

POLICY BRIEF 2011-08

Organizing Schools to Improve Student
Achievement: Start Times, Grade Configurations,
and Teacher Assignments

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Organizing Schools to Improve Student Achievement: Start Times, Grade Configurations, and Teacher Assignments

Proposals for school reform often focus on large and sometimes controversial systemic changes, such as charter schools, accountability standards, and changes to the way teachers are hired, fired, and compensated. Although these reforms may offer great opportunity to improve student outcomes, they may also be costly, face substantial implementation challenges, or lack definitive supporting evidence. At the same time, school boards may overlook relatively simple changes in the way schools are organized and managed that could impact student achievement in positive ways.

In a new paper for The Hamilton Project, authors Brian Jacob of University of Michigan and Jonah Rockoff of Columbia Business School present the evidence on several organizational changes that could provide significant “bang for the buck” in student achievement. While simple, these changes have the potential to substantially improve K–12 student performance. These reforms include:

- starting schools later in the day for students in middle schools (Grades 6 to 8) and high schools (Grades 9 to 12);
- encouraging K–8 school configurations rather than maintaining middle schools (Grades 6–8) or junior high schools (Grades 7–8), or taking measures to address the difficult transition from elementary to middle school; and
- assigning teachers to grades and subjects carefully to increase the gains from specialization.

The Challenge

Jacob and Rockoff’s proposal draws on new evidence on how organizational decisions affect student achievement. For example, middle schools and high schools often start earlier in the day than elementary schools so that the same buses can be used to transport both sets of students. This staggering of buses is known as a tiered transportation system. Older children are transported first so that elementary school children do not have to walk to school or wait for the bus when it might be dark. Additionally, early start and end times are advantageous for older students who have after-school activities or who may work after school. The decision process is premised on the need to cut transportation costs through tiered transportation, but does not take into account how those cost savings might impact student achievement. In fact, the negative effect on student learning from early start times is larger over the long term than the cost savings produced by tiered transportation systems.

By the same token, junior high and middle schools exist because of ideas about how adolescents learn that were prevalent in the 1960s and 1970s. Large-scale changes were made in school and grade organization without strong evidence to back up those theories. However, recent evidence now suggests that this decision went the wrong way: middle-school-aged children learn better in K–8 schools than they do in separate 6–8 or 7–8 schools. For example, in both Florida and New York City, as students entered middle schools, their test scores declined markedly relative to the scores of students in K–8 schools. By eighth grade, those transitioning to new schools experience a loss of over one month of schooling relative to their K–8 peers.

The way in which teachers are assigned to grades and subjects may also impact student achievement. Teachers represent one of the most important inputs in a child’s education; one of the few predictors of teacher effectiveness, particularly in the first few years of teaching, is experience. Jacob and Rockoff provide evidence that teachers may gain experience more quickly by teaching the same subject and the same grade in back-to-back years early in their careers. As a result, the authors find that teacher assignments to grades and subjects affect student performance. Administrators should consider this effect in addition to teacher preference and shortages in particular fields when making assignments.

A New Approach

To illustrate the value of making decisions about school organization based on evidence on student achievement, Jacob and Rockoff explore three organizational changes: starting schools later for middle school and high school students; using K–8 schools rather than junior high or middle schools or taking other steps to minimize the disruptive transitions; and assigning teachers to the same grades and subjects from year to year.

Starting Schools Later

Parents may think their children are just being lazy when they complain about waking up early, but there is a biological basis for their need to sleep late. Medical research documents important changes in the circadian rhythm during adolescence that shift children’s internal clocks to later bed and wake times. At the same time, school start times often change in the other direction: in many places middle schools and high schools start earlier than elementary schools. For example, in Kansas, two thirds of high schools started at 8:00 a.m. or earlier in 2005, and more than 99 percent started at 8:30 a.m. or earlier.

These early start times have been clearly linked with reductions in student performance, stemming from increased absences and fatigue. The best evidence comes from a random assignment study among first-year Air Force cadets. Researchers found that cadets assigned to start classes prior to 8:00 a.m. performed substantially worse in those early classes as well as in all their subsequent courses. Other research suggests that students who sleep later actually spend more time doing homework and less time watching television, providing additional explanation for why later start times might positively impact student achievement.

Jacob and Rockoff propose that school districts pilot ideas like later start times by moving some individual schools to later start times or starting classes later for some segment of the students. A pilot program that does not affect everyone would allow districts to gain evidence on the benefits before applying the change at a wider scale.

The authors believe that state and federal governments can play an important role in encouraging districts to experiment with later schedules. For example, the U.S. Department of Education could sponsor a grant competition to provide some districts with funding to support schedule changes on a trial basis. In fact, the idea for later start times was raised at the federal level in 1999 as the “Z’s to A’s Act.” The Act proposed providing grants to local educational agencies that agreed to begin school for secondary students after 9:00 a.m.

Costs and Benefits

While later start times would not be without costs for most school systems, the authors’ calculations show that the benefits of later starting times would overwhelmingly outweigh these costs.

The major adjustment that would have to be made to accommodate later start times is to the transportation system. Districts with tiered transportation systems in which middle or high schools, or both, start early would either have to eliminate the tiered system and have all schools start at the later time or switch to having elementary schools start first. In the latter case, schools would have to consider if there were safety concerns to having elementary schools start earlier.

Even in school systems where buses would have to be added, costs are not expected to exceed \$150 per student per year. Later start times would lead to higher student achievement—the authors estimate a cumulative increase of 0.175 standard deviations in test scores by the time the student finishes high school. This impact is equivalent to an additional two months of schooling. When translated into earnings, the average student who starts school later would make about \$17,500 more over the course of her life. These lifetime earnings gains are substantially more than the costs of changing transportation systems.

Middle Schools

Unlike the case with later start times, attaining all the benefits of a K–8 system could require a more substantial reorganization of the school system. However, the authors suggest that certain districts that are unable to make the change could consider the drop in achievement associated with middle and junior high schools when crafting their strategic plans and making resource decisions for new investments.

Middle-school-aged children learn better in K–8 schools for a variety of reasons. For instance, because middle and junior high schools pull from many different elementary schools, students enter middle and junior high schools alongside a large group of new classmates. This transition occurs at a time when complex shifts in adolescent attitudes and behavior are taking place. In other words, students undergo a difficult transition at precisely at the time when they may need increased attention to their social and academic needs.

In light of the evidence, some districts have already forged ahead and made changes to their grade configurations. Several major districts, including Baltimore, Cincinnati, Cleveland, New York, and Philadelphia, have either increased the number of K–8 schools or converted completely to a K–8 structure in response to dissatisfaction with middle and junior high school performance. Large-scale capital construction is not necessarily required: the recent move to K–8 in New York City

was accomplished with creative use of school facilities and the operation of multiple schools within a single building.

Because several districts have already demonstrated that these reconfigurations can be accomplished, Jacob and Rockoff recommend that, wherever possible, school systems consider grade K–8 configurations. However, the authors emphasize that the key factor is not necessarily building new K–8 schools, but rather effectively managing students' transition into a middle or junior high school. Therefore, for school systems where building or retrofitting schools to follow a K–8 grade configuration is not an option, a better managed transition could involve the following: repeated school visits and an orientation period for incoming students; extensive coordination by teachers from both sending and receiving schools to align curricula and exchange information on the needs of particular students; and other steps to facilitate the flow of information to both students and instructional staff.

Costs and Benefits

It is important for any district currently using middle schools to weigh the potential benefits of moving to a K–8 structure against the associated costs. The authors look at the costs of school systems that have transitioned from a middle school system to a K–8 system. One-time costs such as new classroom furniture and upgrades to science labs, libraries, and art studios totaled roughly \$120,000 per school. There also were also recurring costs due to the need for additional buses and bus routes as a result of the conversions, which totaled roughly \$14,000 per school per year. On a per student basis, the costs are still small relative to the gains. Amortized over time, total costs for K–8 conversions likely range somewhere between \$50 and \$250 per student. While these costs are nontrivial, they are dwarfed in magnitude by the estimated benefits of a 0.1 standard deviation improvement in test scores—the equivalent of an additional 1.25 months of additional schooling per student. In terms of lifetime earnings of the students, the authors estimate benefits of roughly \$10,000 per student.

Teacher Assignments

As the third part of their organizational proposals, the authors highlight the potential importance of teacher assignments as well as how school administrators might use teacher performance measures that are increasingly available to manage assignments.

Research highlights the productivity benefits of experience, and teaching is no different. Returns to experience are highest when teachers, especially new teachers, teach the same grade and subject for multiple years. For example, an elementary math teacher who receives the same grade assignment year after year will improve roughly 50 percent faster than a teacher who never repeats a grade assignment. In fact, the

Roadmap

The authors propose three organizational changes that have the potential to improve student performance in cost effective ways:

Proposal A: Move middle and high school start times later in the day

- Implementation of later times would vary from district to district. Most likely this would require reorganizing student transportation by either adding additional buses to accommodate all schools starting at the same time or switching start times for elementary schools.
- Adjustments also would need to be made to allow students to continue to participate in after-school activities and may require constructing lights on athletic fields. Some after-school conflicts associated with later start times (such as sporting events) could be minimized if the change in school schedules took place at a regional rather than at a district level because all schools in the region would be on similar schedules.

Proposal B: Address the negative effects of current school grade configurations

- To suit the needs of each district, more K–8 learning environments could be created by increasing the number of K–8 schools, converting existing schools to a K–8 structure, or exploring the creative use of school facilities and the operation of multiple schools within a single building.
- An alternative to altering grade configuration is increasing management of students' transition into a middle or junior high school. Solutions could include an increased orientation period for incoming students, increased teacher communication on students' needs, and additional attention to aligning curricula across schools.

Proposal C: Manage teacher assignments with an eye toward maximizing student achievement

- Teacher assignment management could be done by district administrators, who could monitor teacher assignments. Administrators should be able to determine whether teachers are consistently assigned to the subject in which they are most effective, or whether another teacher in the school would be more effective teaching the subject to a larger group of students.

Learn More About This Proposal

This policy brief is based on The Hamilton Project discussion paper, *Organizing Schools to Improve Student Achievement: Start Times, Grade Configurations, and Teacher Assignments*, which was authored by:

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Additional Hamilton Project Proposals

The Power and Pitfalls of Education Incentives

There is widespread agreement that America's school system is in desperate need of reform, but many educational interventions are ineffective, expensive, or difficult to implement. Recent incentive programs, however, demonstrate that well-designed rewards to students can improve achievement at relatively low costs. This paper draws on school-based field experiments with student, teacher, and parent incentives to offer guidelines for designing successful education incentive programs. Incentives for inputs, such as doing homework or reading books, produced modest gains and might have positive returns on investment, and thus provide a promising direction for future programs. Additionally, this paper proposes recommendations for future incentive programs and concludes with guidelines for educators and policymakers to implement incentive programs based on the experiments' research findings and best practices.

New Assessments for Improved Accountability

Although assessments are needed to hold schools and teachers accountable for student performance, the current assessment system is flawed. Today's tests have not been designed for use in accountability systems. Modern assessments are constructed to be similar from year to year which makes teaching to specific tests far easier. This leads to gains on certain tests without real improvements in learning, and class time may be spent on test-specific coaching instead of on teaching content. A new accountability system can address these issues if it uses an innovative assessment that is not as predictable in combination with non-test metrics such as classroom observations, school inspections, and parental evaluations to rank teachers and schools on their effectiveness.

benefits of having a teacher teach the same subject multiple years are estimated to be larger than firing the worst teachers. However, we are currently not realizing this gain: the authors estimate that 40–70 percent of teachers, depending on the school system, do not teach the same grade level or subject three years in a row.

One particular group of students with large benefits from teacher experience are English language learners (ELL). One possibility would be for the administrators to assign ELL students to specific teachers systematically for several consecutive years to build teacher expertise in serving non-native speakers. In schools with smaller populations of ELL students, making sure that these students are assigned to a small set of teachers year after year will leverage the expertise the teachers have developed.

The authors do not suggest it is possible to recommend a single specific policy for all schools. Rather, they urge school and district administrators to carefully and critically evaluate the teacher assignments with an eye toward maximizing student learning.

Costs and Benefits

To get a sense of the potential benefits of a policy to reduce switching, suppose that elementary teachers never switched grades or subjects. Given the distribution of general experience and estimates of the return to grade-specific experience in New York City, this policy would increase district-wide average student achievement by approximately 0.02 standard deviations (approximately one week of additional learning averaged over every student) in math. While this is a small effect, such a policy would likely entail very little, if any, direct financial cost. As suggested in the questions and concerns, in some cases the costs would be smaller and the benefits larger. Students of teachers who are in their initial few years of teaching, for instance, will benefit significantly if the teacher sticks with a grade and subject for a few years.

Conclusion

Jacob and Rockoff's proposals are not meant to radically transform public education as we know it. It may be surprising, however, that the magnitudes of the benefits of these organizational achievements relative to their costs rival the cost effectiveness of other far more sweeping reforms. The purpose of the proposal is to point out that all these small decisions about the organization of schools and school days impact student achievement, and that these types of choices need to be carefully scrutinized by school districts. The authors point to three such examples—school start times, grade configurations, and teaching assignments—that could improve student performance in ways that are both cost-effective and politically feasible.

Questions and Concerns

1. How would after-school activities be affected by later start times?

If schools started later and ended later, adjustments would need to be made to allow students to continue to participate in after-school activities that require daylight. Many secondary students have study halls or free periods in their schedule, and it might be possible for schools to coordinate student schedules so that those students who participate in after-school activities would have their free periods at the end of the day and could use this time to participate in extracurricular activities. Alternatively, student athletes could be made exempt from their physical education requirement, providing additional room in the schedules in order to arrange for an early dismissal. Districts could also consider installing lights for athletic fields that allow students to practice after dusk. Finally, it is worth noting that some of the conflicts associated with later start times could be minimized if the change in school schedules took place at a regional rather than at a district level because schools in the area would be on the same schedule.

Making adjustments to address after-school activities would not significantly change the cost-benefit calculation put forward earlier. The authors estimate that it costs roughly \$110,000 to erect lights for an athletic field, and \$2,500 annually to operate such lights. These costs combined with the costs for reorganizing bussing systems would still be outweighed by the benefits to student achievement.

2. Would moving to K-8 schools increase economic and racial segregation?

One concern is that moving to multiple K-8 schools instead of a typical use of a “hub and spoke” system with multiple elementary schools feeding into a single middle school may increase racial or economic segregation in a district’s public schools. Although the evidence suggests that middle schools do not appear to be better for economically disadvantaged students, integration may serve another valuable purpose. Nevertheless, many urban areas have open district choice systems, so that moving to a K-8 system would not necessarily entail greater segregation of student populations.

3. What are the challenges to teacher specialization?

Teacher specialization by subject would require significant structural changes in the organization of schooling. Specialization would require upper elementary schools be departmentalized, meaning that a single teacher or small number of teachers teach particular subjects. This may lead to staffing shortages because current teachers could not be reassigned when other teachers depart.

On the other hand, less-extreme forms of specialization would be feasible and could result in improved student learning. In schools where elementary schools are already departmentalized administrators should be able to determine whether the designated math and reading teacher(s) are actually assigned to the subject in which they are most effective.

Highlights

To improve student performance, Jonah Rockoff of Columbia Business School and Brian Jacob of the University of Michigan highlight three cost-effective organizational changes that school systems could implement:

The Proposal

Proposal A: Later school start times for students in middle schools (Grades 6 to 8) and high schools (Grades 9 to 12). Early school start times substantially reduce performance among all students, and especially among disadvantaged students. In school districts with greater flexibility to adjust start times, starting school even an hour later could substantially boost student achievement with almost no cost. In other schools, transportation systems might need to be reorganized, but even then the benefits to students more than justify the organizational costs.

Proposal B: Addressing deleterious effects of current school grade configurations. Adolescent students attending middle schools (Grades 6 to 8) appear to underperform their peers in K–8 schools. Evidence suggests encouraging K–8 configurations or taking measures to address the difficult transition from elementary to middle school would boost student achievement.

Proposal C: Better management of teacher assignments with an eye toward maximizing student achievement.

A growing body of research suggests substantial benefits from teachers remaining at the same grade level for multiple years and documents that elementary teachers are often noticeably more effective in teaching one subject than another (e.g., more effective teaching math than reading, or vice versa), suggesting significant benefits from teacher specialization.

Benefits

The authors estimate benefit-to-cost ratios of between 9 to 1 and 200 to 1 for later start times and increasing the number of K–8 schools relative to middle schools, respectively. These organizational changes, unlike more sweeping reforms, could be implemented at the school level. The cost and benefits of these changes compare favorably to other educational policies.



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