

Executive Summary

Challenges and Strategies of Urban Districts in Recruiting and Retaining Mathematics Teachers

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Introduction

This report summarizes findings from a multi-year study conducted under the auspices of MetroMath: The Center for Mathematics in America’s Cities, a Center for Learning and Teaching funded by the National Science Foundation. For this study, we interviewed 43 administrators in eight urban districts in the northeastern United States¹ to find out the extent of their problems in recruiting and retaining new middle- and high-school teachers of mathematics, the approaches they have taken (or plan to take) to address these problems, and what has resulted from the implementation of these approaches.

The eight urban districts involved in the study were of various sizes and were situated in a variety of geographic settings. Three have between 15,000 and 20,000 students (Armstrong,² Calloway, and Joplin), three have between 25,000 and 35,000 students (Basie, Dorsey, and Gillespie), and two have more than 40,000 students (Ellington and Hampton). In all of the districts but Calloway, students of color comprise the majority of students and at least 65 percent of the students receive free or reduced-price lunch. See Table 1.

Table 1: District Information

	Armstrong	Basie	Calloway	Dorsey	Ellington	Gillespie	Hampton	Joplin
Student Population	15,000	25,000	15,000	35,000	>50,000	30,000	40,000	20,000
District Demographics	% White	35	20	65	15	15	10	10
	% Afr.-Amer.	50	30	<5	65	45	35	60
	% Hispanic	10	45	30	20	30	40	30
	% Asian/other	<5	<8	<3	<3	10	15	<1
% English Lang. Learners	<10	20	<10	<10	20	<10	<10	15
% Free-reduced lunch	65	70	35	80	75	70	80	90
Per pupil expenditures (\$)	12,000	15,000	10,000	15,000	15,000	>17,000	>17,000	12,000

Note: Figures provided have been rounded to protect the identity of the districts. Yearly per pupil expenditures are for 2004-2005.

The eight districts are located in five states and are diverse in terms of their geographic settings. Armstrong, Basie, and Gillespie are small- to mid-sized urban districts that are part of larger metropolitan areas; Hampton is similarly situated, but somewhat larger. To one side of each of these districts is a much larger city/district that forms the center of the metropolitan area, and to the other sides are more affluent suburbs. In contrast, Calloway, Dorsey, and, to a lesser extent, Joplin are more isolated geographically; they are not in areas dominated by a much larger nearby district. Finally, Ellington is a large urban district at the center of a large metropolitan area.

In each district, we interviewed the secondary mathematics supervisor(s), the director of personnel and human resources, and three principals (usually two high school

¹ We added three large suburban districts to the study for comparison purposes.

² Throughout this paper, pseudonyms are used in place of the actual district names. Names of great jazz musicians were used as the pseudonyms.

and one middle school).³ In three of the larger districts, where professional development was not overseen by the mathematics supervisor, we also interviewed the administrator responsible for planning professional development. Prior to conducting the interviews, we asked the director of human resources and the mathematics supervisor to each fill out a one-page questionnaire requesting some basic information about the number of the secondary math teachers in the district, the number of new middle school and high school teachers, etc.

The Challenges Faced by the Districts

I. The Surface View: Tight Supply, Strong Demand, Fierce Competition. The administrators interviewed in our study uniformly saw recruiting and retaining quality math teachers as a significant challenge. At the surface level, central office and building administrators collectively painted a picture in which supply was tight, demand was high, and competition for the most highly qualified math candidates very fierce.

Supply – A shortage of qualified candidates was almost always the first point that administrators mentioned when asked about the factors that made finding and hiring math teachers a challenge. Their general explanation was that there were too few math majors to begin with; that few of the math majors were interested in teaching; and that even fewer wanted to teach in urban schools because of the perceived challenges associated with them. District administrators were lucky if they received three applicants for a secondary math opening.

The supply of potential math teachers was further limited by the frequently expressed perception that many otherwise “qualified” teachers did not have the additional qualities that they needed in order to be successful in urban classrooms. Administrators’ list of desired characteristics and criteria was quite long and very difficult for any individual to meet. To start off, an ideal teacher candidate would be certified, have been prepared in a university-based teacher education program, already have teaching experience, and have classroom management skills, a deep understanding of math content, pedagogical content knowledge, and pedagogical skills such as the ability to promote active learning in classrooms as well as the ability to differentiate instruction. In addition, administrators appeared to have a set of extra characteristics or background factors that they saw as necessary for successful teaching in *urban* schools. These included: a deep commitment to urban education; strong interpersonal skills; a liking of children and an ability to relate to them; an understanding of the lives of urban children gained through life or work experience; and various personal skills and dispositions, such as persistence, flexibility, independence, and the willingness and strength to do one’s job despite the hurdles that are sometimes presented by district bureaucracy.

Demand – Although the small candidate pool seemed to be the first point that came to administrators’ minds, demand factors were also mentioned. The administrators

³ The individuals we interviewed held a variety of administrative titles. To maintain anonymity and confidentiality, we are referring to those interviewed by certain generic titles – such as human resources director, math supervisor, and principal – even though these titles do not always match individuals’ actual titles within their district.

were most likely to list retirements, enrollment increases, family leaves, and dismissals (involuntary terminations) as the main factors driving their need to replace 13-23% of their math teachers each year. Although there is a perception that many teachers voluntarily leave urban schools for suburban schools, our interviewees were somewhat less likely to mention voluntary departures as a major driver of demand, though this certainly played a role. In some districts, demand was also driven by policy and organizational decisions, including early retirement incentives, decisions to intensify math instruction (which meant that more teachers would be needed), and the creation of instructional leadership roles that took some math teachers out of the classroom and necessitated their replacement.

Competition – Administrators also described fierce competition for math candidates, and saw this competition as limiting both the number of applicants they received as well as their ability to convince applicants to accept job offers. Principals and central office administrators frequently described losing their most highly qualified candidates to other districts. Many administrators agreed with the high school math supervisor in one district who observed, “We are not getting what I consider to be the best people. They are going elsewhere.”

Principals often also described competition among schools within the same district for math candidates. This issue of internal competition was related to how centralized or decentralized the hiring process was within a district. Decentralized, or school-based, hiring has the advantage of allowing principals to choose teachers who would best fit their schools, or for teachers to choose where they prefer to teach. However, if not properly implemented, it also creates the possibility for intense competition between schools within the same district (Johnson et al., 2004; Liu, 2004). In our study, a few administrators did describe decentralized hiring systems that disadvantaged certain schools and contributed to staffing inequities within their districts.

II. The Role of Geography. Administrators frequently mentioned geographic location as a factor in explaining their district’s situation vis-à-vis the math staffing challenge. Location influenced the pool of applicants available to them as well as the competitive dynamics they faced. Across the eight districts in our study, we saw three distinct district experiences related to geography.

Life on the Urban Fringe – Four urban districts in our sample were situated inside or on the edge of the greater metropolitan area of a much larger city. This meant they often competed for math teachers with both a much larger urban district at the center of the metropolitan area as well as nearby suburban districts that were usually more affluent.

Stand-Alone Urban Districts – Three districts in our sample were more isolated than districts such as those discussed above. As such, they were relatively shielded from competition from other districts. While they certainly competed with nearby suburban districts for math teachers, administrators tended not to describe the same sort of competitive frenzy as did the administrators in districts located in larger metropolitan areas. They also had fewer problems with retention, since many of the teachers they hired had local roots and were not likely to leave the region.

Life in the Center – One district in our study is the commercial and cultural center of a large metropolitan region that has many universities that draws students from

far and wide. This resulted in a large supply of young, highly educated individuals. This was a mixed blessing, however, because this population is also mobile and transient. Many recent college graduates did not have local roots, and often moved away from the area after a few years.

III. A Deeper View: Policy and Organization. Factors related to federal, state, and local policy, and to district and school organization also shaped the experiences of districts and administrators. These factors further complicated the challenge of attracting and retaining qualified and high quality secondary math teachers.

Policy Factors – A number of policies appeared to influence the nature of the staffing challenge facing administrators, as well as how they responded to the challenge. These included the federal reauthorization of the Elementary and Secondary Act in 2001, better known as *No Child Left Behind (NCLB)*, state early retirement incentives, alternative certification programs or accelerated routes to teaching, and (as is the case for many urban districts) an increased reliance on state budgets for educational funding.

The highly qualified teacher (HQT) mandates of *NCLB* affected the work of administrators in a number of ways. First, the requirement that schools hire only “highly qualified” teachers restricted the supply of candidates and also reduced administrators’ flexibility in hiring. Second, the requirement raised the specter of having to replace current math teachers who, under the policy, were no longer considered “highly qualified.” This was especially an issue for the middle schools, where some math teachers were currently teaching under general K-6 or K-8 certificates, and may have done so effectively for many years, but did not hold subject area certification.

Alternative certification programs did increase the supply of math candidates available to schools and districts. However, administrators, in general, preferred to hire teachers who had traditional preparation.

Another policy that shaped the experiences of the urban administrators was their districts’ increased reliance on state and city funding. Urban districts tend to receive a higher proportion of their funding from state and local government, since they are often the recipients of compensatory education funds or, in some cases, have been taken over by the state. As a result, they can be disproportionately affected by budget delays which can, in turn, negatively affect their hiring timetables. According to school administrators, sometimes state or local governments did not finalize the budget until June, which meant that they could not hire new teachers until well past the time when the most desirable candidates had already accepted job offers of other districts.

Organizational Factors – Organizational decisions, structures, and processes also shaped the challenge and affected administrators’ ability to respond to it. These organizational factors fell into two areas: instructional decisions and hiring processes.

Districts’ decisions regarding how to organize instruction impacted the number and types of teachers they sought. For example, some districts and individual schools responded to pressure to raise math scores on state assessments by reducing the size of math classes or by having struggling students take two math classes simultaneously. This increased the number of math teachers that they needed. The creation of new instructional leadership roles also contributed to the need to hire math teachers since these positions were filled by experienced math teachers from within the district, whose schools then had to hire replacements. The district’s choice of math curriculum could also have an impact

on the staffing challenge. Different curricula placed different demands on teachers, which influenced the qualities that administrators looked for in candidates. Some administrators in districts that had adopted a standards-based math curriculum noted that they now needed teachers with a greater skill set and these teachers were harder to find.

The organization of the hiring process also influenced how districts experienced and responded to the staffing challenge. According to the interviewed administrators, the timetable of the hiring process played a significant role in their ability to attract and land desirable candidates. Many administrators felt their districts were relatively successful in hiring quality candidates if and when they were able to hire early. However, when, as more often was the case, they hired late, they lost many of the best candidates to other districts.

Several factors contributed to the late hiring: delayed budget decisions, administrator's lack of availability in the summer, and, to a lesser extent, candidates' renegeing on signed contracts. In addition, veteran teacher transfer provisions in the district's collective bargaining contract sometimes slowed down hiring, although this did not have as much of an impact as we expected. Despite the fact that the excess and transfer system⁴ is often pointed to as a main constraint on districts' ability to hire whom they want and to do so in a timely manner, very few administrators in our study, when asked, saw this as a significant factor. In only one district did the need to accommodate seniority-based transfers play a major role in delaying hiring.

Delays also resulted from the length of time it took for the human resources office to make and finalize job offers. District human resource (HR) offices varied in their ability to make a speedy offer once a school decided it wanted to hire a certain candidate. Some were able to hire quality teachers on the same day they made a decision, but more often they had difficulty processing the necessary paperwork and conducting reference checks in a timely manner, and even had to wait until hiring decisions were ratified at the monthly Board of Education meeting before extending contracts. Not surprisingly, HR directors and principals often had somewhat different perceptions of the responsiveness of the HR office, though all seemed to recognize the need to move quickly to hire teachers in shortage areas such as math.

The Strategies Adopted by the Districts

Confronted with a difficult challenge, districts and administrators adopted a number of different strategies for coping. In each of the eight districts, we found practices and reforms that held promise, and we heard about some recent improvements that helped make the situation better than it otherwise would have been. As a group, the districts adopted a range of strategies that attempted to either increase the supply of math candidates or reduce their demand for them by limiting turnover. Certain districts also attempted to make organizational changes or process improvements that would enhance

⁴ The transfer system refers to a system in which teachers already working in the district can request a transfer to another school that has an opening. The excess system refers to the system by which tenured teachers whose positions have been eliminated (either due to changes in enrollment or in academic programming) are placed in new positions since they have guaranteed employment in the district. These two systems may be linked or may operate separately. Also, districts vary in terms of the role that seniority plays in determining whose transfer request gets approved or where "excessed teachers" are placed.

their ability to identify qualified applicants, steer them to schools for which they would be a good match, and hire them quickly before other districts snapped them up.

Supply-side Strategies

Administrators' choice of what strategies to pursue appeared to be influenced by how they understood the staffing challenge, and what they viewed as possible and within their control. Because most administrators framed the math staffing challenge primarily as a problem of an insufficient quantity of qualified candidates, many of their strategies focused on increasing the supply of prospective mathematics candidates. Administrators sought to gain the authority to offer incentives to teachers in shortage subjects such as math, expanded their recruitment efforts, and even attempted to grow their own math teachers.

Flexibility in Pay and Incentives. The administrators in our study were well aware of how their salary and benefits packages compared with those of the surrounding districts with which they competed for teachers. However, administrators in these districts did not foresee any dramatic change in their districts' competitive position in the short term, given their current financial and political realities. Nevertheless, some administrators realized that they did have some possibility of modestly improving the financial incentives they offered to prospective math teachers without seeking across-the-board salary increases or other modifications of the district's salary schedule; for example, they succeeded in negotiating into their teacher contracts flexibility in assigning shortage-area alternate-route candidates to higher steps on the standard salary schedule based on their experience with other related careers.

Offering Support and Better Working Conditions as an Inducement. Some districts that were unable to offer even modest pay increases to math teachers attempted to use the promise of support and better working conditions as enticements. Such promises may not have been sufficient by themselves, but some administrators reported that they were successful when they combined assurances of support with tours of schools that showed candidates firsthand what it is really like to teach in the school, and gave them a glimpse of the actual school climate and working conditions.

Using School Tours to Dispel Stereotypes about Urban Schools. The administrators in our study often bemoaned the fact that candidates often had negative stereotypes about urban schools and students that prevented them from applying. However, they also noted that, if a candidate actually visited one of their schools, they were often surprised by how much nicer it was than their expectations. One HR director noted that this was an effective marketing tool because candidates often respond to the tour by saying "I'm shocked, this school really looks great, I want to work here." This strategy appeared to have two benefits. It dispelled myths about teaching in an urban setting for those who had overly negative images of urban schools, while also providing a reality check for those who might have overly positive or simplistic images of urban teaching.

Strengthening Relationships with Universities and Targeting Student Teachers. Administrators in all eight districts reported trying to build or rebuild relationships with local colleges of education to gain access to their graduates – that is, to increase the number of student teachers from the colleges who were placed in their districts. The

districts could then try to recruit the student teachers to return to the district once they had graduated.

Casting a Wider Net and Recruiting from Afar. Two districts recruited teachers from Puerto Rico and two from historically black colleges although their goal was primarily to find teachers with diverse backgrounds and not necessarily math teachers. Two districts recruited experienced mathematics teachers from Asian countries that have many English speakers. Although administrators reported satisfaction with the content knowledge and general teaching abilities of the foreign teachers, they described them as struggling at first to adapt to a vastly different cultural and educational context; however, many seemed to be able to rise to the challenge with proper support.

Hiring Teachers from Alternate Certification Routes. Three of the eight districts relied heavily on alternatively certified teachers, with 25-50% of their mathematics teachers coming from this route. Views about alternatively certified candidates were mixed. Some felt that many of the alternatively certified math teachers were only capable of teaching the ninth and tenth grade curricula (i.e., Algebra and Geometry), and that few had a deep enough knowledge of content or pedagogy to teach the more advanced math topics. Some administrators indicated that some alternatively certified teachers left the district abruptly, which they attributed either to the candidates' lack of commitment or to their lack of formal training or experience (especially in the area of classroom management). As a result of such negative experiences, some districts were reluctant to hire alternatively certified teachers. Others viewed alternatively certified candidates more favorably. One mathematics supervisor, for instance, observed that: "They can teach full range, especially people in engineering and statisticians.... When they merge and include their life experience, the real-life applications that they do, they make the classroom more attractive to the kids. Great teachers make classrooms like a lab. Alternate route teachers can provide a wealth of knowledge." Unlike teachers from foreign countries who were generally experienced teachers, the alternate route teachers lacked classroom experience, and, although they did not experience the same culture shock as the foreign teachers, they were sometimes surprised by and unprepared for what they found in the classroom.

Partnering with Teach For America. Two of the eight districts in our study had partnerships with Teach for America (TFA), but few of these were mathematics teachers, and for the most part these teachers only taught for two years, so they were only short term solutions to hiring shortages.

Grow-Your-Own Strategies. Districts also tried to grow their own math teachers by either sponsoring district-based alternative certification programs or initiating programs that helped current district teachers get additional certification in mathematics. Five out of the eight districts had implemented some sort of grow-your-own strategy. Some of these strategies involved creating and staffing internally run training programs – for example, programs which provided K-8 certified teachers with "the math content that they need to get math certified" – whereas others provided incentives for current district employees to go back to a university to get certified in a high-need subject area.

Demand-side Strategies

While increasing supply was the focus of the majority of district strategies, administrators in our study also described strategies that involved reducing demand by

decreasing teacher turnover. In five districts administrators felt that teacher turnover was a major challenge. In two others, administrators felt that they did not have a retention problem and were doing a very good job keeping teachers once they hired them.

Some administrators in the larger metropolitan areas (but not those in stand-alone urban districts) appeared to view the turnover as inevitable because many of their new hires were graduates of local universities but were not local to the city, and many of them could be expected to leave the district eventually and return to their home communities. On the other hand, although they thought that replacing math teachers was a major challenge, not all felt that they had difficulty in keeping the teachers that they really wanted to keep and regarded as keepable. Some administrators distinguished between retention and turn-over and argued that although teachers leave because of “life changes that everybody has ... we have very few math teachers that we lose who we think are terrific that go off to someplace else because they don’t like us. Generally speaking, the ones we want, we keep.”

Providing Supports for New Teachers. District administrators described in detail a variety of induction and support programs that they provided to new math teachers. These included mentoring, support from coaches and instructional leaders, workshops, and other professional development activities. Administrators also regularly discussed these support programs with prospective teachers; indeed, many mentioned that the prospective teachers whom they interviewed asked about such support. Because ours was an interview study, we had no information about the quality and effectiveness of these programs. However, administrators did speak about the link between support and the retention of new teachers, and in at least two districts administrators attributed their relative success in retaining teachers to their comprehensive support programs.

One high school has had considerable success in terms of retention. Over the past 3-4 years, virtually no math teachers have left this comprehensive urban high school voluntarily. Openings are mainly due to retirements or to dismissals for poor performance. The high school’s department chair attributes this to the many supports that the school has in place for math teachers:

We are very good with working with and supporting new teachers... We have a number of programs [in place] that really...make people feel comfortable and also make people understand that we’re asking them to grow and not necessarily be experts when they show up here.

In this high school,

- Each new teacher is assigned a mentor, who is a very capable math teacher.
- The department is led by a chair and supported by an instructional leader one of whose main tasks is to work with and support non-tenured teachers. Their work with the teachers is confidential and non-evaluative.
- In addition to the non-evaluative support and informal observations, teachers in this school are formally observed and provided feedback six times a year.
- New math teachers receive strong support from colleagues. Math teachers share a physical office space so that, as the department chair observed, “A new teacher in one of these offices not only has their mentor, but they really have 10 other mentors or people working with them.”

- A New Teacher Committee helps new teachers assimilate socially and professionally.
- The Teacher as an Observer program provides substitutes in order to enable new teachers to observe master teachers in areas they are deemed in need of support.
- A new teacher institute (open to all teachers) that consists of 8-10 one-hour workshops in the fall and another 8-10 workshops in the spring.

Fostering a Collegial School Culture. Administrators in many schools (i.e., in at least one school per district) attributed the retention of teachers to the collegial and supportive culture of their school. Some administrators described how their math teachers would support one another and were also social and friendly outside of school. One HR director attributed the success in teacher retention of some district schools over others to:

Providing a culture where somebody wants to work. ...I have schools that match one another by student population, administrative population, a lot of factors, and I have one school that has a ... 17% turnover, and one school that has a 0% turnover. ... why is this happening? ... You have to look at the culture of the school. Do teachers have planning time, do they work together for the benefit of all kids, is there administrative support for teacher edification, and so on and so forth. So there are a lot of factors as to how, whether a teacher is going to be successful or not, but research says that administrative support is the number one determinant in success, and those are the schools that are successful in not only getting the best people, but keeping them, too.

Certifying K-6, K-8 Teachers who Currently Teach Middle School Math. The teacher quality mandates of *No Child Left Behind* raised the specter of having to replace current math teachers who, under the policy, were no longer considered “highly qualified.” This was especially an issue for the middle schools, where some math teachers were currently teaching under general K-6 or K-8 certificates and did not hold subject area certification. Although the NCLB mandate was intended to eliminate those lacking the appropriate credentials from teaching mathematics, it also eliminated those who did not formally meet the new requirements but who had gained valuable experience and expertise through teaching mathematics at the middle school for a number of years. Three districts anticipated this potential problem and attempted to head it off by establishing a training initiative to help current middle school teachers get certified in mathematics. Thus, the district reduced its demand for new teachers by ensuring that these math teachers would have an opportunity to stay in their positions.

Organizational Reforms and Process Improvements

Administrators whom we interviewed adopted a number of practices related to reorganizing district recruitment and hiring practices. Although districts operated under certain constraints—such as the timing of the state budget, hiring freezes, or the requirement that they honor veteran teachers’ transfer rights—several districts reported making changes that allowed them to start the hiring process earlier, process applications more efficiently, improve the collection and flow of information between the district personnel office and school principals, and extend job offers on a timely basis. Making

these changes required coordination, altering well-established processes, and/or utilizing new tools such as information technology.

Reducing the Impact of Seniority-Based Hiring. Overall, the seniority system appeared to have had a rather limited impact on the hiring of math teachers across the eight districts.⁵ In only one district did the transfer process have a major impact on the timetable for hiring new teachers. In two other districts, the transfer process did slow down hiring in the recent past, but its impact had been greatly reduced by negotiating to begin the process earlier and reducing the role that seniority automatically played in placement decisions; in one district, for example, certain shortage area or high-need school positions could be "open posted" and be made to bypass the transfer process entirely.

Offering Letters of Commitment Before the Budget is Set. Some districts were not allowed to offer contracts to candidates until the budget was passed and money came through, which was sometimes as late as June. However, half of the districts in our study tried to cope with such budgetary constraints and uncertainties by offering candidates early letters of commitment, letters of interest, or provisional contracts (promising a position in the district but not at a specific school).. Administrators tried to develop and justify a projection of math teacher openings for the coming year and obtain permission to hire the projected minimum number of math teachers needed before the budget was actually approved. This strategy, however, met with mixed success, because these letters were often not binding or because candidates did not value them. One HR director observed that math candidates, since they knew they were in high demand, typically were unwilling to accept contracts to the district as a whole without having an exact school placement. Nevertheless, this was a tool that conveyed to applicants that the district was committed to hiring them, even though the constraints that they faced precluded their acting on that commitment until later.

Providing Incentives for Early Notification of Intent to Retire or Resign. Another tactic that some districts employed to reduce the amount of late hiring was to encourage veteran teachers to let them know early of their intentions to retire, so that the district would know how many positions it had to fill and could then recruit and hire appropriately. When teachers waited until late spring or summer to inform administrators that they were not coming back for the next school year, administrators would have to look for replacements when high quality candidates were in short supply. One district tried to address this problem by stipulating that teachers would receive their longevity stipend the first year they retire if they announced their retirement intentions by April 1st.

Changing the Balance between District Centralization and School Autonomy. The districts in our study varied in how they divided responsibility for hiring between the central office and individual schools, and among principals, HR personnel, and math supervisors. In all of the districts, however, principals played a major role in hiring decisions. As part of their strategies to address the challenge of recruiting and retaining teachers, some districts adjusted the balance between centralization and decentralization of the hiring process. Movements toward decentralization sought to reduce hiring bottlenecks and bureaucratic delays, empower principals, and ensure that teacher

⁵ In most of the districts this was the result of changes in the hiring process that had taken place in recent years.

candidates and schools made good matches. Movements toward centralization sought to reduce duplication of effort and competition between principals, create more uniformity in hiring standards, and also address issues of equity by targeting teacher resources to schools where the need is greatest.

Investing in and Using Information Technology. Several districts adopted information technology to support their recruitment and hiring activities. Many used online databases to collect, store, and view candidates' applications. As one high school principal remarked, "The [online] system enables you to easily access information about teachers if you have their name, and it allows screening online rather than waiting for folders to come from the [central office].... You can work with resumes on your own time and not have to worry about returning material to HR."

Utilization of information technology allowed districts to improve the processing of applicants, their ability to visualize their applicant pool, and to get information to principals with openings. To take full advantage of this technology, however, districts had to go beyond simply buying hardware and software. They also needed to review and reorganize their overall hiring processes. In one district, the incorporation of information technology occurred in the context of a long process of decentralizing its hiring process. The introduction of a better HR information system complemented these organizational changes and provided principals with a better tool for identifying candidates for their openings. Candidates who in previous years were lost in the shuffle were now more likely to get steered to schools with appropriate openings. The district's director of human resources described the impact of their new online system:

For us, historically, a challenge has been connecting those applicants to the people who are making the selection decisions, which are the schools and principals. But that is one of those problems that we've done a lot to solve with an online system, which allows principals to search for any licensed math candidates in the entire database, and allows us to quickly find and forward resumes and attach applicants to jobs, those kinds of things. The technology has helped us a lot. And I think, in some ways, maybe the applicant pool wasn't as small as we thought it was. We just weren't as efficient in mining it and connecting those applicants with those principals who were hiring for those positions.

The year 2006 was the first hiring season with the system up and running, and it was the first time in many years that the district had a surplus of qualified math candidates.

In contrast, information technology allowed a different district to recentralize part of the hiring process and relieve busy principals from the burdens of recruiting and performing the initial screening of candidates. They still played the major role in the hiring decisions, but were no longer left to fend for themselves. This smaller district was able to benefit from some of the advantages of centralizing the initial step of the hiring process without incurring some of the disadvantages. They reduced duplication of effort and increased consistency in how candidates were treated, while still giving principals the authority to hire candidates that they felt were the best fit for their schools.

The experience of a third district, however, suggests that simply investing in technology is not enough if administrators do not also change organizational processes to take advantage of the new technology. Although this district also invested in an online

application system, many principals still complained about lost paperwork, slow processing of job offers, patronage, and difficulty communicating with the central HR process regarding the candidacy of applicants. Apparently, the central HR office did not have sufficient capacity or will to put the new technology to productive use.

Reflections

In the previous section, we described the various strategies that the districts we studied use to help them ensure that all of their students have qualified teachers of mathematics. Not all districts used the same strategies or combinations of strategies. The mix of strategies used by the administrators of a district appeared to reflect an interaction between three factors: (1) the particular nature of the challenge facing their district, (2) the constraints (both real and perceived) that administrators faced, and (3) the organizational capacity that the districts and schools had or were able to build. It is not surprising that administrators focused on different aspects of the staffing challenge or approached the challenge in somewhat different ways because the individual context of each district was different – so that administrators faced somewhat different challenges and constraints and their districts varied in terms of organizational capacity and financial resources.

An important finding of this study was that the district personnel were very aware of the challenge of attracting and retaining high quality math teachers, took it very seriously, and seemed to be working diligently to develop policies and practices that would help them meet this challenge. Indeed, despite the challenges that they faced in hiring math teachers, most of the districts succeeded in filling virtually all of their openings with “highly qualified” math teachers. This finding was interesting and surprising.

On the other hand, it was clear that when faced with the need to fill a position quickly, administrators simply had to compromise and hire less than satisfactory candidates. Some of these teachers were hired with the expectation that, although they were “qualified” according to *NCLB*, they might not be able to succeed as urban math teachers. Administrators were well aware that “highly qualified” did not necessarily mean high quality. Thus, although they were meeting the mandates of *NCLB*, they were still struggling with getting mathematics teachers with the full set of skills, knowledge, and dispositions required to teach successfully in an urban setting, and in some ways, the mandates of *NCLB* were making this task more difficult by limiting their flexibility.

Our findings suggest that organizational decisions do matter. Although districts and schools are certainly affected by broader economic and demographic factors that are very powerful, what we have found suggests that the decisions and actions taken by district and school-based administrators can have an effect on the recruitment and retention of math teachers. The administrators we interviewed had considerable agency. How they viewed and understood their challenge, and the strategies they employed, did have an effect on their districts’ ability to meet the challenge of staffing their schools with high quality mathematics teachers.

Our analysis also suggests that although increasing pay to attract more math teachers may be important, focusing solely on incentives is problematic. The strategies that seemed to bear the most fruit involved: investing in the training and preparation of

high quality mathematics teachers, investing in the capacity of central human resource offices to manage the recruitment and hiring process more effectively (using information technology and/or process improvements, and investing in staff), and improving the capacity of schools to provide comprehensive, on-the-job support to newly hired teachers to ensure their effectiveness and retention. This is not to say that incentives in the form of salaries are unimportant. Indeed, if there are major salary discrepancies between a district and its neighbors, all of its capacity-building efforts may be for naught.

Although we did not ask administrators directly about state and federal policy, their experiences and the nature of the challenges they described suggest that the following policies are worth considering:

- Providing financial incentives to encourage math majors to enter teaching – The overall applicant pool is simply too small, which leads to intense competition that disadvantages urban school districts. In the long term, increasing this pipeline would likely make the challenge more manageable.
- Reforming the single-salary schedule to offer differentiated pay to teachers in shortage subjects such as mathematics, as well as incentives to take positions in urban, high-poverty schools. At a certain point, the pay disadvantage that some urban districts have can be almost insurmountable. Administrators in our study lacked the resources or the flexibility to offer sufficient inducements to high quality candidates.
- Providing mechanisms that reduce the impact of state budget delays on districts' ability to hire.
- Providing funds that help districts build capacity in their human resource systems—e.g., money for better information systems and additional staff
- Dedicating resources to help districts build capacity in their support systems for new teachers—e.g., for strengthening induction and support programs for new teachers.

Many of these policies will clearly be costly. Some of these costs could be covered by reallocating current resources or spending current resources more wisely. However, it is also likely that additional resources will be necessary, especially if policymakers seek to reform the teacher pay structure. However, if we are serious about ensuring that every child is taught by a capable and effective mathematics teacher, we must make the necessary investments.