STRATEGIC DATA PROJECT

SDP FELLOWSHIP CAPSTONE REPORT

Strategic Staffing: Managing Teacher Quality Across and Within Schools

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Strategic Data Project (SDP) Fellowship Capstone Reports

SDP Fellows compose capstone reports to reflect the work that they led in their education agencies during the two-year program. The reports demonstrate both the impact fellows make and the role of SDP in supporting their growth as data strategists. Additionally, they provide recommendations to their host agency and will serve as guides to other agencies, future fellows, and researchers seeking to do similar work. *The views or opinions expressed in this report are those of the authors and do not necessarily reflect the views or position of the Center for Education Policy Research at Harvard University.*

Framing the Problem

Exposure to highly-effective teachers has been frequently identified as the most important in-school factor associated with multiple positive student achievement outcomes. However, identifying differentiated practices that are most effective for student subpopulations with specific needs, while at the same time trying to ensure equitable exposure to highly-effective teachers for students across all regions, socioeconomic conditions, and grade levels, has continued to be a challenging human capital dilemma for public education agencies.

In Duval County (Jacksonville) Florida, a targeted focus on better serving and reducing off-track/over-age students has compelled an exploration of more sophisticated student early warning and response systems (EWRS). Student and teacher evaluation systems have experienced explosive, parallel growth over the past several years—both in sophistication and variety of models developed and adopted across the country—but still often lack complexity for subgroups of students with specific needs.

Student EWRSs are designed to use known information about students' performance history and other relevant characteristics to identify those students most likely to be at risk for not reaching a targeted benchmark, such as high school graduation, and intervene early with any appropriate support they may need. The rapid evolution and emphasis on increasingly sophisticated teacher evaluation systems, such as value-added modeling (VAM) scores, has been driven by a widespread acceptance of research indicating that an effective teacher is the most important in-school factor related to student success. Despite the common interest of these fields to increase student achievement, few if any EWRSs have been designed to incorporate teacher characteristics as a predictor of likely student success.

There are likely a number of reasons for this, including the complexity of models that would be required and the fact that many EWRSs are designed to predict outcomes several years (and consequently several teachers) ahead of their likely occurrence. In other words, while it may be possible to predict with some utility which sixth graders are more likely to eventually drop out based on past performance and personal characteristics, trying to factor in the contribution of a student's current teacher to that eventual outcome—without any

information yet for the intervening years' teacher or school contributions—raises obvious issues.

However, that does not mean that combining student and teacher-level effects to determine teacher contributions to variability in reaching shorter-term critical milestones is not a potentially powerful tool. In Duval County, we are interested in better supporting, and eventually reducing our high school over-age population in the long term, by developing systems to better identify targeted support practices for our current over-age middle and high school students as well as preventative practices to reduce retentions in the lower grades. As part of that, we want to identify what types of teacher characteristics or practices are more effective in keeping or moving students back on track who are already demonstrating high risk for being retained. The goal of this work is to help develop more strategic placement systems that maximize students' chances for recovery or staying on track by putting them with the best possible teachers for their own specific needs.

In Michigan, local control at the district level over teacher evaluation models has led to severe limitations in the ability to meaningfully compare teacher effectiveness across districts. With as many as 900 different mechanisms for labeling effective teachers, none of which need be disclosed in their entirety to the Michigan Department of Education (MDE), it is impossible to determine exactly how teachers are evaluated. Furthermore, local control may disincentivize rigorous evaluation as districts may want to appear well-staffed to students and the state as well as welcoming to new teacher candidates. Perhaps as a result, fewer than 3% of teachers statewide are labeled as either ineffective or minimally effective, the lower two of Michigan's four effectiveness labels.

One solution to this problem, addressed in Michigan's State Equity plan, is to rely on teachers' professional characteristics—ideally, those that are both easily interpretable and not easily altered. Certification type and content area endorsements are two such characteristics. While we are careful to avoid treating certification characteristics as perfect predictors of teacher quality, it is nonetheless clear that teachers should possess certification in their chosen setting and subject areas. Similarly, while new teachers are valuable drivers of insight and progress, research shows that teachers' value-added increases rapidly early in teachers'

careers, implying that an overabundance of inexperienced teachers will provide suboptimal instruction.

MDE has therefore studied whether schools with high concentrations of economically disadvantaged or minority students also tend to have high concentrations of teachers who are newly certified or are teaching outside of their certification or endorsement areas.

Literature Review

An increasingly sophisticated body of research over the past few decades has continued to reaffirm the importance of effective teachers and teaching practices to student achievement outcomes (Kane et al., 2010). However, equitable hiring, assignment and retention of effective teachers remain significant challenges for education (Loeb, Kalogrides, & Béteille, 2012). The projects featured here attempt to advance research and practice in that area.

The Duval County Public Schools/Jacksonville Public Education Fund (DCPS/JPEF) capstone project looks to build on EWRS literature to help identify best placement options for students. The majority of EWRSs found in extant literature focus on predicting and preventing high school dropouts as the dependent variable of choice. In one of the most comprehensive reviews of successful dropout prevention EWRS models to date, Hammond et al. (2004) analyzed 44 studies of high school graduation promotion or dropout prevention programs that met their criteria for rigor to identify common factors and themes across exemplary programs. The authors classified risk factors related to dropping out across multiple models into four major domains: “individual, family, school, and community factors” (p. 1). Significance levels of the specific factors within those domains varied across studies, but the authors identified eighteen specific risk indicators that were statistically significant in at least two different, independent studies for similar age-group students. Among elementary school-age students, those factors were: 1) low achievement, 2) retention/over-age for grade, 3) poor attendance, and 4) low socioeconomic status.

Teacher Effectiveness

Arguably the most studied and most proliferate field in education policy over the past few decades has been the field of measuring teacher effectiveness. Beginning most notably

with the development of the Tennessee Value-Added Assessment System (TVAAS) in the mid-1980s, the exploration and adoption of various value-added modeling (VAM) and related systems for attempting to quantify teacher contribution to student learning has exploded as a field since (Sanders & Horn, 1994; McCaffrey et al, 2004).

Today, dozens of general variations on value-added modeling approaches exist—and substantially more specific variations (in terms of specific predictors, covariates, assessments, and other decisions within a model's framework are used in different places)—many of which demonstrate a similar level of predictive ability (McCaffrey et al, 2004; Whitehurst et al, 2015). The lack of any clearly best model for quantifying teacher contribution to learning limits attempt to compare teacher effectiveness across districts or states using significantly different models.

Another major limitation of many current models is due to a lack of necessary data; a low percentage of the overall teaching force—as low as 20% in some districts studied—actually has the required combination of consecutive years teaching in a tested subject at a tested grade level, with no other requisite personnel information missing, to be able to calculate VAM scores (Whitehurst et al, 2015). This limitation in particular has led many teacher effectiveness researchers to reconsider the value and contribution to measurement of traditional classroom observations. While classroom observations by administrators continue to struggle with many limitations (cost, potential subjectivity or bias among administrators, potential inconsistency of ratings across sites, restricted variability due to limited ratings scales or observer practice), they also continue to demonstrate comparable predictive ability and better stability than VAM models in many cases (Whitehurst et al, 2015).

Teacher Traits and Student Achievement

Studies such as Gordon, Kane, and Staiger (2006) show that teacher value-added increases substantially during teachers' initial years in the profession. Evidence on specific teacher credentials and other observable factors is mixed. Kane, Rockoff, and Staiger (2008) find that classroom performance in New York City public schools is far more predictive than certification status of later performance in those schools. Rockoff, Jacob, Kane, and Staiger (2011), studying new math teachers in New York City public schools, find that few individual

qualifications and characteristics have a statistically significant impact when evaluated individually, but when grouped into larger categories of cognitive and non-cognitive teacher skills, both composite factors are positively related with student outcomes. Goldhaber and Brewer (1996) find an effect of subject-specific certification in math and science.

While the evidence of observable teacher characteristics on student outcomes is mixed, it is nonetheless clear that poor or minority students are taught by very different teachers than rich or white students are. Peske and Haycock (2006) find major differences in teacher qualifications and years of experience in Ohio, Illinois, and Wisconsin (paying particular attention to the Cleveland, Chicago, and Milwaukee school systems). Given Michigan's lack of common effectiveness or value-added metrics, proxies such as teacher experience, certification, and endorsements may still reflect teaching quality in the aggregate. Even if their direct impact on student outcomes is small, they may nonetheless serve as warning signs of institutional dysfunction or challenging circumstances.

Combined Student-Teacher Factor Models

Research seeking to formally integrate teacher effectiveness characteristics as predictors of student success in EWRS models is much more nascent as a field. Numerous studies however have begun to identify connections between specific teacher effectiveness characteristics and specific student outcomes that could be used to begin building the framework of an EWRS with teacher-level factors included. A meta-analysis of extant research at the time of publication by Wayne & Youngs (2003) identified four teacher characteristic indicators readily available to most districts that had demonstrated confirmed relationships with student performance outcomes: competitiveness ratings of teachers' undergraduate institutions, teachers' licensures and verbal skills assessment scores, teachers' degree areas and relevant coursework, and teachers' certification statuses. For teachers' degrees, coursework, and certifications, the associations with student achievement were more conclusive for mathematics teachers.

Other studies have begun pushing beyond typically available recorded data (which may be informative for hiring new teachers) to trying to identify teacher attitudes and classroom behaviors related to student outcomes (which may be more informative for spreading best

practices). One more innovative model for integrating multiple levels of this type of data into a unified early warning system-type model is the additive risk index work of Lucio et al. (2011 & 2012). The authors identified a number of unique risk and protective factors significantly associated with GPA among high school students after controlling for demographic covariates: academic expectations, academic self-efficacy, attendance, school behaviors, grade retention, and music instruction (Lucio et al, 2011).

Unlike most other EWRSs, the inclusion of protective factors (i.e., factors that are positively associated with increases in desired outcomes—such as academic expectations, academic self-efficacy, and music instruction in this case) rather than just risk factors, provides some more clear implications of best practices teachers can be trained in to reduce student risk factors. Another unique element of the authors' approach in this work is that many of the items tested were measured by student surveys. For example, teacher relationships were measured by student surveys of the degree to which they perceived their teacher is supportive of them in the classroom. Methodologically, this allowed the authors to classify what might otherwise be considered teacher or school-level factors at the student level rather than constructing multilevel models. Potential drawbacks however include the additional time and resources it takes to survey and possible bias issues.

Case Studies

Duval County Public Schools & Jacksonville Public Education Fund

Agency Profile: Duval County Public Schools (DCPS) is the 22nd largest school district in the nation and the sixth largest school district in Florida. It has 195 schools and 13,113 employees. The student population is composed of 125,164 students: 43.6% African American, 37.1% Caucasian, 9.8% Hispanic, 4.7% Multiracial, 4.6% Asian, and 0.2% Native American.

The Jacksonville Public Education Fund (JPEF) is an independent local non-profit organization that works with and in support of DCPS and schools in Duval County. JPEF's mission is to inform and mobilize the community to advocate for universally high-quality public schools for all children. JPEF's work applies data and research, community mobilization, and advocacy and communications initiatives towards aligning informed and engaged community

members, visionary leadership, aligned organizations, and strategic investment around this mission.

DCPS and JPEF are collaborating through the SDP Fellowship to identify more strategic alignment strategies between student early warning, teacher placement, and classroom assignment systems to better support current, and reduce future, off-track students.

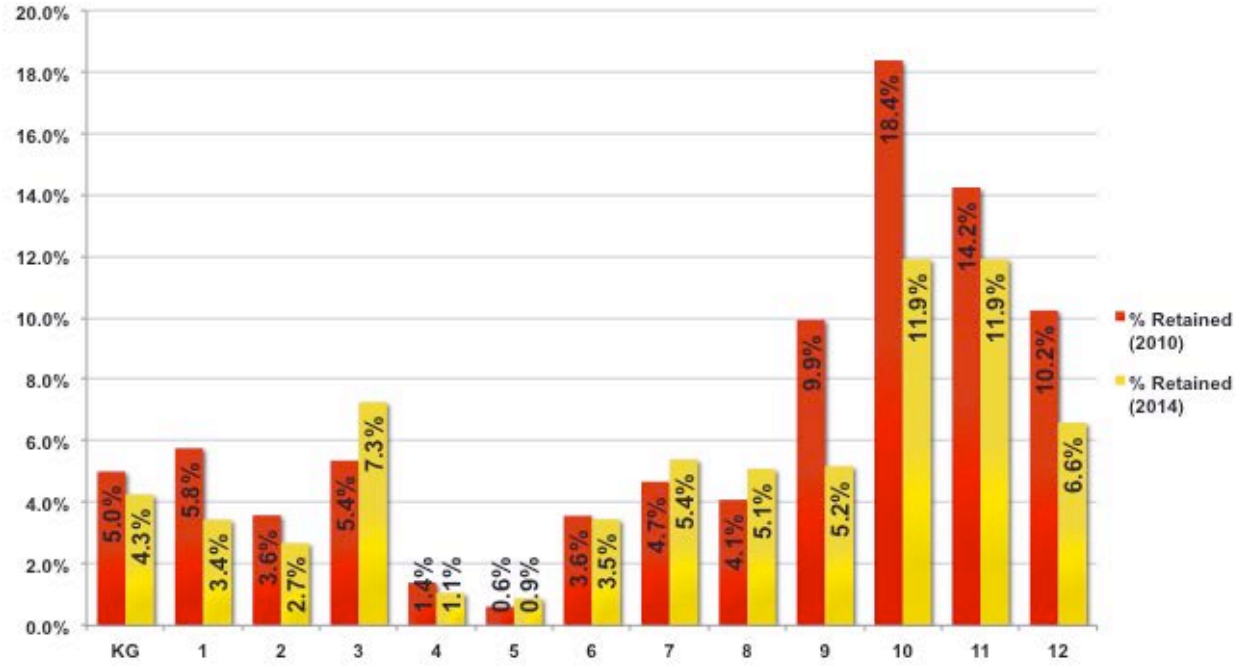
Research Questions

- What are some key student, teacher, and school-level factors associated with current retention rates and other critical outcome indicators, particularly for already off-track or at-risk students in DCPS that may inform the most impactful practice intervention areas to focus on?
- How can we better identify student/teacher characteristic combinations associated with variance in retention rates at each grade level to more strategically inform classroom placement protocols that maximize the likelihood of student success and promotion?

Project Background & Scope: Nearly 30% of students in DCPS comprehensive high schools are over-age for their grade level. DCPS has made it a priority to address this through both supporting and accelerating current over-age students and reducing the future over-age/off-track students pipeline through early intervention focus. This research focuses on supporting the latter efforts.

In addressing our first research question we began by exploring some key, overall trends in retention patterns in Duval County Public Schools over the past several years. The bar graph in Figure 1 shows the percent of students retained in DCPS-operated, general education primary function schools by grade level between 2010 (red) and 2014 (yellow). Initial results indicate a general reduction in retentions across most grade levels over this period of time, though patterns of increased retentions near higher-stakes accountability grade levels 3 and 10 remain consistent.

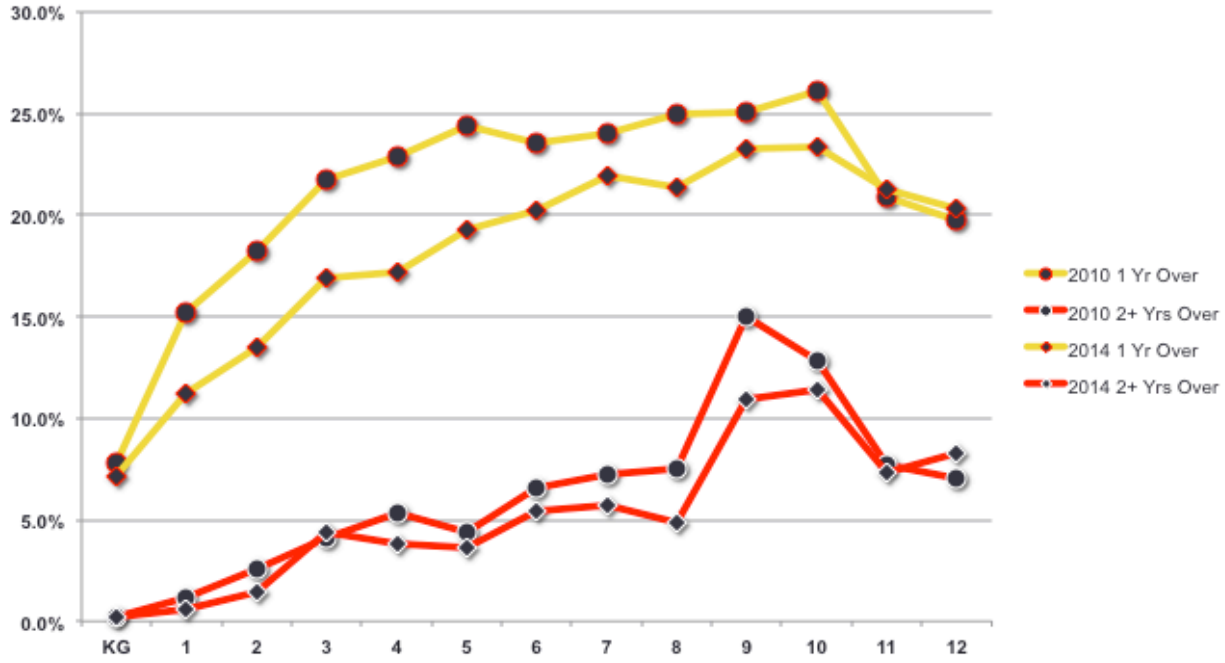
Figure 1. DCPS Retentions by Grade Level, 2010 vs. 2014



Our first research question also sought to better understand current patterns of students already off track or over-age. The line graph in Figure 2 shows the percent of students over-age by 1 or 2+ years at each grade level between 2010 (red) and 2014 (yellow). Initial results again indicate a general reduction across most grade levels over this period of time, though concentration increases are more linear here than with retentions—as might be expected if the impact of early retentions compounds over time.

To better understand potential student, teacher and school-level factors that may be associated with the current retention and over-age student patterns framed above, as well as to help us move towards isolating those potential effects from the teacher characteristics we focused in our second question on disaggregating and reducing variance at each level through multilevel modeling of available data.

Figure 2. DCPS Retentions by Grade Level by Years Overage, 2010 vs. 2014



Methodology & Limitations: In certain methodological decisions for this pilot study of our topic, decisions had to be determined by the real limitations of available data rather than the ideal research framework. One of those hard limitations was the number of years and grade levels available with consistently comparable data from year-to-year, due to a significant number of changes to state and local tests and evaluation instruments over the past several years. As the initial descriptives in Figure 1 show, Duval County retentions peak somewhat in grades K–3 and again largely in grades 9–12. Comparing that with the grade levels we had the most robust early warning and teacher evaluation data on, grades 4–10, we ultimately identified grade 9 and 10 students for this initial study. While our initial planning discussions hypothesized it would be easier to identify teacher effects on students in elementary grade levels, due to the more consistent classroom structure at earlier grades, our initial descriptives and models found there were just too few retentions at 4th and 5th grades (and too little consistent data in K–3) for our purposes in this study.

From a big picture perspective, our analytic approach was to compare students who entered ninth and tenth grades with the same levels of risk factors and try to identify teacher or

school-level experience differences as much as possible between those who were ultimately retained and those who were not. In order to identify potentially significant covariates, we began by identifying a subset of all students who were retained at the end of 9th or 10th grade, and use propensity-score matching to create a matching subset of students who entered the year with the same characteristics and risk factors but were not retained. Students in each subset were matched on grade-level entering, sex, race/ethnicity, free and reduced-price lunch status, and predicted FCAT 2.0 achievement score (Florida's Comprehensive Assessment Test) based on prior performance. (Predicted FCAT 2.0 achievement scores also factor in students' English language learner status, exceptionalities, mobility and age relative to grade level—which is why those factors were not additionally included in our matching criteria.)

Descriptive results are shown in Table 1. Using the propensity score matched comparison subsets of students who were retained versus those who were not, we identified significant differences in teacher characteristics and practices that each group was exposed to. These characteristics and practices were then identified as covariates for further testing in the full sample models.

Table 1: Descriptives: full sample vs matched pairs subsample

	Full Sample (Grades 9 & 10, AY2012/13–2013/14)		PS Matched Subsample (Retention status matched)	
Characteristic	Promoted	Retained	Promoted	Retained
Grade				
9th	11794 (93.1%)	877 (6.9%)	866 (49.9%)	870 (50.1%)
10th	11149 (86.3%)	1774 (13.7%)	1756 (50.1%)	1752 (49.9%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*
Student Gender				
Male	11327 (86.9%)	1708 (13.1%)	1701 (50%)	1701 (50%)
Female	11616 (92.5%)	943 (7.5%)	921 (50%)	921 (50%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*
Student Race/Eth.				
Asian	1214 (95%)	64 (5%)	64 (50%)	64 (50%)
Afr.-Amer.	10725 (88.7%)	1367 (11.3%)	1363 (50%)	1363 (50%)
Hispanic	1975 (86.8%)	300 (13.2%)	289 (50%)	289 (50%)
NA/AI	37 (88.1%)	5 (11.9%)	1 (50%)	1 (50%)
Mult./Other	764 (89.7%)	88 (10.3%)	86 (50%)	86 (50%)
White/Non-His.	8228 (90.9%)	827 (9.1%)	819 (50%)	819 (50%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*
FRL Eligible Status				
Yes	11846 (87%)	1773 (13%)	1754 (50%)	1754 (50%)
No	11097 (92.7%)	878 (7.3%)	868 (50%)	868 (50%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*
ELL Status				
Yes	674 (82.5%)	143 (17.5%)	110 (44.7%)	2486 (49.7%)
No	22269 (89.9%)	2508 (10.1%)	2512 (50.3%)	11794 (93.1%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*
Primary Exceptionality				
Yes (combined)	7589 (87.6%)	1071 (12.4%)	943 (46.2%)	1096 (53.8%)
None	15354 (90.7%)	1580 (9.3%)	1679 (51.7%)	1566 (48.3%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*
Teacher Gender				
Male	4205 (89.7%)	482 (10.3%)	550 (53.4%)	479 (46.6%)
Female	18015 (89.8%)	2045 (10.2%)	2068 (50.5%)	2025 (49.5%)
Missing data	723 (85.4%)	124 (14.6%)	4 (3.3%)	118 (96.7%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*
Teacher Race/Eth.				
Asian	440 (91.5%)	41 (8.5%)	120 (75%)	40 (25%)
Afr.-Amer.	5038 (88.9%)	631 (11.1%)	751 (54.5%)	626 (45.5%)
Hispanic	674 (85.6%)	113 (14.4%)	104 (481%)	112 (51.9%)
NA/AI	82 (87.2%)	12 (12.8%)	0 (0%)	11 (100%)
Mult./Other	66 (88%)	9 (12%)	31 (78%)	9 (23%)
White/Non-His.	15920 (90.2%)	1721 (9.8%)	1612 (48.6%)	1706 (51.4%)
Missing data	723 (85.4%)	124 (14.6%)	4 (3.3%)	118 (96.7%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*
Teacher Highest Degree				
Bachelor's	16354 (89.5%)	1916 (10.5%)	1892 (49.9%)	1898 (50.1%)
Master's	4991 (90.9%)	502 (9.1%)	516 (50.8%)	499 (49.2%)
Specialist	193 (85.4%)	33 (14.6%)	0 (0%)	32 (100%)
Doctorate	682 (90%)	76 (10%)	210 (73.7%)	75 (26.3%)
Missing data	723 (85.4%)	124 (14.6%)	4 (3.3%)	118 (96.7%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*
Teacher Category				
Category 1	8625 (90.1%)	908 (9.9%)	916 (50.4%)	900 (49.6%)
Category 2	11928 (89.2%)	1437 (10.8%)	1380 (49.3%)	1419 (50.7%)
Category 3	2642 (89.8%)	299 (10.2%)	303 (50.6%)	296 (49.4%)
Category 4	108 (93.9%)	7 (6.1%)	23 (76.7%)	7 (23.3%)
Total	*22943 (89.6%)*	*2651 (10.4%)*	*2622 (50%)*	*2622 (50%)*

Descriptives for the full sample are also presented in Table 1. Using what were identified as potentially important variables in the subset comparisons, we tested all that we knew about the students and teachers in multilevel models to determine how much of the overall variance in outcomes is attributable to differences between individual students, between classrooms in schools, and between schools. Results are shown in Table 2.

Once all covariates of interest have been added (full model results), we see that the majority of identifiable variance remains associated with student characteristics, but a few specific teacher practices do emerge as having small but significant unique associations with student retentions. Teachers rated highly on managing classroom procedures appear to have a significant, unique association with reduced retentions, as do teachers rated highly for maintaining accurate records. These two practices may indicate an overarching importance of providing strong classroom structure for students already off track or at risk for falling off track. Interestingly, teachers who rated higher on communicating with families showed a significant association with increased retentions. While seemingly counterintuitive, this may be an example of correlation not equaling causation, and in fact teachers are communicating more with families of some students because they are likely to be retained. Additional considerations for practice or further research are discussed in the lessons learned section.

Table 2: Multilevel model results (full analytic sample)

Fixed Effect	Unconditional	Level 1 Model (Student factors)	Level 2 Model (Teacher factors)	Full Model (All factors)
$ß_0$	.2622 (0.039)**	.748 (.06)**	.742 (.06)**	.768 (.049)**
$ß_1$ (Predicted DSS)		-.002 (.0001)**	-.002 (.0001)**	-.002 (.0001)**
$ß_2$ (Stud. gender)		-.049 (0.003)**	-.048 (.005)**	-.048 (.004)**
$ß_4$ (SR:Asian)		-.057 (.043)	-	-
$ß_5$ (SR:Af. Am.)		-.035 (.043)	-	-
$ß_6$ (SR:Hisp.)		-.03 (.043)	-	-
$ß_7$ (SR:Mult/Other)		-.04 (.042)	-	-
$ß_7$ (SR:White)		-.04 (.042)	-	-
$ß_8$ (FRL status)		.013 (.004)**	.016 (.004)**	.014 (.004)**
$ß_9$ (Days abs.)		.013 (.0003)**	.013 (.0003)**	.013 (.0003)**
$ß_{10}$ (Tch degree)			-.005 (.008)	-
$ß_{11}$ (Tch category)			.007 (.008)	-
$ß_{12}$ (Tch Obs Item 1a)			-.014 (.009)	-
$ß_{13}$ (Tch Obs Item 1b)			.015 (.009)	-
$ß_{14}$ (Tch Obs Item 1c)			.006 (.009)	-
$ß_{15}$ (Tch Obs Item 1d)			-.006 (.009)	-
$ß_{16}$ (Tch Obs Item 1e)			.002 (.009)	-
$ß_{17}$ (Tch Obs Item 1f)			.001 (.008)	-
$ß_{18}$ (Tch Obs Item 2a)			.011 (.009)	-
$ß_{19}$ (Tch Obs Item 2b)			-.001 (.009)	-
$ß_{20}$ (Tch Obs Item 2c)			-.02 (.008)**	-.022 (.006)**
$ß_{21}$ (Tch Obs Item 2d)			-.01 (.009)	-
$ß_{22}$ (Tch Obs Item 2e)			.006 (.008)	-
$ß_{23}$ (Tch Obs Item 3a)			-.009 (.008)	-
$ß_{24}$ (Tch Obs Item 3c)			.01 (.009)	-
$ß_{25}$ (Tch Obs Item 3e)			-.007 (.008)	-
$ß_{26}$ (Tch Obs Item 4b)			-.022 (.009)*	-.026 (.008)**
$ß_{27}$ (Tch Obs Item 4c)			.022 (.009)*	.027 (.008)**
$ß_{28}$ (Tch Obs Item 4e)			-.004 (.008)	-
$ß_{29}$ (T-S gender match)			.002 (.005)	-
$ß_{30}$ (T-S R/E match)			.0005 (.0004)	-
Covariance Parameter	Estimate (SE)			
Schools (Level 3)	.057 (.015)	.032 (.009)	.036 (.01)	.031 (.009)
Teachers (Level 2)	.017 (.003)	.01 (.003)	.007 (.003)	.01 (.003)
Students (Level 1)	.083 (.001)	.075 (.001)	.073 (.001)	.074 (.001)
Variance Decomposition	% by level			
Level 3	36.15%	27.38%	31.16%	26.97%
Level 2	10.69%	8.67%	6.4%	8.49%
Level 1	53.16%	63.95%	62.2%	64.55%

Michigan Department of Education

Agency Context: Dan Leeds is an SDPFellow at the Michigan Department of Education (MDE), where he is employed as an Education Research Consultant in the Office of Educator Talent and Policy Coordination. This newly-established office aims to achieve the promise of an excellent education for every Michigan student through a robust educator support system and measured policy implementation. It currently contains seven out of MDE's several hundred employees, including two student interns. Many of its current projects involve the educator pipeline; these projects include Michigan's state plan to provide equitable access to excellent educators for poor and minority youth and determination of content area shortages statewide.

This project used data and findings from Michigan's equity plan. As a state education agency (SEA), MDE has unique advantages and challenges relative to the Jacksonville Public Education Fund and Duval County Public Schools. MDE's primary advantage is the scope of its data; it contains data on all students enrolled in traditional public schools or public school academies (PSAs) in grades K–12 and has records of the state assessment scores for all tested students.[1] As of the 2013–14 school year, Michigan's public education system contained 905 districts,[2] 3,897 instructional facilities,[3] and over 1.5 million students. This level of data makes it possible to both study regional issues and observe how they align with or deviate from state trends. However, this breadth of data makes it difficult to collect extremely detailed data on individual students. As a result, these data are best suited to examine how teacher characteristics are correlated with student demographics.

[1] Michigan offers assessments in grades 3–8 and 11 in math and reading; in grades 5, 8, and 11 in science; in grades 6, 9, and 11 in social studies; and in grades 4, 7, and 11 in writing.
[2] This number includes 296 PSA districts, which often contain a single school.
[3] This number includes 5 state schools, 128 ISD schools, 3,034 LEA schools, 369 PSA schools, 38 state unique education providers, 103 ISD unique education providers, 218 LEA unique education providers, and 2 PSA unique education providers. It does *not* include the 12 ISD non-instructional ancillary facilities or the 195 LEA non-instructional ancillary facilities.

Project Focus & Scope

MDE, along with the remaining 49 state education agencies (SEAs), was required by the US Department of Education to study whether poor and minority students had equitable access to experienced, qualified, and in-field teachers.[4] The definitions of poor, minority, experienced, qualified, and in field, however, were left to individual SEAs to define based on their unique policies and data capabilities. In particular, Michigan did not have agreed-upon definitions of experienced, qualified, and in field. Data analytic skills were therefore required to determine the metrics being used, combine multiple data sources, and examine issues of equitable access.

Inexperienced teachers are defined as holding a provisional or interim, rather than professional, certification. Ideally, inexperienced teachers would be defined as those in their first three years of experience as research shows that teacher value-added increases most quickly during this period. Unfortunately, MDE cannot consistently measure teachers' years of classroom experience, largely because MDE cannot determine whether teachers do not appear in state data because they were not working in the education profession at the time, were employed in other states or countries, or were employed in non-public schools. While some teachers with provisional certifications may be outside their first three years of experience (for instance, if they have renewed their initial certification), all those with professional certification will be.

To disambiguate the terms unqualified and out-of-field, the former was defined to reflect one's setting while the latter refers to content area alignment. Qualification reflects that teachers in General Education (GE), Special Education (SE), and Career/Technical Education (CTE) settings should be certified in those settings. Those who are not, such as a CTE teacher who possesses only GE certification, are unqualified regardless of content area overlap between their endorsements and assignments.

[4] These are aggregate indicators rather than guarantees of individual quality. In particular, while having all teachers qualified and in field is a worthy aspiration, recently certified teachers both stabilize the teacher supply statewide and provide valuable perspectives and insights. However, newly certified teachers have steep early learning curves and lower average value added than experienced teachers. As a result, schools, districts, or regions with disproportionately many or few inexperienced teachers may are concerning.

Out-of-field teachers are those working in content areas for which they are not endorsed. An English teacher whose only endorsement is in mathematics, for instance, would be out-of-field. A crosswalk developed by the Office of Professional Preparation Services (OPPS) and discussion with OPPS employees yielded lists of endorsement codes relevant to each assignment code.

One type of case tested MDE's separate definitions of unqualified and out-of-field. A teacher may be both qualified and in-field individually while not being both jointly. As an illustrative example, consider a teacher assigned to teach a GE Business course whose endorsements are in CTE Business and in GE English. She has a GE certification, so she would be counted as qualified, and is endorsed in business content, so she would be counted as in field. However, these endorsements individually do not add up to an endorsement in GE Business. Such cases are marked as out-of-field to denote this crucial distinction.

In order to explore students' access to experienced, qualified, and in-field educators, we used data from the 2014 end-of-year collections of the Registry of Educational Personnel (REP) and the Michigan Online Educator Certification System (MOECS). REP contains information on teachers' course assignments and any traditional public schools or charters in which they took place, while MOECS contains information on teachers' certifications and content area endorsements. The two data sets were combined using teacher's personnel identification code values which were assigned consistently across the two data sets.

Based on data from REP and MOECS, we calculated the proportion of teachers at each school who were inexperienced, unqualified, or out of field. We also calculated the percentages of minority, emotional disturbance (ED), special education (SE), and limited English proficient (LEP) students. Data on minority enrollment came from MISchoolData. After cleaning the data, we are left with 3,469 schools containing data on both teachers and students. These schools contain 90,520 teachers and 1,502,616 students. Of the teachers at these schools, 26.8% are labeled as inexperienced, 1.1% as unqualified, and 8.6% as out of field.

Results: Figures 3–5 show how proxies for teacher excellence correlate with student demographics. Figure 3 shows the percentage of students belonging to various racial/ethnic groups, sorted by whether their high schools have a majority or a minority of inexperienced teachers. Figure 4 sorts by whether high schools have any teachers who are unqualified for any course assignment. Figure 5 sorts by whether high schools have over a quarter of teachers out of field for any course assignment.

Figure 3. Student Demographics and Teacher Inexperience

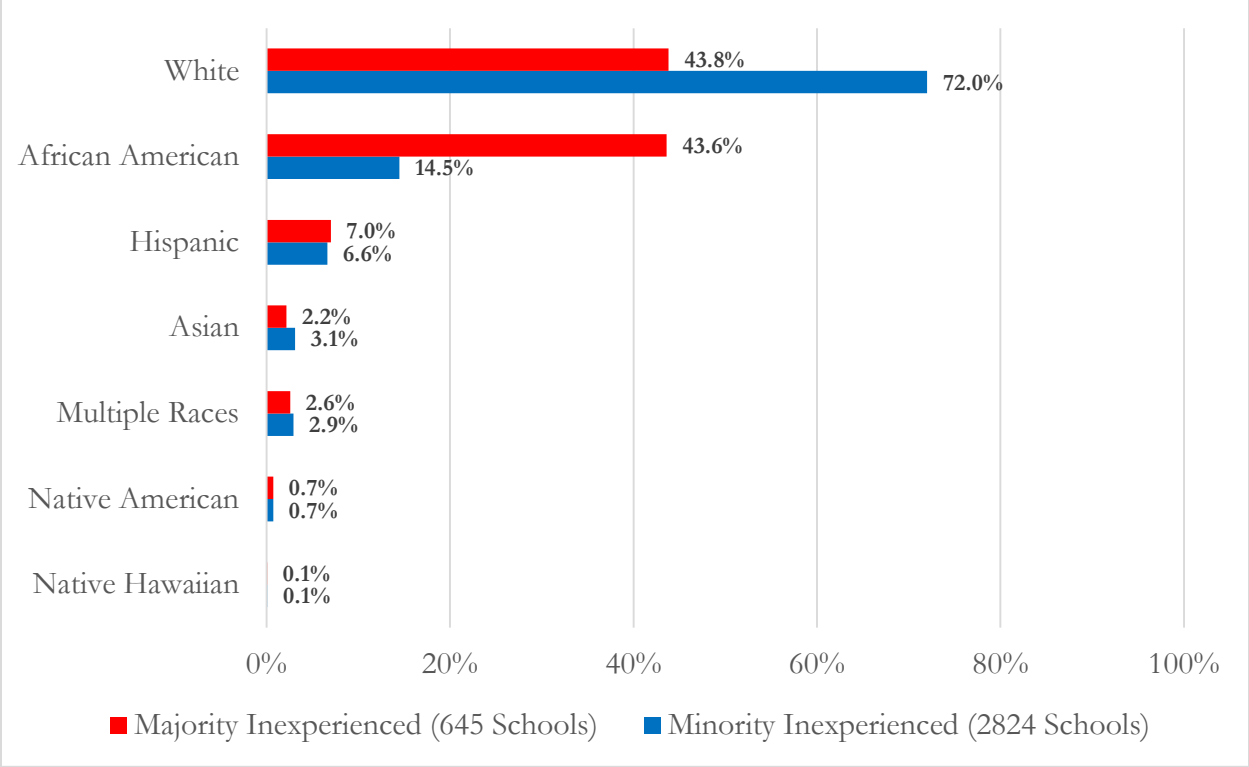


Figure 4. Student Demographics and Teacher Qualification

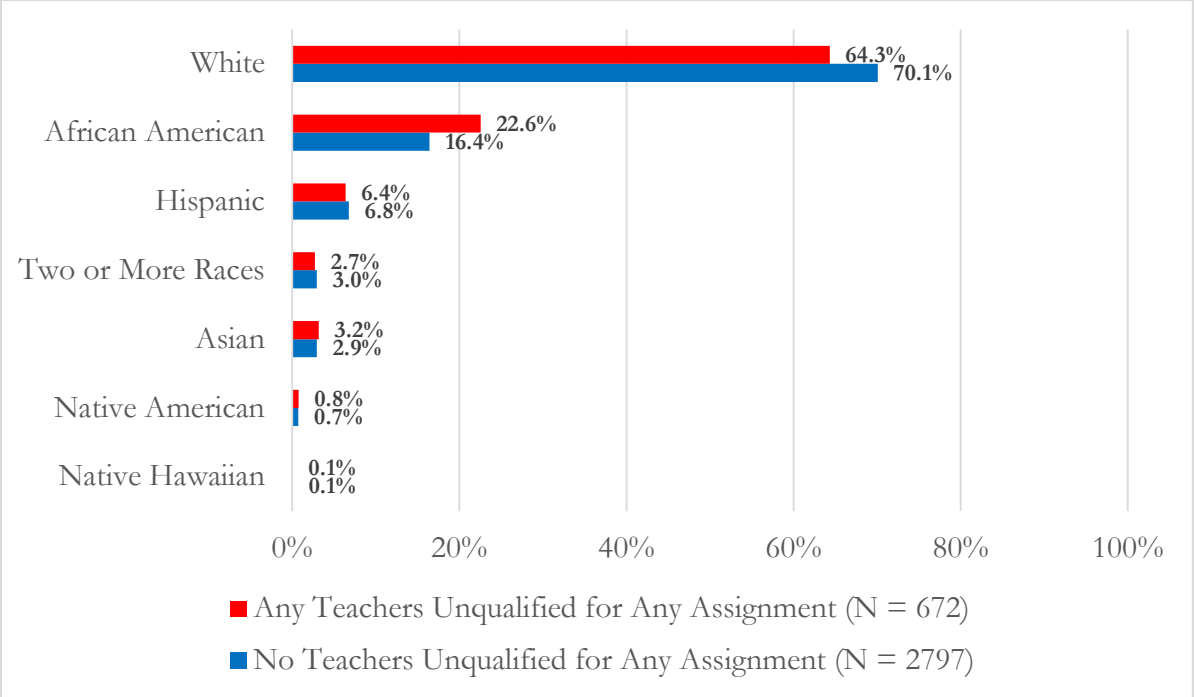


Figure 5. Student Demographics and Teachers In Field

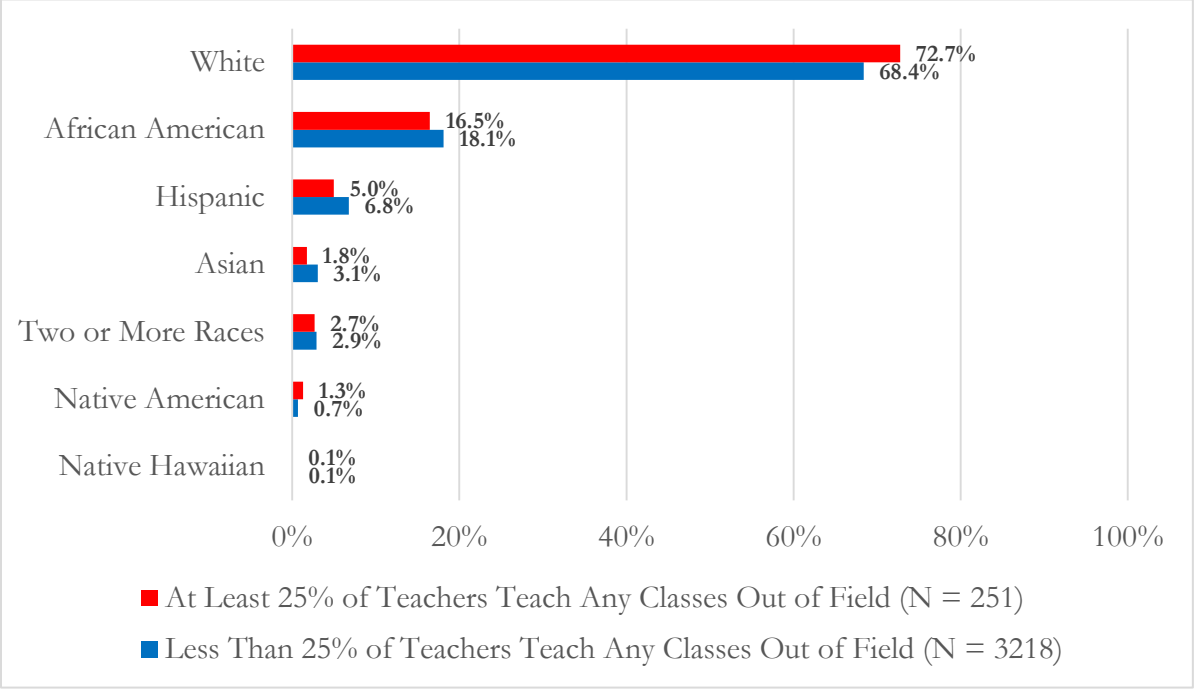


Figure 3 shows that a representative school with a majority of inexperienced teachers has 28.2% fewer White students and over three times as many African-American students as a representative school with a minority of inexperienced teachers. There is little variation among other racial or ethnic groups–Hispanic students are marginally overrepresented in schools with a majority of inexperienced teachers, while Asian and multiracial students are marginally underrepresented.

Figure 4 shows that White students are marginally underrepresented and African-American students are marginally overrepresented at schools where any teachers are unqualified for any course assignments. Again, other racial and ethnic groups show little variation based on these categories. In a reversal of previous trends, Figure 5 shows that White students are more likely to appear in schools with many out-of-field teachers, while African-American students are less likely to do so.[5]

Figure 5 sorts schools by their minority enrollment rate.[6] Schools are grouped by whether minority students constitute 0–24.9%, 25–49.9%, 50–74.9%, or 75–100% of their overall student bodies. Within each grouping, a boxplot is graphed. The bottom of the box represents the 25th percentile of teacher inexperience, the middle represents the 50th percentile, and the top represents the 75th percentile. The whiskers of each box extend 1.5 interquartile ranges up or down (capped at rates of 0 and 1).

[5] Preliminary evidence suggests that this may be partly attributable to small, rural schools such as in Michigan's Upper Peninsula.
[6] This analysis uses only schools with at least 30 students.

Figure 6. Teacher Inexperience by Student Demographics.

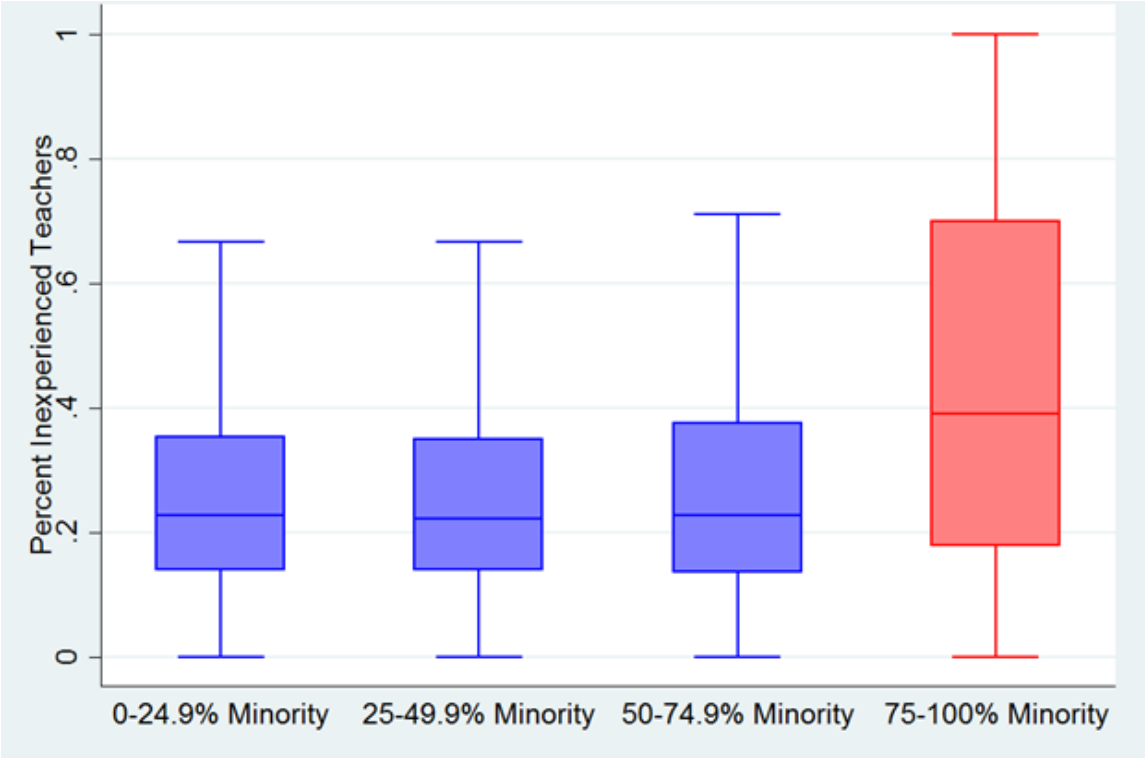


Figure 6 shows schools in the first three categories of minority enrollment have extremely similar distributions of teacher inexperience, with median levels roughly equal to the statewide average. However, schools with extremely high minority enrollment have vastly more inexperienced teachers. The median level of teacher inexperience in these schools is above the 75th percentile at schools in the other three categories, and the 75th percentile is located at the other categories' outer values.

Impact/Next Steps: MDE is currently studying whether statewide findings are replicable in regional or local settings, starting with an analysis of schools located in Detroit Public Schools. Evidence on this front is more complicated–nearly all schools have extremely high minority enrollment, and while unqualified and out-of-field teachers appear at higher rates in Detroit than they do statewide, inexperience varies based on governance structure. As a result, our findings do not completely match those statewide. Next steps in our regional equity studies include investigation of other

teacher characteristics, such as age, race, gender, and time since initial certification. Regional equity studies may also be run on other areas within the state, though no additional regions have yet been chosen for this.

Lessons Learned

Across our work in both Jacksonville and Michigan, a number of common themes emerged as important to understand for building on, refining, or scaling this work to other places. It is clear from what we can measure that inequities in teacher quality distribution still exist both between and within schools. However, it is also clear that what we can measure about teachers remains limited by missing or imperfect data as well as data access issues in some cases. Identifying streamlined data standards and expectations within and across systems is a critical area of effort for focus in the immediate future to ensure that improved teacher development, support and placement systems can someday reach their potential for strategically supporting students.

In addition to developing protocols and systems for better connecting extant data typically collected by local education agencies (LEAs) and SEAs, the data typically collected may only go so far. Some important questions in our projects, such as interactions between student and teacher attitudes and expectations or specific practices, were difficult to assess directly due to the limitations of existing data. Data for identifying differential impact of student by teacher placements within schools, in terms of these characteristics will require the development and systemization of appropriate new survey or observation instruments designed to better gauge more meaningful teacher attitudes and behaviors associated that may be associated with positive outcomes for specific students. Until agencies can better identify these more specific attitudes or practices, the possibilities for more sophisticated, strategic classroom placement models or scaling impact through professional development will remain extremely limited.

Finally, cross organizational data-sharing issues at multiple levels—between LEAs and each other, between LEAs and SEAs, between LEAs, SEAs and independent support, contracted services, or research organizations—can present critical barriers to connecting relevant information or leveraging capacity and expertise across organizations. These barriers are likely limiting the perspectives of all siloed agencies or sectors involved and encouraging the adoption of imperfect solutions indicated by limited information about the whole child or environment. Continuing work on secure, legal and standardized data-sharing MOUs across all relevant education and student support agencies is an important need to address immediately if any of the possible data strategy improvements considered here are to ever ultimately reach their potential.

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