



RESEARCH BRIEF

for the Houston Independent School District

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An Evaluation of Matrices Used to Select Magnet School Students

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HERC was asked by HISD to evaluate the predictive value of aspects of magnet qualification matrices, and to suggest revision/consolidation of the matrices. HERC used an econometric education production function model to predict STAAR reading and math test scores among students who applied to HISD magnet programs in fall 2013 for the 2014–15 academic year. The predictive value of qualifications is assessed based on model fit statistics. Generally, HERC recommends including prior year’s measures of STAAR reading and math, Stanford reading and math (and language for 5th grade applicants), and course grades for magnet matrices for students applying middle and high school magnet programs. For 5th grade applicants, we recommend that schools use the prior year’s course grades; for 8th grade applicants, we recommend using prior year’s course grades as well as first cycle grades from the year of application. We find no evidence that different matrices are useful for different types of magnet programs, and suggest that one matrix could be used for all magnet applicants. Finally, we describe group-level variations in effects of qualifications, which may be useful in how HISD chooses to weight particular qualifications in its matrices.

BACKGROUND

The draw and principle behind magnet schools rests in “three essential civil rights policies—information, open access, [and] desegregation standards” (Orfield 2008: 3). Magnet schools were initially instituted to buttress integration efforts after state-based racial segregation in public schools was legally overturned. By design, magnet schools tend to be located in high poverty urban districts that seek to attract top students within their current student population, as well as students whose families left urban schools with the onset of white flight (Olmstead et al. 2003; Goldring and Smrekar 2000). Although magnet schools’ unique offerings of specialized curricula have been successful in attracting interested students and families into public school systems, today’s public schools remain largely segregated, which is linked to depressed minority student achievement (Laosa 2005). Moreover, increased interest in magnet schools has brought with it the challenge of

oversubscription, which forces schools and districts to weigh the social factors and student credentials it considers most important to determine which students are accepted into these schools.

School districts offer anywhere between one and one hundred specialized magnet school themes, and the number of magnet schools continues to grow both within the US and also outside the country, with over 4,000 magnets in the US alone (Olmstead et al. 2003). Magnet schools attract students who want to be there and hence are more likely to succeed (Olmstead et al. 2003). Texas is one of two states (the second being Florida) with the largest number of magnet programs in the country. Although magnet schools are public K-12 institutions, or programs within schools (Olmstead et al. 2003), they differ from traditional public schools. The goal of magnet schools is to bring students of various racial and economic backgrounds under one roof and to expose them to each other as well as to educational opportunities that minority students would likely

not experience otherwise (Goldring and Smrekar 2000). Magnet schools provide distinctive curriculum, integrated staff, superior information for parents, and also tend to provide students with transportation. The specialized programs can be in math, science, computers, technology, foreign language immersion, environmental sciences, communication arts, or other specializations (Ballou 2009; Goldring and Smrekar 2000). Magnet schools are in popular demand from families exercising choice.

Magnet schools are a principal form of *school choice* policy, which reflects an educational reform movement that allows parents to utilize public funds allotted for their children's education to choose which school their child attends (Education Week 2004). The school choice movement operates under the idea that competition among schools for student applications will lead schools to improve, and in this way the schools will meet the needs of its consumers, in this case parents and students (Pattillo 2008). Supporters of the movement argue that school choice will improve school accountability and this will further lead schools to offer different educational curriculum instead of utilizing a "one-size-fits-all model" (Education Week 2004) and the final result will be improved student achievement (Hoxby 2003). Advocates of school choice also suggest that such options enable poor parents, who cannot purchase homes in well-off neighborhoods zoned to better schools, to send their child to a better school of their choice (Chavous 2012; Greene 2000). School choice is further believed to enable exposure to a diverse student body (Rees 2014). However, some studies suggest that school choice actually enables white flight by benefiting the already advantaged students with affluent backgrounds (Pattillo 2008) who have differential access to information and social capital aiding them in their educational pursuits.

Although there are several types of choice schools (e.g. charters), we focus on magnet schools as they remain a popular and yet relatively understudied form of school choice. In the present study, we identify predictors of student success in magnet schools located in a large urban district in Texas. We model an equation production function on outcomes of standardized test scores, math course grades, and ELA course grades net of school and student characteristics. Following the call of Ballou (2009), we exploit admissions lottery data as it is our closest source to a random assignment of students to magnet schools. Additionally, this study contributes to magnet literature through locating our study of magnet

schools in a less explored geographical region, the South. The location of most magnet studies is geographically skewed, with most studies taking place in the Northeast US (Ballou 2009). Determining the factors that most successfully predict student achievement in magnet schools is an invaluable step towards reinforcing student success in the magnet setting, and ensuring that the full diversity of students who can do well in magnet schools have the chance to gain entry.

Magnet School Students and Integration

Undoubtedly, magnet schools have been employed as tools to create racially balanced schools (Goldring and Smrekar 2000). However, legal challenges to magnet admissions policies designed to ensure racial diversity have largely been dismantled (Goldring and Smrekar 2000; Siegel-Hawley and Frankenberg 2012), particularly following the Supreme Court decision in 2007 in *Parents Involved in Community Schools v. Seattle School District*. This forces districts to develop strategic and innovative methods of admissions that both meet legal standards and remain true to the spirit of integration at the heart of magnet schools.

The composition of the magnet student population at the national and local levels can tell slightly different stories. At the aggregate national level, magnet schools serve higher percentages of students of color than regular public and charter schools (Siegel-Hawley and Frankenberg 2012). However, black and Latino students in magnet schools are also more intensely segregated than in regular public schools (Siegel-Hawley and Frankenberg 2012). In terms of socioeconomic integration, magnet schools serve a similar proportion of low-income students as regular public schools (roughly 44-45 percent), though both regular and magnet schools serve proportionately fewer low-income students than charter schools (Siegel-Hawley and Frankenberg 2012). Compared to white students, black and Latino students have much greater exposure to low-income students across all public, magnet, and charter settings (Siegel-Hawley and Frankenberg 2012).

Within the context of specific locations, however, the story of magnet school composition varies. Goldring and Smrekar's (2000) study of Cincinnati and St. Louis found that, in contrast to other choice schools (e.g., charters) as well as traditional public schools, magnet schools serve less affluent students who are more likely to be students of color. However, in another urban district, magnet school students were not

representative of the broader district's composition; additionally, magnet schools enrolled fewer minorities, males, and economically disadvantaged students (Lohmeier and Raad 2012). Examining a majority-minority district in St. Louis, Grooms and Williams (2015) found that while the magnet schools—like the broader district—were majority-minority, magnet schools had lower black student compositions on average than in district schools as a whole. Individual school districts may differ in their magnet student composition, particularly as magnet student selection processes vary across districts, producing unique levels of racial and socioeconomic diversity within the magnet student population.

Selection Processes for Magnet Students

Across the country, school districts employ various application procedures to manage student access to magnet schools. Within the magnet school community, there was a movement towards reassessing admissions criteria after the cessation of court-ordered desegregation supervision in public schools during the 1990s and 2000s (Frankenberg and Lee 2008; *Gifted Child Today Magazine* 1998). As a popular form of school choice within the public school setting, there are often more applicants than available seats in magnet programs. However, Siegel-Hawley (2014:512) warns that educational stratification worsens without “protective mechanisms” such as outreach efforts to ensure that all families know about their schooling options, resources such as free transportation to ensure that students can reasonably attend these schools, and the reduction of “entrance hurdles” such as family involvement requirements or competitive admissions processes. Currently, there are three predominant methods for magnet student admissions—neighborhood residence (zoned school), lottery systems, and meeting achievement and/or conduct criteria. Frequently, schools and districts opt for magnet admissions systems that incorporate elements from each of these methods. Among the most common methods of accepting students into magnet schools is based on students residing within the school's attendance zone (Ballou 2007). Based on data from the 2000 Census, regular public schools in the largest U.S. school districts would be substantially more integrated if all children attended their neighborhood school (Saporito and Sohoni 2006). However, there is evidence to suggest that accepting students into magnet schools based on neighborhood residence is not a certain resolution to school segregation. Affluent families tend to seek out particular neighborhoods based on their

zoned school preference, as well as schools with restrictive application processes (Ballou, Goldring, and Liu 2006). This could compromise school integration efforts based on neighborhood resident admissions.

Random lotteries in their purest form would allow all students an equal chance to be admitted to the magnet school of their choice. Students are often allowed to enter multiple lotteries and those not selected by the lottery drawing are waitlisted. However, few schools and districts operate their lottery systems exclusively in this manner. Often, districts implement modified forms of lotteries that incorporate a set of qualifying criteria for students to join the pool of magnet applicants. Because of the emphasis on standardized test performance in meeting state and federal education requirements, urban districts often use standardized test scores, GPA, suspension incidence, and attendance rates to select their top students for magnet and charter schools (Lohmeier and Raad 2012). In order to gain a broader demographic mix of students, schools may also implement an admission system that allocates a set number of magnet seats to neighborhood residents, along with a set of seats for lottery admissions. Moreover, districts and schools often employ considerable discretion in magnet student admissions, as some students are afforded additional consideration because they have siblings already attending the school (Ballou 2007), while others gain “conditional” admission in spite of somewhat lackluster test scores or GPA (Lohmeier and Raad 2012).

Two examples of magnet admissions systems include the Los Angeles Unified School District (LAUSD) as well as HISD. LAUSD accepts students into magnet programs based on a priority point system that assigns additional points for continuing magnet students (current magnet students transitioning across school levels), students waitlisted in the prior year, applicants to predominantly minority schools, students leaving overcrowded schools, and students whose siblings already attend the magnet school to which they are applying. For more academically advanced programs, LAUSD requires that specific achievement criteria be met for all admissions. In HISD, applications are placed in a lottery that randomly assigns spaces for qualified applicants and siblings of current magnet students. Each school reserves 25 percent of magnet spaces for siblings of students who are already enrolled for the upcoming school year. However, specific schools within the district—particularly those serving gifted and talented students—have

additional academic qualification criteria for admission (HISD 2015).

The Selection Process and Methodological Bias

A review of the various methods employed by districts to manage magnet student admissions reveals an array of complex considerations that researchers in the field must confront. Grooms and Williams (2015:457) observed, “The ways in which districts implement magnet school policy not only influence the demographics of the school population, but also impacts the long-term academic and social experiences of students in the school.” Specifically, quantitative studies must address factors such as student selectivity, appropriate comparison groups, and policy shifts in establishing clearer associations between student and school-level factors and student achievement in magnet schools.

Self-selection is perhaps the strongest methodological concern in studying magnet programs and student achievement, such that the association between magnet school enrollment and student achievement is confounded by parental and family characteristics that influence where students go to school and how much they learn (Ballou 2007). Particularly as admissions criteria become more regulated, it is likely that more educated and affluent parents will access those options than others. Admissions conducted through a randomized lottery system can help disentangle the effect of the magnet school on student achievement from factors that led specific types of students to particular schools (Ballou et al. 2006). It also establishes a natural comparison group, particularly among those who enroll in zoned schools as compared to applicants who enrolled in magnets (Ballou et al. 2006; Howell and Peterson 2002).

However, even with a true randomized lottery, the comparison group is much more difficult to ascertain. Magnet applicants who are not admitted disproportionately leave their school districts, leading to missing data in the comparison group (Ballou 1997; Ballou et al. 2006; Engberg et al. 2014). Noncompliance with the lottery outcome may mean that parents send children to a nonmagnet program within the district, or they leave the district and send children to private or charter school outside the district. Moreover, students may be admitted but may not attend (Ballou 1997). Those at risk of leaving the district tend to be more affluent, from better educated neighborhoods and are less likely to be black—this is the case particularly at the elementary school level where the fraction of at risk households is highest (Engberg et al. 2014). Considerations must

also be made for students who leave the magnet school before graduating, which may be due to dropout or to students transferring to different schools (Lohmeier and Raad 2012).

The HISD Magnet Selection Process

The HISD magnet selection process underwent a significant change before the 2014-15 school year. The district transitioned from a paper application process, in which individual applications were delivered to each school that a student applied to, to an online application process in which one application was sent to several schools. This online application system also digitized and systematized application data, connecting the list of schools to a student background, achievement, and school data. This offered an unprecedented opportunity to systematically examine the magnet qualification and selection processes, as well as the influence of magnet attendance on student achievement.

At the time of data capture, students submitted applications in the fall of 2013 for admission to magnet programs for the 2014–15 academic year. Most magnet middle and high schools employed qualification *matrices* as the first part of the selection process. These matrices assigned points to students for some combination of student achievement in course grades, standardized tests (STAAR or Stanford/Aprena), behavioral conduct grades, and school attendance. Each magnet program type (e.g., fine arts, STEM, languages) used a different matrix with particular cutoffs and points assigned. While all programs used the same general criteria, some specialized schools used additional criteria, such as a specialized admission test or an audition. Matrices assigned an overall number of points to each student based on these criteria; students who reached a particular point threshold were considered qualified for admission to the magnet program. Schools were allowed to lower their threshold if they did not fill all available slots, but schools were not allowed to raise the threshold beyond that set by the district.

Beyond qualification, magnet schools that were oversubscribed used a lottery system to select among qualified students. This lottery is randomly selected, with the exception that up to 25 percent of slots are reserved for siblings of currently enrolled students. Qualified students who are not initially assigned a slot at a magnet school are placed on a waitlist. The magnet selection process is independent at each school; that is, a student’s probability of admission to one school is not influenced or informed by their probability of admission at another school. As such, students can

be admitted or waitlisted to more than one school. After parents are informed of magnet lottery results, they must select one of the admitted schools, but are allowed to remain on waitlists and can change their school selection at any point before the first day of school, dependent on availability. As such, there is a great deal of reshuffling that occurs before students enroll in the following academic year.

RESEARCH QUESTIONS

Given this online magnet application system and the qualification matrices in place during the 2014-15 school year, HERC and HISD wanted to answer the following research question:

- What best predicts achievement for students enrolled in magnet programs?

This question is conditional on the magnet school a student enrolls in, which itself is dependent on the set of schools to which a student is initially admitted, how students choose between their initial options, and whether students change their election if they are moved up from the waitlist at other schools. Unfortunately, HISD does not yet have such a detailed level of data capture for applicants to the 2014-15 academic year. HERC anticipates being able to access these detailed data in later years.

Rather than addressing the magnet selection process itself, this analysis instead focuses on the qualifications that predict student achievement among applicants, independent of the school to which a student was accepted or enrolled. This strategy produces an estimate of the factors that predict increases in student achievement over time, under the assumption that achievement prior to enrolling in a new school is most predictive of achievement after enrollment, regardless of whether a student enters a magnet or non-magnet school. As such, the following are research questions addressed in this report:

1. Which student qualifications are most predictive of achievement for students who apply to magnet programs?
2. Do different magnet programs (STEM, language, fine arts) need to use different qualification matrices?
3. Does the effect of student qualifications on achievement vary by student background characteristics?

DATA AND METHODS

Data

Analyses focus on students enrolled in HISD in the fall of 2013 who applied to magnet programs for the 2014–15 academic year. We limit the population to students applying to grades 6 and 9, as they are applying to middle and high schools that use qualification matrices. We do not examine applicants to elementary schools for two reasons: 1) beginning students have not currently been enrolled in HISD and thus do not have administrative records; and 2) elementary magnet programs generally do not use qualification matrices, except for Vanguard (gifted/talented) magnet schools. We further restrict the analytic sample to students who were enrolled in HISD continually from 2011–12 through 2014–15, to ensure enough data to conduct analyses. This includes approximately two-thirds of all applicants to grades 6 and 9. The analytic sample is selective of students who are less mobile than the overall pool of magnet applicants; moreover, the pool of magnet applicants is likely to be more selective of higher-achieving students than the HISD population as a whole.

Measures

The dependent variable is the change in STAAR reading and math scores from 2013 to 2014. These would have been 4th and 5th grade scores for applicants to 6th grade, and 7th and 8th grade scores for applicants to 9th grade. We focus on achievement among all magnet applicants, regardless of which school a student was accepted or enrolled in. The focus on prior achievement is intended to be a precise estimate of the factors that predict increases in student achievement over time, under the assumption that prior achievement is most predictive of achievement after a student enters school in 6th or 9th grade. Later, in confirmatory analyses, we apply our model to 2015 STAAR reading scores (math scores were unavailable).

The main independent variables are based on the qualifications included in any of the existing magnet matrices used in fall 2013, at the time that the analytic sample was applying to magnet programs. For the analytic model used, these are all measured in terms of change or growth scores between years. Independent variables include: change in STAAR reading and math scores (2012-2013); change in Stanford reading, math, language, science, and social studies scores (2012-2013, 2013-2014); change in final year academic course grades (2012-2013, 2013-2014), measured as

percentages; change in conduct grades (final year 2012- 1st grading cycle 2013); change in number of unexcused absences (2012-2013).

We also used indicators of the type of magnet school applied to, in order to determine whether the same qualifications could be used for the following magnet school program types: middle school career, art, language, STEM, Vanguard (gifted/talented); and high school career, art, language, STEM, health professions, and Vanguard. We also examined whether effects of qualifications differ by student ethnicity (American Indian, Asian/Pacific Islander, African American, Hispanic, White, or Multiracial) and economic status (not disadvantaged, reduced lunch-eligible, free lunch-eligible, and poverty [receives some form of public assistance]).

Analytic Strategy

The model we applied to the data is a value-added Education Production Function (EPF). This model recognizes that a child's educational achievement is a function of all the resources ever given to a child since birth (such as parental education, health care, neighborhood advantage), but that the researcher cannot observe all the resources. The solution is to look at a "value-added" specification. If we observe only two years' worth of resources and outcomes, then we are able to see the "value added" by additional resources provided over that time period. This successfully gets around our "incomplete data" problem, and allows us to determine which resources contribute significantly to achievement. For the purposes of this project, we focus on resources that are currently considered as qualifications in HISD magnet matrices.

First, we examined whether all qualifications used in previous magnet matrices are necessary to predict change in STAAR reading and math scores from 2013-2014. We start with a baseline model with all predictors, and then drop each one individually and examine model fit statistics to determine whether the predictor significantly improves model fit enough to be necessary. We use both likelihood ratio Chi-square tests and Bayesian

Information Criterion (BIC) statistics to assess model fit. Generally, we felt that a qualification had to improve model prediction for both reading and math outcomes, be substantively related to outcome subjects, and to work in an expected direction in order to be included in the final matrix. When non-predictive qualifications are dropped, we ran confirmatory analyses with the final model predicting 2015 STAAR reading scores.

Similarly, we compared baseline and final models predicting 2013-2014 change scores to determine whether the final model predicted model fit similarly for all magnet school program types. Finally, we ran models by student ethnicity and economic status to examine whether the final model worked similarly across student groups. Since these models more closely align with an intention to determine the right qualification matrix, we used 2014 measures to predict 2015 STAAR reading scores. All analyses were conducted using the *regress* and *xtmixed* functions in Stata, and we adjusted for school-level variation in outcomes.

RESULTS

Descriptives

Below we use as an example the changes in test scores and the changes in selected qualifications for the 2013-14 school year 8th grade class. As a demonstration, we divide the population into two groups: students that are currently enrolled in a magnet program in 2013-14 and those that are not.

Comparing the magnet and non-magnet students in the 8th grade, there are stark differences that motivate the use of an EPF (**Table 1**). For example, on average all the 8th graders improve their math score by nearly 70 points between the 6th and 8th grade. However, for magnet students all of that gain occurs between the 7th and 8th grade, while for non-magnet students the growth is more evenly divided with an 18 point gain the first year and 50 point gain the second year.

Table 1. Growth in STAAR Achievement: Full Population and by Magnet Status in 2013-14.

Changes in Qualifications	8 th Grade Population	8 th Grade Magnet	8 th Grade Non-Magnet
Conduct 2014- 2013	0.09	0.08	0.10
Class Grades 2014- 2013	1.28	0.73	1.47
Class Grades 2013- 2012	-1.01	-1.08	-0.98
Unexcused Absences 2013- 2012	0.72	0.45	0.82

For this model to be valid, we need the changes in achievement to be described by the changes in qualifications. If the entire 8th grade population achieved the exact same conduct score and exact same number of unexcused absences, etc., then we would not be able to explain the differences in the achievement using differences in these qualifications. However, we see in **Table 2** that the

changes are different for the groups, allowing us to use this model. Furthermore, there is a high standard deviation of the qualifications across the entire student population (not shown); this variation across thousands of students will give us a reasonable effect of each particular qualification.

Table 2. Changes in Qualifications That Serve as Inputs in EPF Model: 8th Graders in 2013-14.

Changes in Qualifications	8 th Grade Population	8 th Grade Magnet	8 th Grade Non-Magnet
Conduct 2014- 2013	0.09	0.08	0.10
Class Grades 2014- 2013	1.28	0.73	1.47
Class Grades 2013- 2012	-1.01	-1.08	-0.98
Unexcused Absences 2013- 2012	0.72	0.45	0.82

Exploratory Models

Our exploratory models, examining the first research question, focus on students who applied to 6th and 9th grade magnet programs in the fall of 2013 for the 2014-15 academic year. Our first step is to examine change in STAAR reading and math scores from 2013 to 2014, predicted by prior changes in STAAR and Stanford test scores, course

grades, conduct, and unexcused absences. Our goal was to determine the qualifications that best predict the outcomes, in order to determine the simplest model that best predicts student achievement; we work under the assumption that students who experience larger growth from 2013 to 2014 are most likely to perform well on STAAR in 2015.

Table 3. Exploratory Models Predicting Change in STAAR Reading and Math Scores from 2013 to 2014, Based on Changes in Qualifications: Among 5th Grade Magnet Applicants in 2013-14 School Year. (Keep in Matrix based on goodness of fit tests: likelihood ratio test and BIC statistics.)

Qualification	STAAR Math	STAAR Reading	Keep in Matrix?
Stanford math 2012-2013	0.55 ***	0.15	Y
Stanford language 2012-2013	0.92 ***	0.51 ***	Y
Stanford reading 2012-2013	0.93 ***	0.48 ***	Y
Stanford science 2012-2013	0.04	0.08	N
Stanford social studies 2012-2013	0.07	0.05	N
STAAR math 2012-2013	-0.36 ***	0.14 ***	Y
STAAR reading 2012-2013	0.19 ***	-0.31 ***	Y
Conduct 2013-2014	-4.30	2.23	N
Course Grades 2013-2014	-0.20	-0.63	N
Course Grades 2012-2013	-2.29 *	-0.83	Y
Unexcused Absences 2012-2013	3.49 *	1.56	N
BIC statistic	36032.59	35082.85	

*p<.05 **p<.01 ***p<.001

Models predicting achievement among students who were in 5th grade in the 2013-14 (**Table 3**) show significant effects of increases in

Stanford math, language, reading, STAAR math, STAAR reading, course grades from 2012-2013,

and unexcused absences on growth in STAAR math from 2013-2014. Fewer effects are shown on growth in STAAR reading from 2013-2014; Stanford math, course grades, and unexcused absences are not significant. HERC's recommendation for the final magnet matrix is based on goodness-of-fit tests (likelihood ratio test and BIC statistic) that measure how well each qualification improves the predictive power of the model; generally, we felt that a qualification had to improve model prediction for both reading and math outcomes, be substantively related to outcome subjects, and had to work in an expected direction in order to be included in the final matrix. Thus, we would keep Stanford language and reading, and STAAR math and reading. In

addition, we recommend keeping Stanford math even though it does not significantly predict STAAR reading, because it is a core subject and because it has such a strong influence on STAAR math scores. We also find that including both course grades in 2013 and the first cycle of 2014 does significantly improve model fit; however, this improvement is largely due to course grades from 2013, so grades from the beginning of the 2014 school year could be dropped. Our recommendation not to include unexcused absences is largely due to the unexpectedly positive influence on growth in STAAR math; we would not want to unintentionally encourage unexcused absences.

Table 4. Exploratory Models Predicting Change in STAAR Reading and Math Scores from 2013 to 2014, Based on Changes in Qualifications: Among 8th Grade Magnet Applicants in 2013-14 School Year. (Keep in Matrix based on goodness of fit tests: likelihood ratio test and BIC statistics.)

Qualification	STAAR Math	STAAR Reading	Keep in Matrix?
Stanford math 2012-2013	0.62 ***	0.50 ***	Y
Stanford language 2012-2013	0.04	0.00	N
Stanford reading 2012-2013	0.25	0.48 ***	Y
Stanford science 2012-2013	-0.06	0.36 ***	N
Stanford social studies 2012-2013	0.29	0.51 ***	N
STAAR math 2012-2013	-0.46 ***	0.05 **	Y
STAAR reading 2012-2013	0.42 ***	-0.22 ***	Y
Conduct 2013-2014	21.32	13.21	N
Course Grades 2013-2014	3.22 ***	1.71 **	Y
Course Grades 2012-2013	-0.18	-1.30 *	Y
Unexcused Absences 2012-2013	3.01 **	3.39 ***	N
BIC statistic	23278.44	38466.72	

*p<.05 **p<.01 ***p<.001

Our findings from models predicting achievement among students who were in 8th grade in 2013-14 are a bit more complex (**Table 4**). Generally, fewer qualifications were predictive of STAAR math than of STAAR reading, perhaps because fewer students took the STAAR math 8th grade exam in 2014. HERC recommends including Stanford math and reading, STAAR math and reading, and course grades (both 2013 and first cycle of 2014). We found some unexpected complexity in results for Stanford science and social studies. These subjects do improve model fit for STAAR reading growth, but not for STAAR math; given the goal of parsimonious models that can apply to both subjects, HERC does not

recommend including these subjects, but HISD may make a different choice. HERC makes an exception when it comes to course grades. In fact, 2013 grades do not improve fit for models predicting STAAR math; however, first cycle 2014 grades improve prediction for both STAAR reading and math, and we would not recommend using only one cycle of grades for a matrix. As a result, HERC recommends averaging 2013 and first cycle 2014 grades, to gain a more stable estimate of student's class conduct.

Once final models were determined from exploratory models, HERC confirmed these models by predicting 2015 STAAR reading (for the 5th grade sample) and English I (for the 8th grade

sample). We found similar results for the 2015 outcomes, suggesting that our exploratory models would be successful in predicting which students would have high achievement once they were in magnet schools.

Variation by Magnet Program Type

The second research question examined whether the same basic model would sufficiently predict achievement among students who applied to different schools with different matrices. That is, can HISD use one matrix for all magnet middle schools, and one for all magnet high schools? Generally, HERC found that one matrix could be used for all magnet applicants, particularly for middle school applicants. We did find a few exceptions among high school applicants. Conduct grades did predict achievement for applicants to language magnets and art magnet (reading only), and there was inconsistent evidence suggesting that Stanford science may be predictive for applicants to STEM, health, and Vanguard schools, but again for reading only. Because many of these magnet types include only one school (for example, Carnegie as the only Vanguard magnet high school) and the qualifications are predictive for only reading, HERC would be wary of suggesting different matrices based on inconsistent evidence and for relatively small predictive gain. It should be noted that some schools include specialized entrance exams (Bellaire and DeBaKey) or require artistic auditions (HSPVA); it is beyond the scope of this report to examine the unique predictive power of these qualifications, since they were used

by only one school and may contribute to admission goals that go beyond STAAR reading and math achievement. Overall, HERC is confident in determining that all middle school applicants can use one matrix, and largely recommends one matrix for high school applicants, unless schools are particularly specialized or have slightly different admission goals.

Variation by Student Ethnicity or Socioeconomic Background

The extent to which the strength of individual predictors varies by student background may be a source of unintended inequality in the application to magnet programs. For example, if one group of students systematically scores lower on science sections of standardized tests, and these science scores are part of the formula used to assess eligibility for a given magnet program, this hypothetical group of students will always have lower odds of admission to the given program. Educators can and have responded to such scenarios in numerous ways, ranging from adjusting the weight of a given predictor to completely dropping the predictor for all students. In this section, we estimate fully interactive models to assess the extent to which student ethnic or socioeconomic background is systematically correlated in a different manner with a given predictor, compared to other groups. We estimate separate models for 5th graders applying to magnet schools for 6th grade, and 8th graders applying to magnet schools for 9th grade.



Figure 1. 5th grade model: 2014 indicators predicting 2015 STAAR reading score.

With only one exception, 5th grade applicants did not experience meaningfully different relative strengths amongst the predictors by ethnic background. 2014 STAAR reading scores were predictive of 2015 STAAR reading scores for all groups except white students. All ethnic groups (Asian, Black, Hispanic, White) experienced a significant correlation between the outcome variable (2015 STAAR reading score) and the remaining predictors (2014 STAAR math, 2014 average course grades, 2014 Stanford reading, 2014 Stanford math, and 2014 Stanford language arts).

With regard to poverty status, the relationship between the 2014 school year predictors and the 2015 outcome (STAAR reading scores) unfortunately presents along expected lines. That is, non-disadvantaged students all experienced positive, significant correlations between their 2014 school year predictors and 2015 STAAR reading score; the only non-significant predictor for non-disadvantaged students was the 2014 STAAR math score. For 5th grade students in poverty, all STAAR and Stanford scores, along with course grade averages, were meaningful predictors of their 2015 STAAR reading scores.

Notably, the predictive strength of the 2014 scores was much less compared to students who are not in poverty.



Figure 2. 8th grade model: 2014 indicators predicting 2015 English end-of-course exam score.
Note: STAAR math score was removed for 8th grade model.

Unlike in the 5th grade models, 2014 STAAR reading scores of 8th grade students were not significant predictors of 2015 scores; this relationship held true across all ethnicities. However, it is important to note that the 2015 outcome score for 8th graders is the English end of course exam. For 5th graders, the 2015 outcome score was the STAAR reading score, so it is hardly surprising that the 2014 STAAR reading score was a strong predictor of the 2015 STAAR reading score.

Across all ethnicities, Stanford reading, Stanford math, and Stanford language scores were all significant predictors of 2015 English end of course exam scores. The only ethnicity-based variation for 8th graders is seen in the strength of the correlations. Asian students experienced only a mild positive correlation between Stanford math scores and 2015 English end of course exam scores.

Also unlike the 5th grade models, 8th grade students did not see variation in their 2014 and 2015 score correlations as a function of poverty status. Both non-disadvantaged students and students in poverty saw positive predictive power between their 2014 and 2015 scores.

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This is an abbreviated version of a much longer research study written for peer review. For additional information on the findings presented here, or to obtain the full peer-review version of this research brief, contact the Houston Education Research Consortium at 713-348-2802 or email here@rice.edu.