, that means a student receives individualized math tutorials for as many as 150 hours per year.

Students are assigned to participate in a tutorial session as part of their regular class schedule. Each tutor is assigned to work with two students at a time during each session. Part of the tutorial session is focused on remediating students' skill deficits, for which Match/SAGA has its own skill-building curriculum. Tutors tailor instruction to students' current skill level; often their work begins with teaching basic math skills. Students begin their work at the lowest math skill level they have yet to master, and as they progress they work on more-advanced coursework. The bulk of each session is also tethered to what students are working on in their math classrooms or what they will face in state or national math exams at the end of the year.

The Match/SAGA tutorial approach uses frequent internal formative and summative assessments of student progress to continuously individualize instruction and benchmark achievement. The daily "tickets to leave" exercises are one-to three-question mini-assessments of the day's lesson that allow the tutor to revise the next day's lesson. SAGA also divides the year into seven to ten course units, each with a pre-test and post-test; these tests help tutors determine how much review time is needed before the next unit. Quarterly proficiency assessments consist of 50 questions of basic math skills, administered at the beginning of the school year and up to four other times during the year. These tests assist tutors in targeting specific areas the student has not yet mastered that will be taught in the next quarter. These numerous assessments allow tutors to constantly and consistently measure student progress and tailor curricula to meet their students' needs.[2]

The key insight of the Match/SAGA tutorial model was about the basic economic barrier to personalizing education within big-city public school systems: per-pupil costs. Under the Match/SAGA tutorial model, youth receive intensive, individualized instruction at costs that are feasible at large-scale—around $3,800 per student in the Chicago Match/SAGA program—and are predicted to fall to $2,500 per student when carried out at large scale in a district. The per-pupil cost is low because the program selects tutors who can succeed in teaching two students at a time, but who typically do not have the extensive training and experience required to successfully teach classrooms of students. Because less preservice training is required, the Match/SAGA tutorials can hire instructors who commit to this work for a single school year as a public service and in exchange for a modest stipend. Tutors teach for six or seven periods of an eight-period school day. At each school they are overseen by a full-time site director who handles behavioral issues in the tutorial room and communication with school staff, and who offers daily feedback and professional development to tutors. Match/SAGA has also refined the model and figured out ways to implement the program at moderate scale in multiple locations in a way

that is consistent with how it was intended to be implemented. In principle, nothing about this educational strategy would preclude any other well-run nonprofit organization from delivering it.

RESULTS FROM A RANDOMIZED CONTROLLED TRIAL IN CHICAGO

The study we describe here builds on prior work by a member of our larger research team who found Match tutorials to be highly effective in a set of Houston public high schools that implemented a whole set of school reforms (Fryer 2014). Results from our work in Chicago have shown that at moderate scale, intensive, individualized instruction as delivered under the Match/SAGA tutorial model can generate very large gains in academic outcomes in a short period of time, even among students many years behind grade level (Cook et al. 2015). The large gains in academic outcomes for disadvantaged youth stand against a backdrop of few prior success stories in improving academic outcomes, particularly achievement test scores, for similarly disadvantaged adolescents. The impacts on academic achievement per dollar spent are sizable compared to even the most successful early childhood programs.

For our study of Match/SAGA tutorials, our research team worked with CPS and Match Education to conduct a large-scale randomized controlled trial of this approach in the 2013–14 academic year in 12 disadvantaged high schools on the high-crime and low-income south and west sides of Chicago. Randomized controlled trials represent the gold standard for research in areas like medicine, but remain far too rare in social policy research. We continued this study in the 2014–15 academic year, expanding to youth across 15 CPS high schools; we are currently analyzing results from the full two-year study.

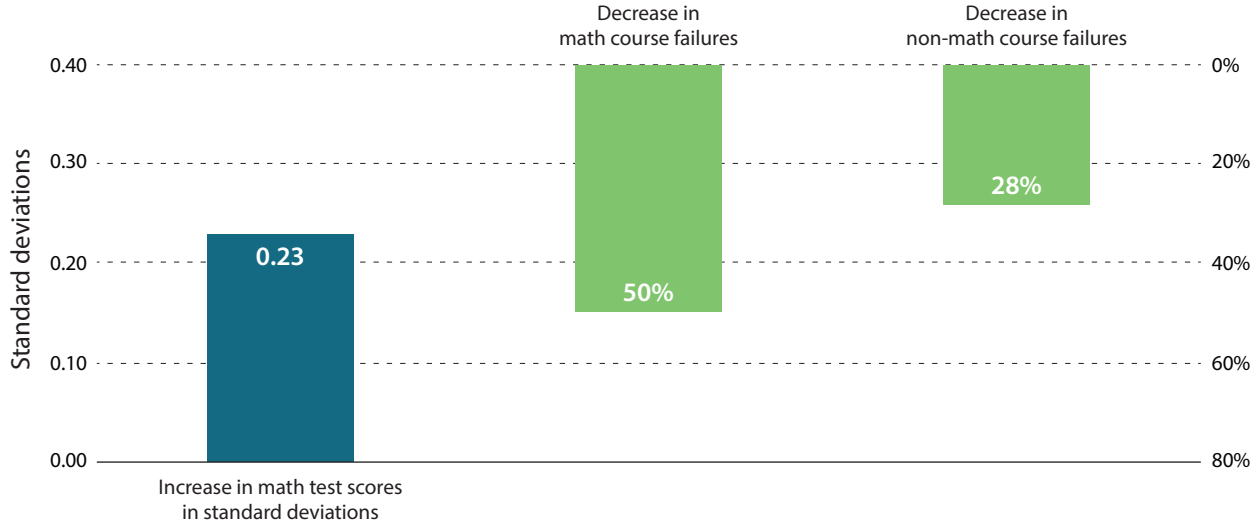
During the summer of 2013, we worked with CPS to identify 2,718 male incoming ninth- and tenth-grade students who were estimated to be at elevated risk of dropout, but not at such high risk that truancy would prevent them from benefitting from a school-based program. We randomized these students either to receive the Match/SAGA tutorial intervention or to be in a control group receiving status quo CPS services.

We focused on math skills partly because failure to complete required core math classes is one of the key drivers of high school dropout in Chicago (Hacker 2012), and because of growing evidence showing the importance of math specifically for short- and medium-term success in school, and also for long-term economic outcomes like employment and earnings (Duncan et al. 2007). We focused on male youth partly because their graduation rates and test scores lag behind those of female youth.

Of the youth in the study, 95 percent were either black or Hispanic, 90 percent were eligible for free or reduced-price lunch, and 49 percent had failed at least one course the year before they were randomized. In the school year prior to randomization, the students had an average GPA of 2.2 on a 4-point scale and had missed about a month of school. Around one in five had been arrested prior to the start of the study.

FIGURE 1.

Impacts of Match/SAGA Tutorials on Math Test Scores and Course Failures



Approximately 600 students were randomly assigned to receive the Match/SAGA tutorial intervention. As shown in figure 1, the impacts were strong: students assigned to the tutorials had substantial gains in math test scores relative to the control group. In fact, we found that Match/SAGA tutorials helped students to learn between one and two *extra* years of math, over and above what the typical American high school student learns in one year.

There are a number of ways to measure test score gains, and every way we checked, the gains experienced by the students who participated in the Match/SAGA tutorials were large. One way to compare test scores is using national percentile ranks. We found that Match/SAGA tutorials moved kids on average from about the 34th to about the 42nd percentile in the national distribution—in other words, the program closed about half the gap between participants' math scores prior to the tutorials and the national average. In terms of "effect size" units, or standard deviations, we found that Match/SAGA tutorials improved students' scores by 0.19 to 0.30 standard deviations, depending on the exact test and norming that we examined. As one way to assess the magnitude of these effects, 0.27 standard deviations is equal to about one-third of the black–white test score gap in math in the National Assessment of Educational Progress among 13-year-olds. This, of course, does not mean that providing this intervention universally would cut the black–white test score gap by this much each year, since the effects could be different for different populations; in particular we do not now know how cohorts of primarily white youth would benefit from the program if they were enrolled.

These impacts are measured on the ACT's Explore and Plan tests, which CPS administers to ninth and tenth graders, respectively. In addition, the impacts are measured on in-person math achievement tests administered to a randomly selected subsample (separate from the focal high-stakes test administered by CPS). We found similarly sized impacts on this additional math achievement test. The similarity in the effects of the tutorial program on both tests is one indication that the results of the Explore and Plan tests do not reflect a narrow "teaching to the test" by the Match/SAGA tutors.

A similar conclusion is suggested by the fact that math grades improved: CPS math teachers themselves saw sizable gains in math performance among the students who participated in Match/SAGA tutorials. The tutorials improved math grades by 0.58 points on a 1–4 point scale, a sizable gain compared to the average math GPA among the control group of 1.77 (or essentially a C minus average). We also found that the tutorials cut in half the chance that students failed their math course.

Even though the tutorials focused specifically on math, the students in the program improved their performance in other subjects—reducing the chances of failing non-math courses by about one-quarter. We do not know the mechanism underlying this improvement, for example whether the spillover occurred primarily in other subjects that reward math skills, such as science, or if having success at math helped to change the students' motivation, feelings of self-efficacy, or institutional attachment. There are three findings from our research that may suggest why the individualized Match/SAGA tutorials are effective. First, we found that the students who received the math tutorials were more likely to report that they liked math, but no more likely to say that they liked reading. Second, they were more likely to say they were "good at math," but no more likely to say they were "good at reading." Third, the students in the math tutorials were more likely to report that their friends "did not study enough." It is unlikely that friends of students receiving the tutorials reduced their study habits; instead, the tutorials appear to have changed the participants' mindset around school and math and how much studying is "enough."

The combination of working on math problems appropriate for a student's skill level along with individualized support from tutors likely helped the tutorial participants perceive themselves as capable. And once they saw that they could do some simple math problems, it became easier to do more-complex problems. It is possible that they then saw that their friends were missing out on this satisfying process—learning—by not studying enough.

The degree to which these mechanisms could be replicated in a version of the tutorials that changes the group size slightly or supplements the tutor's time with the use of technology remain critical questions to investigate as part of the scale-up process.

This study highlights a systemic challenge for so many urban school districts: the need for a more-robust safety net to help students who fall behind and wind up experiencing a mismatch between what they need and what regular classrooms deliver. Many have thought that improving academic outcomes was infeasible for male ninth- and tenth-grade minority students living in economically disadvantaged, distressed, and dangerous communities; our study suggests otherwise. Students who are four to six years behind grade level—unfortunately not an uncommon occurrence in distressed urban areas—have been getting very little or virtually nothing out of regular classroom instruction for years. A few years of the Match/SAGA tutorials intervention could bring almost all students up to grade level—at which point they could begin to successfully reengage with and benefit from the grade-level material taught in regular classrooms.

Because of the low ratio of students to tutors required under the tutorial model, the costs are relatively high at $3,800 per student per year. We estimate that the cost could be reduced to around $2,500 per student if the tutorials were delivered at a large scale. One way to think about the scalability and

sustainability of these results is to compare the costs to the expected long-term benefits. Our calculations suggest that these costs are more than offset by the benefits of the program, as measured by the predicted gains in future lifetime earnings among students who participate in the tutorials.

Estimating the long-term benefits of a recently implemented program clearly requires making assumptions about the future, but doing so can indicate whether the program would generate sufficient benefits to make the necessary expenditures a worthy investment. To estimate the long-term benefits implied by the increased math test scores, we relied on a study of the long-term effects of kindergarten classroom characteristics by Chetty et al. (2011). In that study, Chetty et al. estimate that each one-percentile increase in test scores in elementary and middle school is associated with $100 to $150 in additional annual earnings. In our research, we found that participation in the Match/SAGA tutorial program increased the average student's test score by approximately seven percentile points. Combining these two findings implies that the tutorials are expected to increase participants' adult earnings by between $700 and $1,050 each year. Discounting these gains back to age fifteen, and comparing them with estimates of per-student costs that range between $2,500 and $3,800 per year, we estimate that the benefits would be roughly five to eleven times larger than the costs—suggesting that the current investment in tutorials is economically worthwhile. We also calculated benefit-cost ratios under the extreme assumption that it would be necessary to deliver four years of tutorials to a student to maintain the test score impact we found. Even in this extreme case we estimate that the benefits would be between 1.3 and 2.9 times as large as the costs. These calculations suggest that this type of tutorial program is a cost-effective way to improve learning and could lead to long-term benefits that significantly outweigh the costs.

SCALING UP THE PROGRAM

Based on the results described above, we propose that schools serving economically disadvantaged students set up an educational safety net by delivering individualized math tutorials during the school day. Specifically, we propose that all school districts receiving schoolwide Title I funds provide individualized daily tutorials to all third through tenth grade students who are at least two grades behind grade level in math. In the tutorials, one tutor would work with two students for a full class period every day. Since we find in our Chicago data that the Match/SAGA tutorial program doubles or triples the amount of math students learn over the course of a year, the expectation would be that most students would need a year or two of this intensive safety-net intervention to catch back up to grade level, at which point they would begin to benefit from regular classroom instruction. Put differently, we view our proposal as a complement to and acknowledgment of, but not a substitute for, ongoing policy discussions about strengthening regular classroom instruction and other common targets of school reform.

Under our proposal, all students in the third through tenth grades would be assessed either at the beginning of the school year or at the end of the previous school year to determine which students are two grades or more behind grade level in math. These students would be assigned to receive individualized Match/SAGA tutorials each day of the school year, with each tutorial taking place during a full class period of about 50 minutes. Where appropriate (e.g., in middle and high school grades), the tutorials would be treated as a required course: students would receive a grade and it would be credit-bearing. Students would be enrolled in these math tutorials in addition to their regular math class. If the student progresses to grade level, the tutorials could be discontinued. Students who remain behind grade level could continue in the math tutorials for multiple years.

The tutorials could be administered by organizations like SAGA Innovations, which is currently delivering individualized math tutorials of the sort we propose in Chicago, New York City, and elsewhere. We believe SAGA could deliver tutorial services at a significantly larger scale. But because the tutorial framework is highly replicable, in principle nothing bars any other well-run nonprofit organization from implementing a model with a similar curriculum and framework. Put another way, a key question about the possibility of replicating the tutorials is whether the recipe for combining the necessary inputs into a successful program is written down in sufficient detail for others to pick up the plan and carry it out themselves. We argue that it is, because the Match/SAGA tutorial program has the advantage of being fairly well reverse-engineered. The program developers have a good sense of what key program elements make it successful—smart, enthusiastic tutors who will work for one year for a modest stipend, who are selectively screened and intensively supervised. The tutoring task itself is well articulated. Having exported the model to several cities now, the organization has a fairly well-developed set of instructions to offer new providers or franchisees in other cities.

Another question about scale-up is whether there are binding limits on the supply of effective tutors willing to do the job for the modest stipend currently offered. Match and SAGA have been operating their tutorial program with thousands of students in several cities across the country, and usually receive something on the order of five to twenty applications from potential tutors per opening. That suggests at least some room to grow, although whether big leaps are possible in the ability to recruit high-quality tutors and supervisors (and whether increases in the stipends paid would be required to do that in a way that does not compromise staff quality) is uncertain.

COSTS AND FUNDING

In 2014 about $14 billion of Title I funding was allocated to districts across the country. Large districts, including Chicago and New York City, receive hundreds of millions of dollars of Title I funding each year. In an era of budget shortfalls and crises, CPS received a waiver under the then-prevailing No Child Left Behind Act of 2001 (NCLB) that allowed them to direct Title I resources to fund the Match/SAGA tutorial program, with roughly $400,000 in the 2014–15 academic year and $2.5 million in the 2015–16 academic year. In conversations with lawyers and representatives of the U.S. Department of Education, it became clear that this use of Title I funding in Chicago was particularly exciting to many policymakers, because the Match (now SAGA) tutorial program specifically targets high-school-age youth, a population that has historically been under-served in the allocation of Title I funds.

Such use of Title I funds is permissible without a waiver in the latest reauthorization of the Elementary and Secondary Education Act of 1965 (ESEA) as the Every Student Succeeds Act of 2015 (ESSA) in December 2015. The ESSA allows for best practices in school organization and student-centered learning, emphasizing the role that tutoring has in both. In the bill language, high-quality tutoring is highlighted as an effective pedagogical approach that raises student achievement and as an organizational strategy akin to other school day activities that benefit particular students, such as offering Advanced Placement courses. Due to changes in the statutory language around the "supplement, not supplant" provisions for the use of Title I funds that tie "supplement" more tightly to fiscal accounting practices rather than programmatic decisions, schools will be able to more readily adopt pedagogical and organizational strategies like tutoring with the use of Title I funding.

In a sense, our proposal to expand math tutorials comes full circle on the reform strategies promoted and paid for through Title I since its inception through ESSA authorization. In the early years of Title I, one of the simplest choices a school could make to account for supplemental services to targeted students was to pull these students out of their regular classrooms for remedial work. Though the research at the time suggested that pullouts seemed to offer some of the same features as the Match/SAGA tutorials described here—low student-to-teacher ratios, less classroom management, and more time on task—some argued that it was not the most effective approach for Title I (Hill 2006). Concerns over the quality of instructors and instruction, lack of coordination with classroom teachers, stigma and racial segregation of the students, and organizational incoherence at the school level led some to argue for using Title I for schoolwide programs rather than pullouts (Cohen and Moffitt 2009). While schools were never forbidden from adopting pullouts as a strategy through Title I, similar tutoring programs were often paid for through budget lines set aside for supplemental educational services (SES) and were therefore limited to out-of-school time under the NCLB regime. Our pilot evaluations in Chicago were paid for with Title I SES funding, which was allowed because Illinois received an NCLB waiver permitting SES funds to be used to pay for the Match/SAGA tutorials during the school day.

With the historical stigma around pullouts and the funding stream silo for tutoring, it is not surprising that school day tutorial programs like the one evaluated in this proposal are novel. Though our study did not look at stigma directly, students who participated in the tutorials reported that they liked and were good at math. Integrating tutoring into a schoolwide plan and organizational routine might alleviate some of the residual concerns around pullouts while allowing students to benefit from intensive, personal, high-quality instruction under ESSA.

While schools are free to adopt tutorial programs as part of the schoolwide strategies, ESSA also established a grant program that allows state education agencies to reserve up to 3 percent of funding for direct student services programs such as tutoring. Along with other in-school programs, including Advanced Placement courses, credit recovery, or early college high school pipelines, the provision would apply to "components of a personalized learning approach, which may include high-quality academic tutoring" (Sec. 1003A(c)(3)(D)). School districts that apply for an award under this section must demonstrate how services to the lowest-achieving students would be prioritized. This may be another source of funding to finance Match/SAGA tutorials in Title I schools.

Chapter 4. Questions

Should students who are not in economically disadvantaged schools receive these tutorials?

Tutorials of this sort would likely be effective for students who have fallen behind grade level, no matter what type of schools they attend. We suspect that many school districts with the resources to do so already incorporate individualized instruction into their curriculums. While we have not studied the impacts of the tutorials in a high-income school district, we suspect they would be effective and we encourage well-funded districts to consider adopting the program as well.

Should students who are not behind grade level receive these tutorials?

While individualized tutorials may also be effective for students who are at or even above grade level, this proposal focuses on using tutorials to remediate skills among students who are behind grade level so that subsequent classroom instruction can be more effective for them. By reducing the range of educational needs that students have, the tutorials will allow classroom teachers to focus on delivering grade-level material in an effective way.

What other types of students would benefit from Match/SAGA tutorials?

While our study in Chicago demonstrated the effectiveness of the Match/SAGA tutorials for ninth- and tenth-grade boys, we see no reason why the tutorial approach would not be just as effective for girls or for younger students. The curriculum is designed to teach a mix of basic skills and grade-level material and is already designed to cover third- through tenth-grade math topics. Extending coverage back to first grade seems feasible. And while Match/SAGA has a well-developed tutorial model for math, federal research dollars would be well spent to support the development of a similar model for other subjects and for earlier grades.

If a school cannot implement the tutorials at the full scale described in the proposal, how should it allocate seats?

We propose that large school districts around the country might devote some of their Title I funding to support individualized Match/SAGA tutorials. For districts that do not devote enough funding to serve all of their third through tenth grade students who are scoring two grades behind grade level in math, we propose that they select which students to enroll in the program by lottery. This will allow districts to learn how effective the tutorials were in their district, and will help other districts to learn about how different ways of implementing a tutoring program like this can make it more or less effective.

Why do the tutorials need to be in-school rather than after-school?

Based on our observations, it appears that a key reason the Match/SAGA tutorials are effective is that students spend a large amount of time focused on doing math, and do it every day. We would be concerned that attendance rates would be lower in after-school tutorials, and students would be less focused and engaged with the work.

How important is the face-to-face format of the tutorials relative to an online format? What about using technology to do the tutorials?

It is natural to wonder whether technology can be used to deliver the individualization of instruction that is a key ingredient to the Match/SAGA tutorial model. We need additional research to answer this question. While it is possible that technology could be used to reduce the cost of the tutorials, a crucial question will be whether this will also harm the effectiveness of the program—potentially so much that the cost savings are not worth it. What we know right now is that the face-to-face model works at medium scale across different urban school systems. What we do not yet know, but would be important to learn, is the degree to which incorporating technology would change both costs and the effectiveness of the intervention.

Can we try larger tutorials of three or four students instead of two students?

Since the cost of the tutors is the key expense for the program, increasing the number of students per tutor would substantially lower the cost of the program, and is worth investigating further. It is also possible that experimenting with larger tutorial sizes during the scale-up stage could lead to potentially even lower-cost (and perhaps even more-cost-effective) possibilities. At this point, the evidence shows that tutorials with one tutor and two students are cost-effective.

How quickly can students progress through the tutorials?

Students are allowed, and even encouraged, to move at their own pace. Students can be reshuffled easily across tutorial groups so that they are paired with another student working at a similar level. The program has many of the benefits of what has historically been called "tracking" in education circles, but without the major downside. Whereas a student placed in a low "track" in school has a hard time making the discrete jump to a middle or upper track, a student who begins the tutorials at a fourth-grade level can move with his tutor to fifth-, sixth-, or eventually seventh-grade math as quickly as he is able to master the material.

Should students participate in tutorials in reading or other subjects besides math?

To begin, we are only proposing that the tutorials be offered in math. There is research showing that some individualized reading tutorial programs are effective, though these can be more expensive. We hope that tutorial programs can be developed for reading and other subjects—like science, writing, and history—that can be delivered at scale at reasonable cost in the future.

How many tutors would be needed each year to deliver tutorials on the scale you propose?

To offer tutorials to one-quarter of all third- through tenth-grade students at the 100 largest public school districts in the United States, we estimate it would require about 140,000 tutors each year. This is clearly a large number, and a scale far beyond what we—or any other researchers—have studied. It may be the case that it would simply not be possible to recruit that many effective tutors each year without offering a stipend that would make the tutorial program cost-prohibitive. We are currently developing methods to study exactly this question. An alternative may be to offer the tutorials only to students who are significantly farther behind grade level. For example, it would require fewer than 50,000 tutors to serve 10 percent of all third- through tenth-grade students at the 100 largest school districts. This is also a large number, but may be more feasible. Another possibility would be to limit tutoring to ninth and tenth graders, where we have directly tested its effectiveness. It would require about 35,000 tutors nationwide to serve one-quarter of all ninth and tenth graders at the 100 largest school districts, and 14,000 to serve 10 percent of all ninth and tenth graders in those districts. As a point of comparison, each year about 75,000 people participate in AmeriCorps, about 5,000 work as Teach For America corps members, and about 3,000 participate in City Year.

Chapter 5 . Conclusion

We are eager to continue to learn about how the Match/SAGA tutorial intervention can be scaled up most effectively. If it is possible to achieve at large scale the impacts we demonstrated in Chicago, we believe this individualized tutorial program has the potential to be a transformative strategy in public education, helping our most at-risk youth catch back up to grade level, reengage with regular classroom instruction, and gain real hope for a diploma and all the long-term economic benefits that go along with that.

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Endnotes

1. The exact magnitude of the black–white gap depends on the study sample examined, the age at which the gap is measured, the achievement assessment that is used, and the academic subject being examined; most studies report the gap among adolescents to be in the range from 0.5 to 0.9 standard deviations, with gaps that tend to be larger for math than for reading (Clotfelter, Ladd, and Vigdor 2009; Fryer 2014; Jencks and Phillips 1998; Reardon 2011).
2. Each site director has some combination of experience including math teaching or tutoring, mentoring, program direction, nonprofit management, public speaking, and training of adults, and is trained specifically in the Match/SAGA model. Tutors complete a daily report to the site director, where they note each student's progress and communicate any issues.

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Highlights

Economically disadvantaged students who fall behind grade level and miss developing crucial foundational skills can have major difficulties in subsequent grades and later in the workforce. Roseanna Ander of the University of Chicago, Jonathan Guryan of Northwestern University, and Jens Ludwig of the University of Chicago propose scaling up a tutorial program that would allow students who have fallen behind grade level to reengage with regular classroom instruction, likely improving their chances of graduating high school and achieving the many long-term economic benefits that go along with academic success.

The Proposal

Individualized Tutorials. School districts would deliver daily, individualized, in-school tutorials to all students in the third through tenth grades who are at least two grades behind grade level in math. A single tutor would be paired with two students for a full-period tutorial session during each school day. The content of the tutorial would be customized to the students' level of knowledge and learning style, allowing students to work back up to grade level and begin benefitting again from regular classroom instruction.

Funding the Tutorials. To finance the tutorial program, school districts would use Title I funds made available through the December 2015 reauthorization of the Elementary and Secondary Education Act as the Every Student Succeeds Act (ESSA), including the grant program established in ESSA that allows state education agencies to reserve up to 3 percent of funding for direct student services programs such as the tutorials that the authors propose here.

Benefits

The need for a more robust safety net for students who fall behind grade level is a key systemic challenge for many urban school districts. The authors' proposals would meet this need by bringing students back up to grade level so that they can reengage with regular classroom instruction. The program on which the proposal is based—tutorials offered to predominately minority students in some of Chicago's most disadvantaged public high schools—substantially increased students' standardized test scores and school performance. In one year, participants learned between one and two extra years of math above what the typical American high school student learns in that period. The program's tutors are talented people interested in dedicating a year to public service in exchange for a modest stipend. With the program's relatively low labor costs, the authors calculate that the costs of the tutorials would be more than offset by their benefits, as measured by the predicted gains in future lifetime earnings among the participants.

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