NYC HS Admissions Matching Algorithm

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The New York City public school district is the largest in the country. Unlike most other districts, there is no specified path for any student going from middle school to high school; that is, students are not assigned a high school based on their location. Rather, students are "matched" with a high school through a ranking system. For our project, we explored the algorithm used to match New York City middle school students to New York City high schools.

NYC middle school students are tasked with ranking the top high schools they would like to attend. Meanwhile, high schools must rank the middle school students that they would like to attend their school. These rankings are then placed into an algorithm; students are told which high school they matched with and high schools are given a roster of students. This algorithm closely resembles the stable marriage problem. In the stable marriage problem, parties are matched together; the algorithm is complete when no two parties that would prefer to be with each other over their current partner exist.

High schools rank students based solely on academic criteria, such as math scores, reading scores, and attendance. They do not consider factors such as race, ethnicity, gender, or socio-economic background. Students, meanwhile, base their rankings on personal preference and knowledge of the high schools. Similar to the college application process, students' preferences may be heavily influenced by their access to and/or knowledgeability of their guidance counselor. A knowledge guidance counselor who knows the student personally, for example, may be better able to advise the student on strategic rankings. A guidance counselor without such knowledge may be less helpful.

This process is filled with inequalities, beginning with the very first step: students ranking schools. This step is so crucial and subject to inequalities because students only get ranked by schools that they rank. That is to say high schools only rank students that rank them. This is much like applying to college: you can't get into a school that you do not apply to. Yet, just like applying to colleges, it is often inadvisable to apply only to Harvard, Yale, and Columbia because there is a high chance of getting rejected by all of them. If a mediocre student only ranks the best of the best high schools, there is a good chance that they'll fail to match with any school and will end up placed in the school closest to them, which may not be best suited to them.

As such, there is a clear art to the selection of high schools a student chooses to rank. Yet students cannot be expected to grasp the nuance of this system, or of familiarizing themselves with all high school options, let alone knowing where they stand against other student applicants. This is where guidance counselors may come in. If a student attends a

school that has enough resources to devote a counselor to dealing only with high school resources, then that student is immediately at an advantage compared to students without those resources because the counselor has a greater ability to understand the ranking process and advise on it. The more counseling resources a school has, the better opportunity a student will have of getting into the best possible school for that student. And, of course, the wide disparity between counseling resources in middle schools is often directly correlated with the socio-economic status of the students in attendance.

That said, there are a number of reasons why this system exists as it is, despite the clear inequities. For one, given how massive the school system is and how many students there are, it would not be feasible or productive for schools to rank students who are not interested in attending that school. Additionally, with approximately a million students in the NYC public school system, it would be impossible to recruit and maintain employment of enough guidance counselors to ensure that each student saw someone who was intimately familiar with their abilities and the high school system.

The second step of the process, when schools rank the student applicants, is also ripe for creating inequalities. After students rank their top twelve schools, each screened school receives a list of the students that had the school in their rankings. The schools then use their own method of ranking these students, often defaulting to factors such as math and reading test scores as well as attendance percentage to determine which students they would prefer to admit to their school.

There is a real problem when schools are allowed to use factors such as test scores and attendance percentage in their admissions criteria. Middle schools that provide better test prep and more testing resources have a clear edge in getting their students into highly ranked high schools. These types of schools tend to be located in areas with a low percentage of minority students. Meanwhile, attendance percentage is often skewed against students that may have extra duties at home such as caring for a younger sibling or an elder relative. If these students are unable to attend school as often as their peers, they run the risk of being ranked lower by the high schools they would like to attend. Again, this problem tends to persist more in minority communities.

Unfortunately, there isn't a great way around using these metrics. Outside of math and reading test scores and attendance percentage, there aren't many objective measures that schools have available to them to use for rankings. One possibility would be to use class rank, which eliminates the attendance metric, but many middle schools don't supply that data for high schools to use. Even this metric still relies on academic performance within a school, which can disproportionately bias against minorities that are struggling with outside conditions unrelated to their academic abilities or devotion. A final option that the DOE does use is to mandate that schools admit a designated percentage of students from different testing quartiles in order to provide opportunities for students that may not be capable of showing their abilities through testing. While this helps to reduce some of the inequities, it isn't a complete solution as not all students are able to benefit from this policy.

Sources

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