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Mapping Choice: A Critical GIS Analysis of English Learner Enrollment

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Abstract: In many ways, Arizona is on the forefront of school choice: in addition to a state-wide open enrollment law, it was one of the first states to adopt charter school legislation in 1994 and currently has the second-highest percentage of public school students attending charter schools in the nation. Despite the extensive research on school choice, less is known about whether choice systems meaningfully impart more opportunities for students classified as English learners, a diverse group that has been the subject of multiple discriminatory policies and has one of the lowest graduation rates in the state. The current paper uses geospatial analysis to examine English learner participation in school choice in one Arizona metropolitan area. The results indicate that charter schools consistently under-enroll EL students regardless of demographic variability across geographic locations. Charter school locational patterns may be one contributing factor to EL enrollment disparities, though they are not likely to be the only reason. Employing a conceptual framework of motility or "mobility capital" (Kaufman et al., 2004) and a critical stance on the spatial dimensions of neoliberal reforms, findings suggest that unregulated school choice may not reliably provide improved schooling options for students classified as English learners.

Keywords: school choice; English language learners; Geographic Information Systems; charter schools; open enrollment

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Elección de mapeo: Un análisis GIS crítico de la inscripción de estudiantes de inglés
Resumen: Arizona está a la vanguardia de la elección de escuelas: además de una ley de inscripción abierta en todo el estado, fue uno de los primeros estados en adoptar la legislación de escuelas chárter en 1994 y actualmente tiene el segundo porcentaje más alto de estudiantes de escuelas públicas que asisten a escuelas chárter. escuelas de la nación. A pesar de la extensa investigación sobre la elección de escuelas, se sabe menos acerca de si los sistemas de elección brindan significativamente más oportunidades para los estudiantes clasificados como aprendices de inglés, un grupo diverso que ha sido objeto de múltiples políticas discriminatorias y tiene una de las tasas de graduación más bajas del estado. El documento actual utiliza el análisis geoespacial para examinar la participación de los estudiantes de inglés en la elección de escuela en un área metropolitana de Arizona. Los resultados indican que las escuelas chárter constantemente inscriben menos a los estudiantes EL, independientemente de la variabilidad demográfica entre las ubicaciones geográficas. Los patrones de ubicación de las escuelas chárter pueden ser un factor que contribuye a las disparidades en la inscripción de EL, aunque no es probable que sean la única razón. Empleando un marco conceptual de motilidad (capital de movilidad; Kaufman et al., 2004) y una postura crítica sobre las dimensiones espaciales de las reformas neoliberales, los hallazgos sugieren que la elección escolar no regulada puede no proporcionar de manera confiable mejores opciones de educación para los estudiantes clasificados como aprendices de inglés.
Palabras-clave: elección de escuela; estudiantes del idioma inglés; Sistemas de Información Geográfica; escuelas charter; inscripción abierta

Escolha de mapeamento: Uma análise GIS crítica da matrícula de alunos de inglês
Resumo: O Arizona está na vanguarda da escolha de escolas: além de uma lei de matrícula aberta em todo o estado, foi um dos primeiros estados a adotar a legislação de escolas charter em 1994 e atualmente tem a segunda maior porcentagem de alunos de escolas públicas que frequentam escolas charter. escolas da nação. Apesar da extensa pesquisa sobre a escolha da escola, sabe-se menos sobre se os sistemas de escolha oferecem significativamente mais oportunidades para alunos classificados como aprendizes de inglês, um grupo diverso que tem sido objeto de múltiplas políticas discriminatórias e tem uma das taxas de graduação mais baixas do estado. O presente artigo usa análise geoespacial para examinar a participação do aluno de inglês na escolha da escola em uma área metropolitana do Arizona. Os resultados indicam que as escolas charter registram consistentemente menos alunos EL, independentemente da variabilidade demográfica entre as localizações geográficas. Os padrões de localização das escolas charter podem ser um fator que contribui para as disparidades de matrículas em EL, embora provavelmente não sejam o único motivo. Empregando uma estrutura conceitual de motilidade (capital da mobilidade; Kaufman et al., 2004) e uma postura crítica sobre as dimensões espaciais das reformas neoliberais, os resultados sugerem que a escolha escolar não regulamentada pode não fornecer opções de escolaridade aprimoradas de maneira confiável para alunos classificados como aprendizes de inglês.
Palavras-chave: escolha escolar; alunos da língua inglesa; Sistemas de Informação Geográfica; escolas charter; inscrições abertas

Mapping Choice: A Critical GIS Analysis of English Learner Enrollment

Over the past several decades, school choice has emerged as a central pillar of school reform, functioning in tandem with accountability and testing to transform the landscape of public education in the United States (Apple, 2016; Au, 2016; Betebenner et al., 2005). With a range of supporters that span the political spectrum, school choice is representative of a neoliberal model of education in which students choose from multiple school types—such as charter, magnet, and selective enrollment—in addition to traditional attendance-area schools (Nguyen & Kebede, 2017). Guided by ideologies that value competition as a universal mechanism for improvement and view the private sector as inherently superior to the public, the logic of marketized systems rests upon an assumption that parents will be empowered to *vote with their feet*, thereby forcing schools to improve—or risk closure—as they compete with one another for students (Lipman, 2011; Patillo, 2015). However, this model may not account for existing contexts of uneven geographical distribution of capital and development across cities, legacies of racialized disinvestment, and patterns of segregation that may structure both the experiences and outcomes associated with school choice as it is implemented on the ground (Harvey, 2005; Reay & Lucey, 2003; Waitoller & Radinsky, 2017).

Neoliberal policies of school choice emerged in the late 1980s as part of a quasi-marketized strategy that challenged the idea of traditional school zones. Advocates argue that such policies free disadvantaged students from the "tyranny" of place by providing options that enable students to attend schools located in areas that may be more affluent than their local neighborhoods (Gabay-Egozi, 2016). Within this logic, school choice makes urban geography matter less. Nevertheless, a growing body of scholarship suggests the opposite may be true: that choice-based, marketized education policies have a profound impact on the production, reorganization, and meaning of space, across multiple interconnected scales (Cucchiara, 2013; Harvey, 2005; Lipman, 2011; Smith & Stovall, 2015; Waitoller & Radinsky, 2017). First, on the level of individual families selecting schools, these decisions are intimately bound up with where families are able to live, itself a complex matter embedded within geographies of cities that are informed by social hierarchies (Yoon et al., 2018). Increased student mobility associated with school choice also comes with pragmatic concerns, such as longer distances traveled by traditionally underserved youth who may have to traverse hostile neighborhoods, and youth attending schools that do not reflect populations they are familiar with or environments that are welcoming to them (Quiroz & Lindsay, 2015). Moreover, marketized school choice policies have also played a significant role in the spatial restructuring of American cities (Lipman, 2011). For example, rampant closures of public schools predominantly serving children of color have been described as a key factor in larger racialized neoliberal projects, effectively setting the stage for gentrification through the erasure of neighborhood and city identities (Nguyen et al., 2017). Housing markets, urban renewal, and educational markets are all deeply interrelated (Lipman, 2011).

Among populations of students who may be most vulnerable to changes in public school policies include those who rely on specialized services, such as students who are designated as English learners (ELs). An incredibly diverse group with a wealth of community and individual assets (González et al., 2005), English learning students are more likely to attend segregated, underfunded, and unsafe schools (Jiménez-Castellanos & García, 2017), and have one of the lowest graduation rates in Arizona (Arizona Department of Education [AZDE], 2019). Evidence suggests that nationally English learning students tend to be underrepresented in schools of choice (Buckley & Sattin-Bajaj, 2011; Mavrogordato & Harris, 2017; Ravitch, 2010; Winters, 2014). This is surprising,

since English learning students are an increasingly substantial part of the public school system—due to both immigration trends and the exit of white students from public school districts (Gándara & Aldana, 2014). Importantly, all public schools (including charter and magnet schools) are legally required to provide services for English learning students.

This study contributes to the literature on school choice by focusing on the participation of English learning students, a population that tends to be left out of school choice research (Buckley & Sattin-Bajaj, 2011; Mavrogordato & Harris, 2017). As geography is especially fundamental to understanding context-dependent school reforms involving the mobility of students (Yoon & Gulson, 2010), this research also builds upon and extends research on school choice through its use of geospatial analysis to analyze English learner enrollment in a borderland county in Arizona, a state on the forefront of marketized reforms (Potterton, 2019). Shedding light on these spatial patterns is important because it can help policy makers, district leaders, and communities develop policies that effectively advance educational equity for students who are often ethnically, linguistically, and spatially pushed to the periphery.

The question guiding this study was, in what ways do school location patterns shape English learner participation in school choice in the Tucson Metro Area of Pima County, Arizona? To answer this query, I used a critical GIS methodology to analyze the spatial patterns of charter school distribution, highly rated district and charter school distribution, English learner enrollment, and census block groups with high percentages of English learning school-age youth. More specifically, the sub-questions I used to guide my analysis were: (a) Across similar catchment areas, how do charter schools compare to district schools regarding English learner enrollment, and can differences in English learner enrollment be explained by school location? and (b) Where are charter schools and highly rated schools[1] (district and charter) located in relation to census blocks with high percentages of English learning school-age youth? To answer these questions, I employed a conceptual framework of motility (Kaufman et al., 2004) and a critical stance on the spatial dimensions of neoliberal reforms to interrogate the ways that educational inequalities are spatially produced and maintained for EL youth.

Admittedly a reductive measure, school ratings were included for sub-question (b) because they are a public, state-supported metric for evaluating schools and form the foundation for viewing education as a marketplace where parents and students are positioned as consumers making rational, informed decisions (Au, 2016). As such, my inclusion of Arizona state formula-calculated A-F school ratings here is by no means intended to reify their universal validity, but rather to critically explore their role in constructing the official desirability of schools and by extension the neighborhoods in which schools are located.

Review of Research

In what follows, I situate this study within two bodies of literature: research on English learner participation in school choice, and the burgeoning field of geospatial analysis of school choice.

[1] This refers to the ratings schools receive on their annual "report cards," as required in the Elementary and Secondary Education Act of 1965, amended in 2015 as the Every Student Succeeds Act. Highly rated refers to schools that receive an A or B rating. In Arizona, the formula for A-F ratings includes year to year student growth on state assessments, as well as their scores on those assessments in English language arts, math and science. It also includes English learner performance and improvement on the state language assessment, indicators that an elementary student is ready for success in high school and that high school students are ready to succeed in a career or higher education and high school graduation rates (AZ Department of Education, 2019).

English Learners and School Choice

Charter Schools

Students designated as English learners are one of the most severely underrepresented groups in charter schools across the country (Blum, 2015; Fabricant & Fine, 2012; Harvey, 2018; Mavrogordato & Harris, 2017; Ravitch, 2010; Stern et al., 2015; Winters, 2014), though there is considerable variation across states and large districts. In Minnesota, Rhode Island, and Missouri, for example, charter schools enroll higher percentages of ELs than traditional public schools (Sattin-Bajaj & Suárez-Orozco, 2012). In places like Arizona, California, Georgia, Kansas, New Mexico, New York City, North Carolina and many others, the opposite is the case (Buckley & Sattin-Bajaj, 2011; OELA, 2018; NCES, 2018; Sattin-Bajaj & Suárez-Orozco, 2012; Winters, 2014). There is clearly still a great deal to learn about how school choice shapes English learner enrollment in different regions of the US.

Though existing research remains in the early stages of addressing these disparities, several possible explanations have been offered to explain the pervasive under-enrollment of ELs in charter schools. In their mixed-method study of Latinx and non-Latinx parents whose children were enrolled in a diverse charter school in Indianapolis, Indiana, Mavrogordato and Stein (2016) found that while both sets of parents conducted a multi-stage search process and had similar criteria for evaluating schools, Latinx parents relied more heavily on social networks for obtaining school information, and rarely used additional tools—either because of linguistic or technological barriers, or because they were unaware of their existence. The use of all-English printed marketing, digital materials, and monolingual English staff has (perhaps unsurprisingly) been cited as a significant and widespread exclusionary measure that prevents ELs from enrolling in charter schools (ACLU, 2017; Ayscue et al., 2017; Garcia & Morales, 2016; Mommandi & Welner, 2018). It is also possible that there are differences in English proficiency between ELs enrolled in charters and those in district schools (Buckley & Sattin-Bajaj, 2011).

Beyond linguistic barriers, other potential explanations for the under-enrollment of ELs in charter schools include that parents may not possess the cultural fluency required to navigate choice systems, or be familiar with the expectations for parental involvement that it entails, despite caring deeply about their children's education (Mavrogordato & Stein, 2016). Put another way, ELs are less likely to attend schools of choice because of the failure of schools to validate the cultural wealth of students and families in their outreach and recruitment strategies (Mavrogordato & Harris, 2017). As noted by Sattin-Bajaj (2014), many assumptions underlying choice policies are based on the norms, values, and resources of white middle-class families. Without intentional recruitment, parents may not be sufficiently aware of school choice options or familiar with the United States' school system and application process (Buckley & Sattin-Bajaj, 2011; Winters, 2014). Common charter school practices such as early application deadlines and short application windows mean that social networks and word-of-mouth information are of heightened importance; because people are significantly more likely to have relationships with others who share their own race, religion, education, and occupation (McPherson, et al., 2001) these factors tend to replicate pre-existing enrollment demographics each year (Mommandi & Welner, 2018).

Open Enrollment

Open enrollment refers to programs that remove restrictions on student movement, enabling students to transfer out of their assigned local schools and enroll in schools of their choice, provided there is space. Open enrollment programs vary in several important ways. There are intradistrict school choice programs (students are limited to their residential district) and interdistrict

(students can attend schools across districts). In a quantitative analysis of five years of student enrollment data in Colorado, Lavery and Carlson (2015) found that ELs were less likely to participate in an interdistrict open enrollment. Cobb and Glass (2009) found that unregulated choice and open enrollment programs may increase the concentrations of English learner students and socioeconomically disadvantaged students in some schools. This may be because most open enrollment programs fail to provide transportation for students who elect to attend a non-assigned school (Koedel et. A.l, 2009). Thus, the mere provision of options is meaningless without careful consideration of *how* students and families will access those resources.

Yet another factor that may contribute to the segregative effects of unregulated open enrollment is that families often use existing racial, ethnic, and linguistic divisions as a basis for evaluating and interpreting school choice options (Bell, 2009; Holme, 2012; Yoon & Gulson, 2010). For example, the mostly white, affluent parents in Holme's (2012) study used status ideologies to attribute academic motivation and behavior to schools based on the racial and SES makeup of the student bodies, thereby enabling them to avoid recognizing (or admitting to) the fundamental role that race and status played in directing their school choices. Through this deficit lens, the presence of English learners was seen as potentially impeding the academic advancement of native-English-speaking students (Holme, 2012). Spatially, these class- and race-based ideologies can function to attribute symbolic meanings to different neighborhoods as well, influencing where families decide to purchase homes and where they send their children to school (Holme, 2012; Rowe, 2015). These findings underscore the need for critical research into the ways that enrollment policies may potentially facilitate the flight of whiter, more affluent families from particular districts (López, 2016), and how English learner students and their families are experiencing and responding to these shifts.

Accountability Structures, School Choice, and English Learners

Accountability measures, in which schools and districts are held responsible for student achievement have perhaps been some of the most central components of neoliberal education reforms (Apple, 2016). While not inherently a problematic concept—indeed, finding ways to evaluate how well our schools are serving *all* students is a laudable and necessary goal—the implementation of accountability policies have been fraught with problems (Leonardo, 2009). Chief among these has been a reliance on high-stakes standardized testing as a means of evaluation. Scores on these tests have been used to justify a long list of educational policies, including charter school legislation, teacher evaluations, challenges to tenure and collective bargaining, school closures, the use of undertrained Teach for America recruits in high needs areas, and Common Core national standards (Au, 2015; Heineke, 2018; Henry, 2016; Koyama, 2015; Leonardo, 2009). Because standardized tests do not take students' widely divergent educational histories, access to resources, or other aspects of structural inequality into account, they misrepresent test scores as valid reflections of teacher effort and student intellect (Apple, 2004).

This is particularly true for English learners. After being in English language development classes for only one year, ELs are required to take the same standardized test as native English speakers (Martin, 2016). Rather than an accurate assessment of content knowledge, these tests actually measure English proficiency (García & Morales, 2016; Martin, 2016; Menken, 2010). Indeed, on a national level, ELs tend to score between 20 and 50 percentage points lower than native speakers on standardized exams in English Language Arts and other content area subjects (Menken, 2010). This points to a troubling misalignment between the purposes for which the tests were designed (to test content knowledge of native English speakers) and their actual use (Solórzano, 2008).

The dubious validity of such tests for all students—but perhaps especially for English learners—has significant consequences in a system in which test scores are valued so highly. Schools with more ELs, for example, are more likely to be deemed as failing (Menken, 2010). Scholars have argued that measuring school quality using performance-driven metrics like test scores, suspensions, and attendance, ultimately incentivizes schools to exclude students that may damage their performance and subsequent reputations (McWilliams, 2017; Stern et al., 2015). In urban districts with rapid charter school growth, students perceived as "high needs," such as students with disabilities and English learners, have been pushed out of rigorous 'no-excuses' charter schools (Waitoller et al., 2019), 'counseled out' of charter schools (Stern et al., 2015), and found to be disproportionately concentrated in traditional neighborhood schools (Buras, 2015; McWilliams, 2017). Regardless of how these enrollment disparities come to be, population differences between school type can clearly affect the validity of performance-driven evaluative measures as a policy tool. Findings about the positive effect of charter enrollment on student test scores in Newark, New Jersey, for example, become notably less generalizable given that the city's charter schools enrolled significantly fewer English learners and students with special needs than the entire student population of Newark (Weber, 2020). By attending to the locational patterns of charter schools and highly rated schools with respect to English learning populations, this study sheds light on the ways that geography exists as an additional layer to the interrelated issues of accountability, school choice, and English learner enrollment.

Geospatial Studies of School Choice

Geospatial research has the capacity to highlight the role of structural, relational, and organizational factors in the production of social inequality, thereby challenging decontextualized, individualistic frameworks (Hogrebe et al., 2012). The capacity of geospatial analysis to portray values relative to one another and in relation to other variables provides much more nuanced information than a single global value, such as a mean. For example, one key debate surrounding choice that is particularly well-suited to address using GIS is whether choice exacerbates or ameliorates racial segregation. In the early years of school choice in Arizona, Cobb and Glass (1999) used GIS to compare the ethnic composition of 55 urban and 57 rural charter schools with nearby district public schools throughout the state. By matching charter schools with the closest district public school of a similar grade range, the researchers found that charter schools typically enrolled 20% more white students than their public-school counterparts. They also found that charter schools enrolling a majority of students of color tended to be vocational schools or secondary schools that targeted students who had been expelled from public schools. Ten years later, in a geospatial study of the 22 largest school districts in the United States, Sohoni and Saporito (2009) demonstrated that public schools would be less racially segregated if all children living in a school district attended their neighborhood schools. Their findings indicated that increased segregation was a result of two primary factors. First, white students exited integrated neighborhood-based public schools at an elevated rate. Second, both white children and children of color were redistributed into private, charter, and magnet schools more unevenly than they were distributed across residential areas (Sohoni & Saporito, 2009).

This research and other evidence point to the ways school choice policies may intensify segregation between schools through a system that unevenly equips students and parents with information and social capital. While these disparities are shaped by income and race, they are often interpreted through an individualized meritocratic lens as the effects of effort, care, and parental know-how (Aggarwal, 2015; André-Becheley, 2007; Rowe & Lubienski, 2017; Yoon et al., 2018). While variables of race and income dominate in the literature, these are not the only significant

categories of difference. This study contributes to the extant literature by focusing on English learners, who tend to be left out of this work.

Conceptual Framework

This study was informed by a conceptual framework attending to the political context and spatial dimensions of school reform. I also applied the concept of motility, or mobility capital, to examine spatial patterns of enrollment.

Neoliberalism, Choice, and the Uneven Production of Space

For the last three to four decades, neoliberalism has been the dominant social, political, and economic framework in the US (Lipman, 2011). Perhaps most famously associated with historic figures like Ronald Reagan and Margaret Thatcher who are often credited with having ushered in the neoliberal era, neoliberalism is a complex amalgamation of political and economic theories, practices, discourses, and ideologies that value individualism and free market capitalism, and promote private property rights and the reduction of the public sphere (Au, 2016; Harvey, 2005; Lipman, 2011). Private entities are conceptualized as being more effective than public institutions, which are discursively constructed as incompetent, wasteful, and generally inferior[2]. Within this framework, emphasis is redirected from state regulation and provision of public services onto individuals, who become "responsibilized" agents exhorted to address their own needs (Quiroz & Lindsay, 2015).

Because advocates of neoliberal policies understand all social spheres through an economic analytic lens (Marx & Saavedra, 2014), the neoliberal bent of contemporary education policy is epitomized by a marketized approach in which the ability to choose between educational options is elevated as a primary mechanism for school reform. However, several presumptions animating this approach— such as a neutral market and rational, equally empowered citizen-consumers— may deserve more critical interrogation. From varying levels of desirability attributed to subpopulations of students, largely based on their ability to excel on high-stakes testing and the perceived cost to educate them (Martin, 2016), to parents relying primarily on race and other socially-constructed status ideologies to select schools for their children (Holme, 2002; Yoon & Gulson, 2010), a growing body of research has empirically documented circumstances that undermine the capacity of unregulated choice—particularly when paired with accountability structures—to advance educational equity (Ayscue et al., 2017).

Geographic space is fundamental to school choice not only on an individual level, but also on the scale of cities and regions as well. In marketized schooling systems, education is constructed as a good to be strategically marketed; as such, school choice frequently intersects with efforts to revitalize cities (Nguyen et al., 2017; Quiroz & Lindsay, 2015). For example, in cities like Philadelphia, Chicago, and New Orleans, educational policies have been explicitly crafted to attract more affluent residents to previously low-income neighborhoods and encourage public-private partnerships to augment the resources available to areas targeted for redevelopment (Buras, 2015; Cucchiarra, 2015; Lipman, 2011). In doing so, concerns over equity, redressing the protracted disinvestment from low-income communities of color, and creating opportunities for marginalized communities to meaningfully participate in decision-making often take a back seat to objectives relating to economic integration, the return of middle- and upper-class parents to public schools, and private interests (Buras, 2015; Cucchiara, 2015; Lipman, 2011).

[2] This discursive binary is deeply embedded in political economies of race in the US. See Hohle (2012) for a thorough analysis of how anti-Blackness was operationalized to sow distrust in public institutions and garner white support for neoliberal policies in the postwar South.

Motility

Much critique of school choice is centered on the fact that in and of themselves, choices may not necessarily be empowering because actors are still embedded in asymmetrical power relations and inequitable landscapes (Patillo, 2015; Yoon & Lubienski, 2017). Indeed, as argued by critical geographers like Soja (2010), Massey (2005), and Harvey (2005), the spatial and social dimensions of reality must be considered in tandem, as they are inextricably linked. Movement through space—for instance, selecting and attending a school—necessarily involves interactions between actors, structures, and contexts, and is motivated by social and political logics (Kaufman et al., 2004).

The concept of *motility* has been proposed as one way to describe the interrelatedness of spatial and social mobility (Kaufman et al., 2004). More specifically, motility is a concept that researchers use to describe how socio-economic factors enable or determine physical mobilities and vice-versa, how physical mobilities influence socio-economic circumstances (Mason, 2011). As such, Kaufman et al. (2004) theorized motility as a type of capital which, like its social or economic counterparts, can be exchanged for other types of capital and is linked to the societal distribution and maintenance of power (Kaufman et al., 2004).

Motility goes beyond describing actual or past movements through space to include consideration of constraints and *potential* capacity for movement. For instance, though an asylum seeker from Honduras may physically move around a great deal, an analysis of her motility would reveal that she does not have the same level of control over her movements as someone traveling the same distance for pleasure or business. Using the same logic in a very different context, a student who takes a public bus across the city each day to avoid attending a nearer but notably understaffed, underfunded school may be highly mobile, but have reduced motility. Motility is therefore a more comprehensive lens than mobility for analyzing movement with respect to social inequality and stratification (Kaufman et al., 2004). School choice policies are premised upon the ability of all students to freely move through geographic space; the concept of motility contributes a necessary layer of complexity by addressing how, why, and to what effect those movements take place. Though the present study does not include qualitative analysis on the social dynamics of choice, the concept of motility was essential for interpreting findings through a lens attendant to the constraints and differential possibilities that shape how school choice functions.

Context

Pima County is the second most populous county in Arizona, with more than 99% of the county's population centered in the city and surrounding metropolitan area of Tucson. A rapidly growing mid-sized city, the Tucson metropolitan area is home to a little more than one million residents (U.S. Census Bureau, 2019). English learners constitute approximately 6.27% of K-12 charter and district school students in Pima County, compared to the state average of 7.23%. Though proportionately smaller than the English learner populations of neighboring states like California (21%) and New Mexico (15.7%), Arizona's Pima County warrants special attention for three main reasons: (1) the state's notoriously assimilationist English-only language policies, (2) the extent to which Arizona has led the way in school choice on a national scale, and (3) Tucson's long history of displacing and segregating English learner students and their families. Each of these will be briefly discussed below.

Arizona's Language Policies

Arizona's restrictive language policies have produced a uniquely challenging environment for the education of English learners, leading some to argue that the state is an epicenter of the struggle for linguistic hegemony, a struggle rooted in the ideology that allowing any language other than English into the public sphere threatens American nationhood (Gándara & Orfield, 2012). Arizona, along with California and Massachusetts, became an English-only state in 2000 when voters passed Proposition 203, a ballot initiative that replaced bilingual education and ESL programs with structured English immersion (SEI). SEI, a relatively new and untested program model at the time, required teachers to use English exclusively to teach students area content, meaning that students were expected to learn in a language they had yet to acquire (Iddings et al., 2012).

Together with HB 2064, which mandated that SEI instruction take place in a segregated, daily four-hour block of time and focus exclusively on English grammar and vocabulary, devoid of all other content, Arizona's language policies have resulted in rapid English language development teacher attrition and exacerbated deprofessionalization (Heinecke, 2018), a widened achievement gap between English learner and non-English learner students (Jiménez-Castellanos & García, 2017), a drastically reduced set of educational options for English learners (Iddings et al., 2012), declining graduation rates for English learners (Henderson & Ambroso, 2018) and psychological trauma (Combs et al. 2005)[3].

Charter Schools in Arizona and Pima County

Arizona has the highest percentage of students attending charter schools (17.2%) in the nation, second only to Washington D.C. (NCES, 2018). This is more than triple the national average of about 5% (Nevarez & Wyloge, 2016). The state has the third highest number of schools run by educational management organizations, which are for-profit entities that charge a fee for their management services (National Alliance for Public Charter Schools, 2014). As such, Arizona is on the forefront of marketized education policies. Significantly, in Pima County, charter schools operate independently from local school districts.

According to a report by Arizona Minority Education Policy Analysis Center (AMEPAC) (Vagi et al., 2018), charter schools in Arizona enroll a higher percentage of white and Asian students and lower percentages of Latinx and Indigenous students, when compared to the statewide student population (Vagi et al., 2018). Earlier research demonstrated that Arizona charter schools had the highest share of schools with no ELs in comparison to traditional public schools in Arizona. The state's non-charter public schools, on the other hand, had the highest share of schools with concentrations of ELs greater than 50% (Hass & Huang, 2010). In their comparison of enrollment and residential demographic data, the Arizona Center for Investigative Reporting (Nevarez & Wyloge, 2016) found that on the whole, charter schools tend to be whiter than areas in which they are located, while Hispanic students are more likely to be over-represented in district schools (Nevarez & Wyloge, 2016). Importantly, this state-wide finding varies significantly by type of charter school. In charters designated by the report as "rigorous" (tailored for academically advanced students) or "progressive" (e.g., the Montessori method of teaching), white children comprised more than half of the student body, with Hispanic students making up about 20%. In schools categorized

[3] Significantly, the governor of Arizona signed SB 1014 into law in 2019, which grants public schools and teachers of ELs more flexibility to develop research-based instructional models that deviate from the four-hour SEI block. Schools are still required to provide structured language instruction for two hours, but are advised to integrate grade-level content with reading, writing, and comprehension strategies (Office of the Governor Doug Ducey, 2019). Precisely how schools and districts will respond to this new development has yet to be seen.

as serving "at risk" students (catering to students in danger of failing school), Hispanic students were an overwhelming majority, and less than 20% of students were white (Nevarez & Wyloge, 2016).

A report released by the ACLU (December 2017) provided evidence that many Arizona charter schools either unlawfully excluded students or engaged in practices that served as barriers for some students to enroll. Fifty-six percent of the 471 charter schools analyzed were found to implement policies that were clear violations of the law or that may discourage the enrollment of certain students (ACLU, 2017). These unlawful and/or exclusionary practices included placing an enrollment cap on the number of students with special educational needs, refusing to admit students with prior suspensions, including unexplained questions about languages spoken at home on the charter school application, failing to provide application documents in languages other than English, and requesting copies of students' birth certificates and/or Social Security numbers with no mention of acceptable alternative documents (ACLU, 2017). These practices (and the lack of oversight that enables them) may be partly to blame for the skewed demographics of Arizona's charter school population.

Tucson Unified School District (TUSD)

In Pima County's largest school district, TUSD, choice policies are layered over an existing federal desegregation order that has been in place since 1974. Though originating with Mexican American and African American families who sued the district for segregating and discriminating against students of color, the case has since shifted from its original purpose. As argued by López (2016), the Court has conflated the difference between de jure and de facto influences on segregation. As overall enrollment in the district declined (white students in particular) and Latinx enrollment grew, high-performing majority-Latinx magnet schools were instructed to enroll more white students and fewer Latinx students, meaning that they were turning away the very students that the desegregation order was originally intended to help (López, 2016). In the 2017-18 school year, TUSD enrolled approximately 45,700 students, of whom 61% were Hispanic, 9% were African American, 20% were white, 4% were Native American, 2% were Asian/Pacific Islanders, and 3% were multi-racial (TUSD, 2018). In its annual report, District officials write that avoiding having 'racially concentrated' schools (70% or more of one group) becomes difficult as Hispanic populations increase, neighborhoods are racially concentrated, and the overall enrollment in district schools decreases (TUSD, 2018). With its ability to situate school enrollment data within their spatial contexts, geospatial research may help provide a more accurate picture of whether schools are demographically reflective of surrounding areas.

Significantly, López (2016) notes that there has been an exodus of white families from TUSD and into private schools, charter schools, and suburban districts. There are 54 charter schools within the boundaries of TUSD alone; 40% of students enrolled in these schools are white (López, 2016). Moreover, the racial makeup of the four largest charter schools is between 45% and 74% white, compared to only approximately 20% in TUSD (López, 2016). These demographics raise important questions about how school choice functions within local policy contexts, and who are the primary beneficiaries of charter schools and open enrollment policies.

Methods

Critical GIS

A Geographic Information System (GIS) is a computer-based system that is designed to manage and analyze data that are geographically locatable (spatial data) and data that have no associated geographic information (aspatial data). With its powerful capacity to visualize and analyze

a wide range of geographically organized data—including demographic, socio-economic, housing, crime, and environmental data—GIS has a long history of being used by the state, military, and corporations in service of their interests (Pavlovskaya, 2018; Vélez & Solórzano, 2017). Technological advancements over the past few decades, however, have made inexpensive yet effective tools much more accessible to researchers in the social sciences, as well as nongovernmental, grassroots, and community groups (Morrison & Garlick, 2017).

As mapping technologies have become more accessible to more diverse groups, scholars proposed critical GIS as an approach to geospatial research that aims to use GIS for progressive social goals by creating maps that challenge the status quo (Pavlovskaya, 2009). Critical GIS is defined as a "network of knowledge, ideology, and practice that defines, inscribes, and represents environmental and social patterns within a broader economy of signification that calls forth new ways of thinking, acting, and writing" (Pickles, 1995, p. 4). Pavlovskaya (2018) describes three ways that critical GIS has the capacity to problematize existing conditions: (a) by challenging accepted technological norms and finding new ways to represent spatial information; (b) mapping spaces of possibility and hope; and (c) challenging existing dynamics of social power by problematizing geographies of class, race, gender, and other systems of oppression.

In the field of educational research, most scholars using GIS have centered issues of justice, equity, and access in their spatial research from the very outset (Cobb, 2020). From analyzing the distribution of preschools (Webster & White, 1997) to mapping literacy-rich environments (Jocson & Thorne-Wallington, 2013) to producing asset-based cartographies of possibility (Green, 2015), educational researchers have used spatial analysis to develop knowledge based on the understanding that space, place, race, income, and opportunity are all deeply interconnected, particularly in the United States (Cobb, 2020; Mann & Saultz, 2019). Inspired by this body of work, my objective in this research is to reveal spatial configurations of power that may contribute to educational inequities. In analyzing the ways that school locational patterns shape English learner participation in school choice, I consider the extent to which the assumptions about individual liberties embedded in choice models are equally accessible to all students, and whether prioritizing the mobility of individual students has unexpected consequences for groups of historically underserved people.

Data Collection

To conduct this analysis, I used publicly available demographic data from the U.S. Census Bureau, enrollment data from the Arizona Department of Education, open enrollment data from the three most populous school districts in Pima County, and geographic data (shapefiles) from Pima County's GIS department.

From the U.S. Census, I used 2017 American Community Survey (ACS) data, since the most recent enrollment data available was also from the 2017-2018 school year. The ACS data was at the level of the neighborhood block group, to capture a finer grain of information than a census tract. The block group is the smallest geographic entity for which the decennial census tabulates and publishes sample data, and typically has between 600 and 3,000 people (U.S. Census Bureau, 1994). Since neither the individual addresses nor zip codes of English learner students were available, census data on the percentage of school-age youth (between 5 and 17 years old) who reported speaking English less than "very well" were used to create a proxy for students classified as English learners. This proxy was important for analyses requiring an approximation of where English learner students live.

Data from the Arizona Department of Education included information about school type (district public or charter) and enrollment statistics for each school (number and percentage classified as ELs). Pima County GIS data included school district boundary lines, school catchment

area boundary lines, and a point feature class of schools. I excluded online charter schools from the present study because the spatial component of their enrollment was not as obvious.

I then compiled the data into a geodatabase, which is simply a way of storing spatial data in one large file that can contain multiple point, line, and polygon layers. Creating the database in ArcGIS Pro, desktop GIS software, involved importing block group geometry, associated census data, and a point feature class of all schools in the county. I joined an Excel file containing school enrollment data to the school point feature class by manually creating a common identification code that enabled matching enrollment data to the school's location. This process also involved using the Arizona Department of Education's online school database to check for any changes in school location, school closures, and any other inconsistencies.

Data Analysis

To answer my overarching question, how school location patterns shape English learner participation in school choice in the Tucson Metro Area of Pima County, Arizona, I developed two more specific sub-questions: (a) Across similar catchment areas, how do charter schools compare to district public schools regarding English learner enrollment, and can differences in English learner enrollment be explained by school location? and (b) Where are charter schools and highly rated schools (district and charter) located in relation to census blocks with high percentages of English learning school-age youth? All analysis procedures subsequent to creating the geodatabase are discussed below, organized by research sub-question.

Across Similar Catchment Areas, How Do Charter Schools Compare to District Public Schools Regarding English Learner Enrollment, and Can Differences in English Learner Enrollment Be Explained by School Location?

I used a Mann-Whitney U-Test to determine whether differences in English learner enrollment between charter and district public schools was statistically significant. The Mann-Whitney U-Test is a nonparametric test of means that is robust to outliers. Data on English learner enrollment violated some of the fundamental assumptions required for the use of a *t-test*, which is a statistical test for analyzing differences between two groups. For example, school enrollment data by percentage of English learner students were not distributed normally, and the two groups of schools (district and charter) did not exhibit similar variability (as measured by the standard deviation). The Mann-Whitney test, also called the *Wilcoxon*, is an ordinal-level method in that it uses only the rankings of the observations (Agresti & Finlay, 1997). The observations from both groups are combined and then ranked from 1 to $n_1 + n_2$. The test statistic compares these mean ranks (Agresti & Finlay, 1997). The null hypothesis of the Mann-Whitney U-Test is that the mean ranks of the two samples are identical. The test statistic for the Mann-Whitney U-Test is calculated as follows:

$$U_1 = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1$$

$$U_2 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

where R_1 = sum of the ranks for group 1 and R_2 = sum of the ranks for group 2.

n_1 = 76 charter schools, n_2 = 205 district schools

Effect size (*r*) for the Mann-Whitney U-Test is calculated using Wendt's (1972) formula:

$$r = 1 - \frac{(2U)}{(n_1 n_2)}$$

Next, I needed to determine whether differences in English learner enrollment could be explained by charter schools' locations. This is important because it is possible that charter schools enrolled fewer ELs because they are located in neighborhoods where fewer ELs live, thus implicating that the disparity could (at least in part) be explained spatially. In ArcGIS Pro, the Summarize Nearby tool finds features that are within a specified distance of features of interest and calculates statistics for the nearby features. In this case, I calculated the percentage of English learners (using the proxy derived from census data) living within a five-mile radius of each school. This was then compared to the percentage of ELs enrolled at each school. A five-mile radius was used because it demarcates an area that is roughly the same as the mean area of school catchment zones in Pima County. Since charter schools do not belong to a district and do not have catchment zones, I used a five-mile radius as a proxy to enable a fair comparison between the two types of schools. I then calculated the difference between the percent of students who were enrolled as ELs at each school, and the percent of ELs living within a five-mile radius of each school. As these data also failed to meet the normality criteria, I again used the Mann-Whitney test to determine whether there was a statistically significant distinction between district and charter schools, in terms of the difference between enrolled ELs and ELs living within a five-mile radius of each school.

Where Are Charter Schools and Highly Rated Schools Located, In Relation to Census Blocks with High Percentages of English learner School-Age Youth?

Using ArcGIS Pro, I performed three separate Cluster and Outlier Analyses (Anselin Local Moran's *I*) to enable a visual comparison of (a) the parts of the Tucson Metro Area that were home to statistically significantly high percentages of English learner students, (b) the parts of the metro area in which a statistically significantly larger percentage of schools were charter schools, and (c) the areas where high proportions of schools are highly rated.

The Cluster and Outlier Analysis identifies spatial clusters of features with high or low values, as well as outliers, by calculating a local Moran's *I* value, a z-score, a pseudo p-value, and a code representing the cluster type for each statistically significant feature (ESRI, n.d.). Features are designated as part of a cluster if the value for *I* is positive, indicating that neighboring features have similarly high or low values; negative values for *I* indicate that neighboring features have dissimilar values, and that the feature is therefore an outlier. Because the Moran's *I* statistic used for this analysis is a *local* indicator of spatial association (LISA)—meaning that it is calculated for each observation—this analysis can reveal patterns of association that a global statistic would obscure (Anselin, 1995). In other words, a LISA allows for the decomposition of a global statistic into its constituent parts, revealing local patterns that may deviate from global spatial trends (Anselin, 1995). For example, while a global spatial statistic (e.g., Global Moran's *I*) might show a general spatial trend that the northern parts of the city have more English-only households, a local statistic would reveal particular neighborhoods that are aberrations from the larger pattern (e.g., northern neighborhoods that have many multilingual residents), or locations in which multilingualism is significantly clustered, relative to surrounding areas.

The primary value of the cluster and outlier analysis is as a visual tool for observing how similar an observed value is to its neighboring observations (Manesh, et al., 2020). That is to say, after conducting the automated calculation of a local Moran's I index, z-score, and pseudo p-value for each spatial unit (census block groups, in this case), the researcher's task is to visually analyze the resulting mapped output, which is color-coded to indicate statistically significant clusters and outliers. As argued by Pavlovskaya (2009), visual examination is a powerful analytic technique, perhaps the most widely used function of GIS.

Findings

Across similar catchment areas, how do charter schools compare to district public schools regarding English learner enrollment, and can differences in English learner enrollment be explained by school location?

Table 1

Summary Table of K-12 Schools and Percent EL Enrollment in Pima County

	Elem.	Middle	High	Other (e.g., K-8, K-12)	Total	% ELs (mean)
District Schools	126	32	35	10	203	7.39
Charter Schools	4	4	18	50	76	3.57

Charter schools (mean percentage of ELs = 3.57) enrolled significantly fewer English learners than district schools (mean percentage of ELs = 7.39), relative to the total number of students enrolled. The Mann-Whitney U test results indicated that this difference was statistically significant, $U(N_{charter}= 76, N_{district}=203) = 4920$, $z = 4.69$, $p < 0.00001$. The effect size of 0.36 indicates that the practical significance of the difference in English learner enrollment between the two groups is small to moderate (Sullivan & Fienn, 2012).

The difference variable for the second Mann-Whitney U-Test was calculated by subtracting the percentage of school-age English learner populace living within a five-mile radius from the percentage of students enrolled at the school as ELs. A negative number, therefore, indicated a school that served proportionately *fewer* English learner students than resided in the surrounding neighborhood, whereas a positive number indicated that a school enrolled proportionately *more* English learner students than resided in the surrounding neighborhood.

Results from the second Mann-Whitney U-Test showed that charter schools enrolled fewer English learners than district schools, even when this calculation was normalized in terms of the surrounding population. This disparity is statistically significant, $U(N_{charter}= 76, N_{district}=203) = 3829$, $z = 6.43831$, $p< 0.0001$, and practically significant as well, with a large effect size of 0.504. However, because ELs tend to be concentrated in the younger grades and there are far fewer charter elementary schools, this could have skewed the results. To address this potentially confounding factor, I conducted the analysis again, this time using only data from secondary schools. Because many charter schools that serve secondary students are K-12 or 6-12, these schools were included in the analysis. Based on the results of this test, the null hypothesis— that distribution of the English learner difference variable was the same across charter and district secondary schools— was once again rejected. District high schools had a higher (more positive) difference variable compared to charter schools serving secondary students. Test results indicated that this difference is statistically significant, $U(N_{charter}=45, N_{district}=38) = 475$, $z = -3.21$, $p< 0.001$) and practically significant as well, with a medium effect size of 0.444. Thus, the results similarly demonstrated that charter secondary school populations were less reflective of surrounding populations than public district secondary schools, in terms of English learner students.

Where are charter schools and highly rated schools located, in relation to census blocks with high percentages of English learner school-age youth?

Figures 1 and 2 depict the results of the Cluster and Outlier Analysis for block groups by proportion of charter to district schools (Figure 1) and percent of school-age population who are English learners (Figure 2, calculated using proxy). The results are organized by type of cluster. The pink areas indicate a cluster of block groups with significantly high values relative to neighboring areas, while the pale blue sections are clusters with statistically significantly low values relative to neighboring areas. Red represents outliers that deviate from nearby block groups by having a significantly high value, while the dark blue indicates outliers that have a significantly low value. Table 2, below, quantifies these visual results by listing the number of census block groups that fall into each category of cluster (high-high and low-low) or outlier (high-low and low-high).

Figure 1

Cluster and Outlier Analysis Results for Block Groups by Proportion of Charter Schools to All Schools

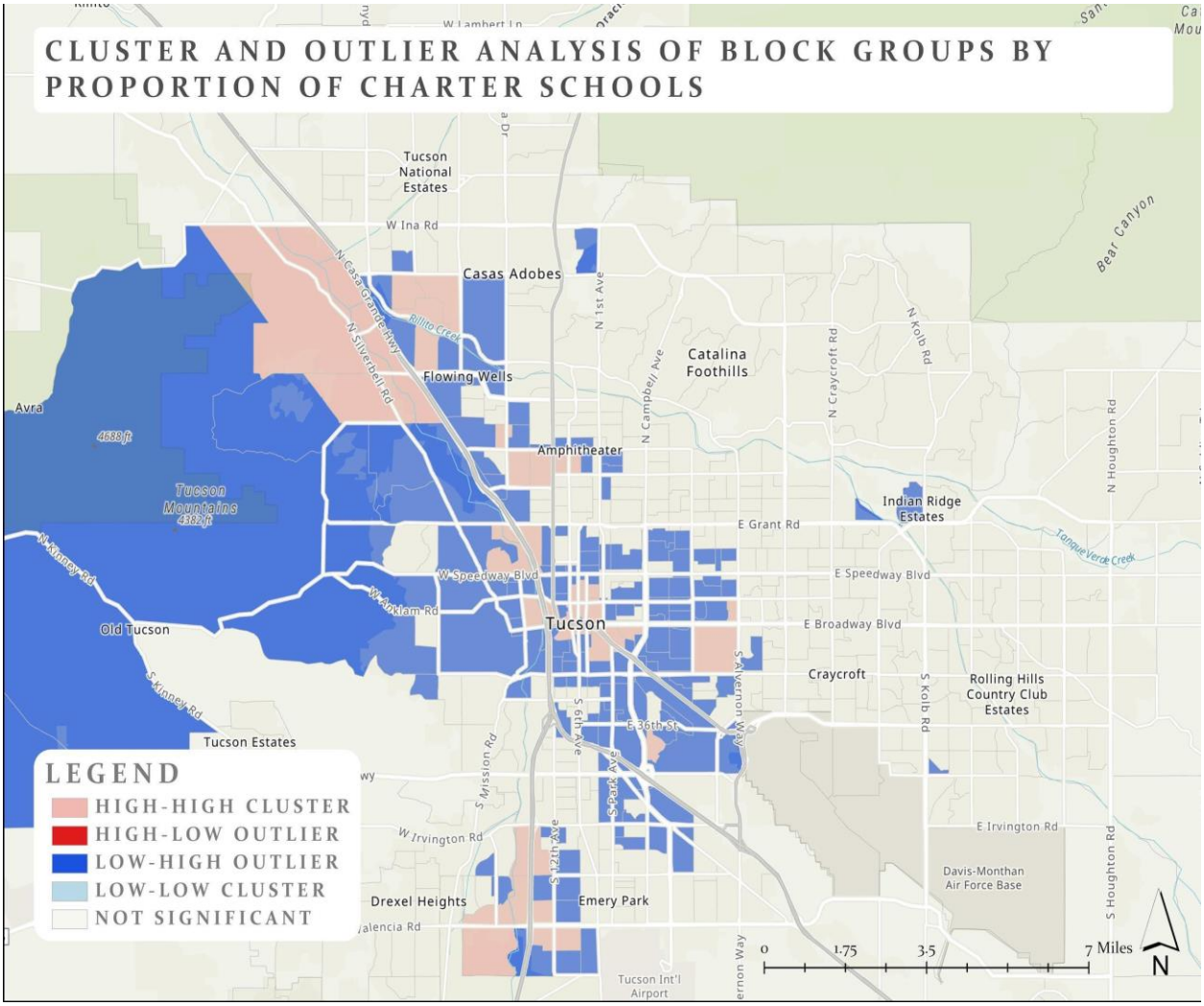


Figure 2

Cluster and Outlier Analysis Results for Block Groups by Percent EL Residence (Calculated Using Proxy).

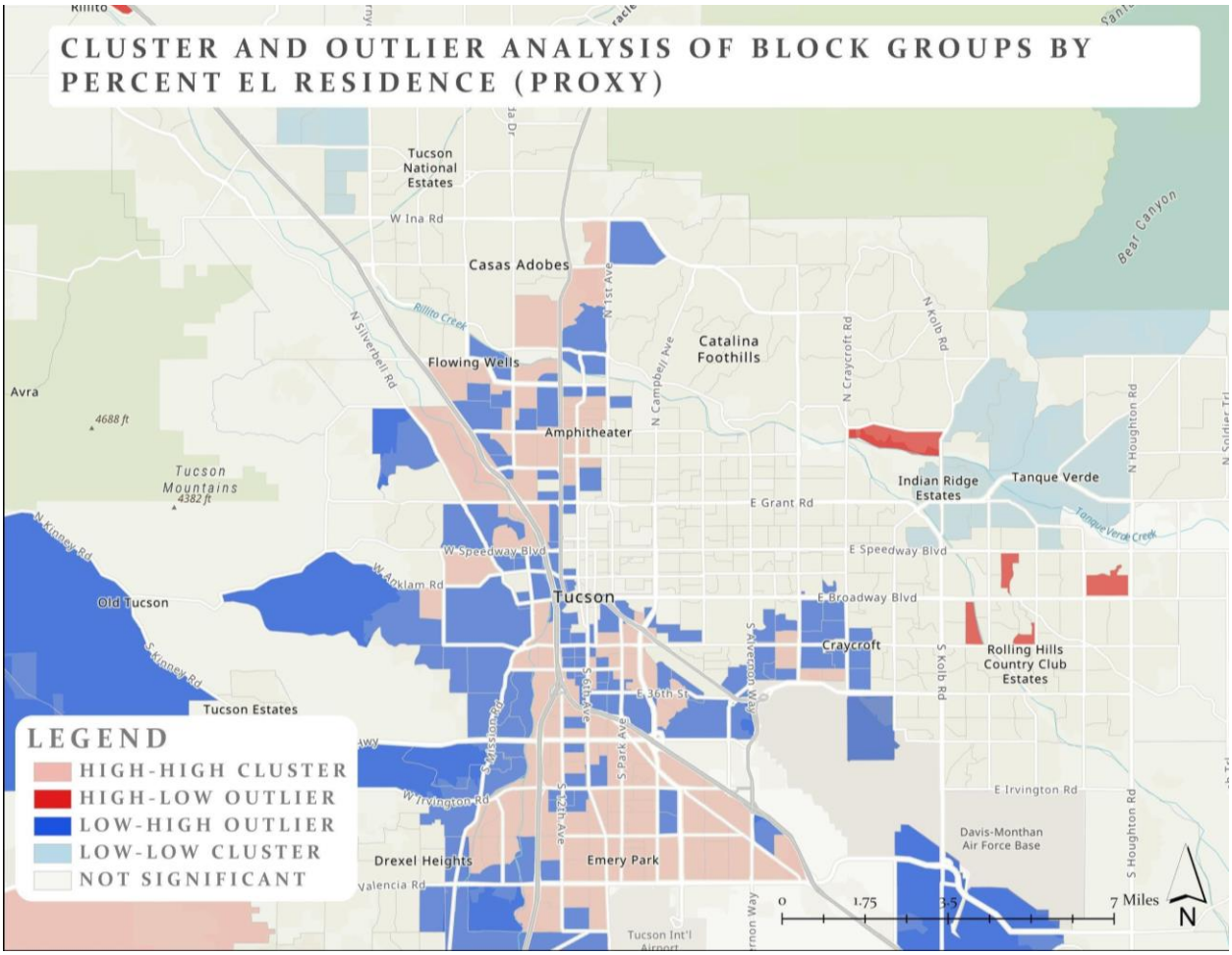


Table 2

Summary Table of Total Clusters and Outliers by Variable

	Block groups by % EL residence (proxy)	Block groups by proportion of charter schools	Block groups by proportion of A and B rated schools
High-High	40	23	24
High-Low	16	0	32
Low-High	31	102	5
Low-Low	100	4	61

Table 3

Matrix of Overlapping Cluster and Outlier Block Groups

		Block groups by proportion of charter schools				Block groups by proportion of A and B rated schools			
		HH	HL	LH	LL	HH	HL	LH	LL
Block groups by % EL residence (proxy) Clusters and outliers	High-High	8	0	13	0	0	5	0	24
	High-Low	0	0	0	0	1	0	0	0
	Low-High	4	0	9	0	16	13	0	16
	Low-Low	0	0	0	0	4	0	0	0

With several outliers, Figure 2 evinces a clear pattern of clustering, with English learner residences concentrated in the north-central, south-central, and southwest parts of the metro area and significantly fewer English learners in the northeastern neighborhoods. Figure 1, which illustrates the clustering of block groups by proportion of charter schools to all schools, depicts a topographically similar—if more diffuse—pattern. That is to say, the pattern of charter school clustering overlaps significantly with the clustering of English learner residences, though this pattern is not perfectly consistent. As indicated in Table 3, 8 out of 23 block groups clustered by a high proportion of charter schools are in areas with significantly high proportions of school-age English learning youth. There are also, however, 13 block groups within English learner residential clusters that are low-high outliers in charter school distribution, meaning that they have low proportions of charter schools, compared to surrounding areas. When considered in light of the results from question (a), that charter schools are less representative of their surrounding populations, this finding is not terribly surprising. One possible explanation could be that since English learner students are more likely to come from low-income families (Takanishi & Le Menestrel, 2017), they tend to live in areas that have lower property values. These areas may be more attractive for charter schools, which must consider real estate prices when choosing a location (Gulosino & Lubienski, 2011). Figure 3, showing where charter schools are located relative to clusters of block groups with significantly high and low median home values, corroborates this possibility, as a significant portion of charter schools are located in block groups with low property values, relative to values in the area as a whole.

Figure 3

Cluster and Outlier Analysis Results for Block Groups by Median Value of Owner-Occupied Housing Units, with Charter Schools.

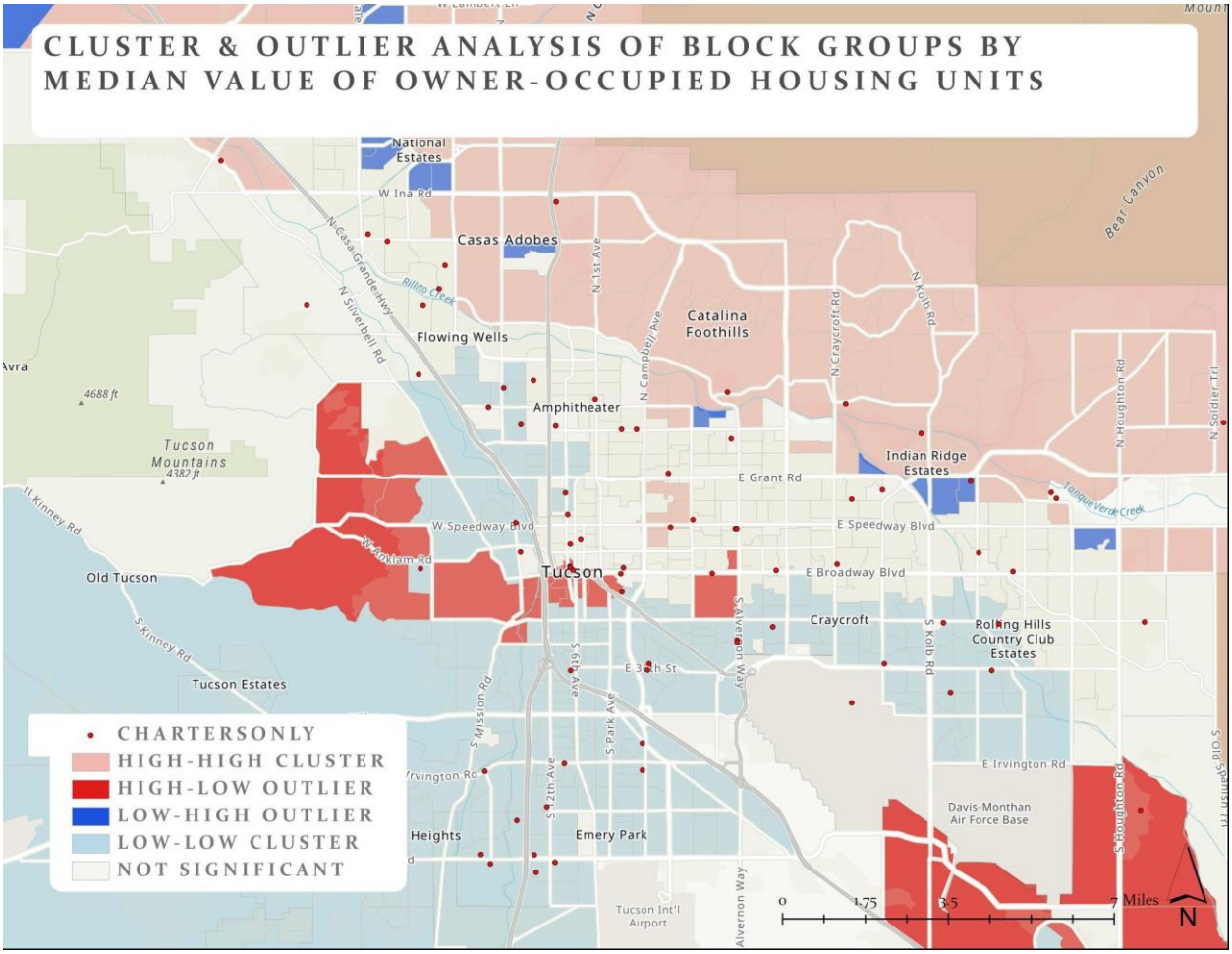
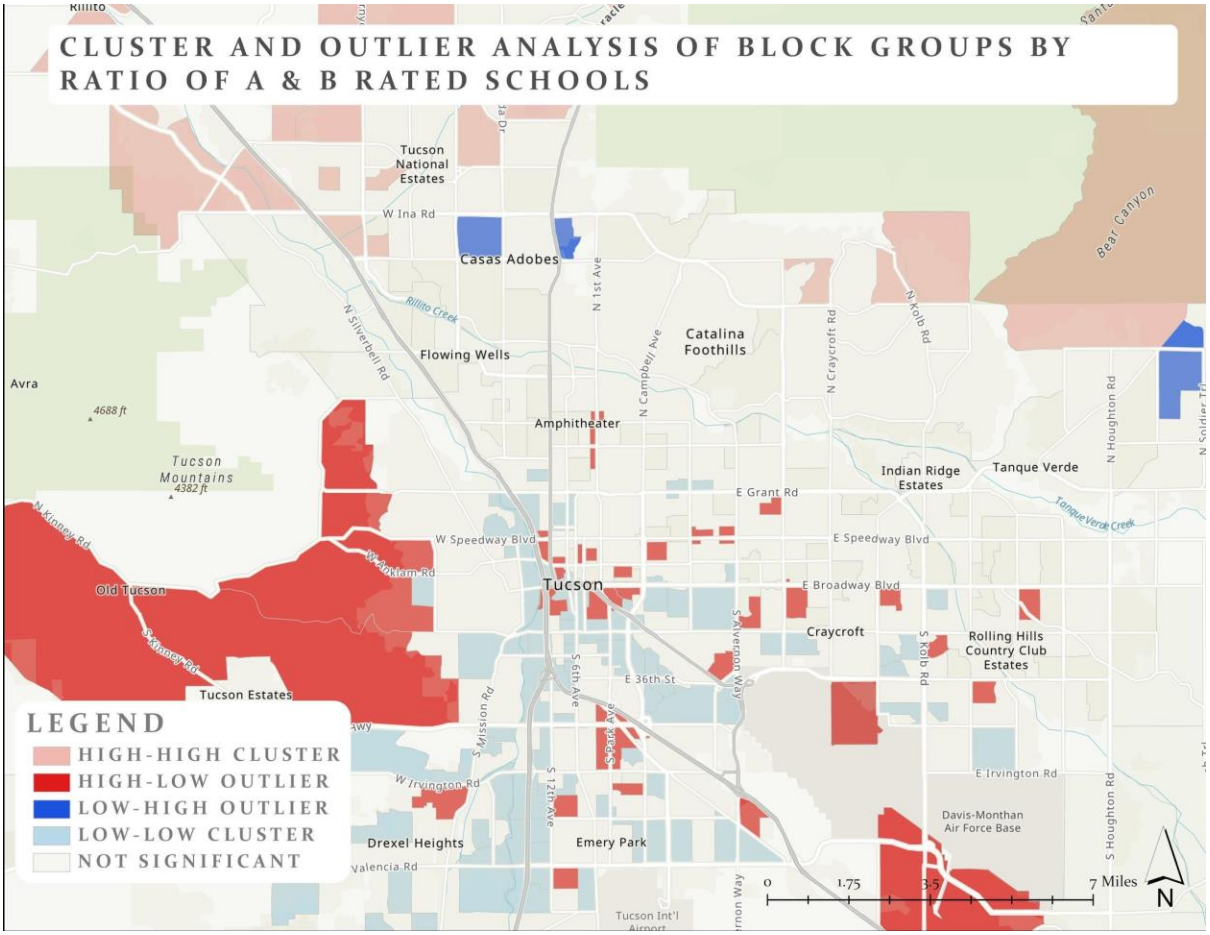


Figure 4 shows how census block groups are clustered according to the proportion of highly rated schools to all schools in each block group. When juxtaposed against the map of EL residential clusters (Figure 2), Figure 4 sheds light on the types of schools EL families have access to, as well as illuminating geographies of school desirability as they relate to where EL students live. Figure 4 displays a striking pattern of block groups with low proportions of highly rated schools clustered in the southern portion of the city (with some notable outliers), and several block groups with high proportions of highly rated schools in the far northern parts of the city. When compared to Figure 2, there is a loosely inverse relationship between block groups that are home to high percentages of ELs, and block groups with high proportions of highly rated schools. In fact, there was not a single cluster of highly rated schools that overlapped with a cluster of English learner residences.

Figure 4

Cluster and Outlier Analysis Results for Block Groups by Proportion of A & B Rated Schools to All Schools



Conversely, there were 24 block group clusters of high English learner populations that overlapped with clusters of significantly low proportions of highly rated schools. In other words, barring some important outliers, schools in areas where many ELs live tend to have lower ratings, and schools in areas with significantly fewer ELs tend to have higher ratings. Further analysis of Pima County data shows that approximately 46.2% of all schools in Pima county received an A or B rating for the 2017-2018 school year; of the schools with English learner populations higher than 5%, only 26.6% received an A or B rating.

Limitations

One significant limitation of this study is that the category of English learner is much less stable than official reported enrollment figures would suggest. Classification as an English learner is not a permanent label and can change within the course of a school year, meaning that enrollment data collected in October may not accurately reflect school populations in May. Moreover, students designated as English learners are incredibly diverse in so many ways. Studying ELs as a group without attending to within-group differences, as this study did, can misrepresent English learning students as unrealistically homogenous.

There are also several drawbacks and challenges associated with using GIS methodologies and technical tools. There are many considerations that shape school choice which are not always accounted for in geospatial studies, such as parents' feelings about the neighborhoods and communities children will have to pass through on their journeys to school (Taylor, 2007), the local politics of crossing informal boundaries (Lipman, 2007), and the relationship between school choice and the construction of class-based community identities (Rowe, 2015). The ways that ideologies of race and class inflect understandings of schools and their surrounding neighborhoods is one important way that *place*—the social meanings attached to spaces—matters in school choice (Bell, 2009; Boterman, 2013; Holme, 2002; Lipman, 2011).

While GIS is well-equipped to calculate travel times and radii around schools, how to include social, emotional, historic, and even some physical factors is less obvious, though just as important (Lubienski & Lee, 2017). Researchers have posed mixed methods GIS (Lubienski & Lee, 2017) or qualitative GIS (Cope & Elwood, 2009) as a means of intentionally and meaningfully combining quantitative and qualitative data. While such research is in its infancy, it holds great promise for its capacity to synthesize spatial information from various perspectives and across multiple scales (see Bell, 2009; Yoon & Lubienski, 2017). For example, though this study demonstrated that English learners are under-represented in many schools of choice in Pima County, explanatory factors causing this discrepancy are as yet hypothetical. Future research on this topic might therefore seek to integrate the types of map-based analyses demonstrated in this study with qualitative data that captures some of the values, ideologies, experiences, conditions, and on-the-ground spatial arrangements shaping the ways English learner students and their families relate to school choice.

Discussion and Implications

Findings from this analysis demonstrate that charter schools disproportionately under-enrolled English learners, even when accounting for population variability as a result of school location. Moreover, clusters of block groups with high proportions of charter schools overlapped significantly, though not consistently, with clusters of block groups with high proportions of English learner school-age youth. Together, these results indicate that charter school locational patterns may be one contributing factor to the under-enrollment of English learner students, though they are not likely to be the primary or only explanatory factor. Spatial issues, however, almost certainly still play a role. A conceptual lens of motility, which attends to an individual's capacity for and control over their movement, is useful here as it draws our attention to the complex physical *and* social elements of mobility, both of which are likely at play. At a finer scale of analysis, for instance, proximity may still be a barrier for students who live within a 5-mile radius of a charter school but lack transportation, which is not provided by most charter schools (Koedel et. al, 2009). What traversing a distance feels like, how possible that journey seems, and which schools families perceive as viable options are factors that shape a student's motility, but are not captured by a quantitative analysis of measurable distances. One important direction for future research, therefore, is to employ qualitative and mixed methods to investigate the spatial dimensions of English learner participation in school choice.

One of the consequences of charter schools and open enrollment policies in Pima County has been an overall decrease in district enrollment, especially among white students, and particularly in central urban districts like TUSD (López, 2016). Because of existing residential segregation and perhaps differential motility, this leads to district schools in particular areas having significantly higher proportions of English learner students relative to schools in other neighborhoods, and charter schools as a whole. Given current socioeconomic and educational disparities, concentrations

of English learner students that vary dramatically by neighborhood and school type could be problematic due to two factors: first, the coupling of choice systems with accountability measures that use test scores to evaluate schools, and second, the use of unregulated school choice as a means of lessening long-standing educational inequities. These two factors are described in more depth below.

As for the first factor, the neoliberal push for quantifiable evidence of school effectiveness in the form of public evaluative measures like the "school report card" creates a deceptively neutral mechanism by which schools can be compared with one another but does little to account for deep existing socioeconomic inequalities or the spurious validity of standardized assessment tools. Schools serving higher proportions of ELs, for example, are more likely to be evaluated as failing, in large part because test scores more accurately reflect English language proficiency rather than content knowledge for students still learning English (Menken, 2010). This is certainly true in Pima County, as previously mentioned. Within an educational quasi-marketplace, this may mean that schools serving more English learner students are at a disadvantage and may therefore be disincentivized to enroll such students. This can create a spiral that leads to a system that is increasingly sorted by race, class, and language (Apple, 2004).

Moreover, this trend is also manifested spatially. This study's results demonstrated that census block groups with significantly *fewer* highly rated schools notably overlapped with census block groups home to significantly *higher* residential English learner populations. If the school rating systems are to be taken at face value, this would indicate that English learner students have reduced access to high quality schools. As such, this could be an incentive for English learner students to use open enrollment to attend more distant schools. Would widespread use of open enrollment by English learner students be considered an equitable policy outcome, if those movements were largely reflective of decreased *local* schooling options? From a motility perspective, this would indicate reduced agency and control over movement, suggesting an inequitable landscape of schooling options for English learner students. In any case, further research is certainly needed to better understand the extent, experience, and outcomes of English learner participation in open enrollment.

However, even if such school rating systems are, at best, incomplete measures of school quality, they still have power. If well-resourced families are using school ratings to inform decisions about where to live— a phenomenon substantiated by research (Dougherty et al., 2009; Kane et al., 2003)—these rating systems may exacerbate segregation by representing the parts of town where English learner students live and go to school as less desirable. In other cities, similar rating and performance measures have been used to justify the closure of schools located predominantly in low-income communities of color (Good, 2017). These closures then led to students traveling longer distances to school (Lipman, 2007) and often functioned as a harbinger of displacement, as such neighborhoods are often targeted for urban renewal in the form of policies designed to attract new types of people (Good, 2017; Gulson, 2007). The fact that areas in Pima County where many ELs live and go to school tend to have fewer highly rated schools is therefore a pattern worth noticing.

Regarding the use of unregulated school choice as a means of lessening long-standing educational inequities, quite simply, if English learner students are not the principal beneficiaries of school choice (particularly charter schools), then using choice as a primary strategy for school improvement excludes a significant group of students. This is a terribly consequential issue, as this particular group of students is one to whom a tremendous educational debt is owed. As noted earlier, the education of English learners in Arizona has been dramatically politicized, with a host of ill effects (Combs et al. 2005; Heinecke, 2018; Henderson & Ambroso, 2018; Iddings et al., 2012; Jiménez-Castellanos & García, 2017). In Arizona, which has one of the lowest graduation rates of ELs in the country, only 39.43% of English Learners graduated from high school in 2017, which

was a vast improvement over the 25% graduation rate in 2015 (AZED, 2017). It might be worth asking, therefore, what other approaches to structural school reform might be precluded by an overarching emphasis on choice. Future research might therefore investigate what it would look like to center the needs, experiences, and assets of ELs in school reform, with emphasis on the role of space and place in shaping relationships between schools, multilingual communities, and urban environments.

As school choice is generally promoted as a solution to educational inequality, it is essential to understand how these systems impact students who have been historically underserved due to a confluence of structures relating to race, ethnicity, language, and income. Findings about the accessibility of choice systems for English learner students may therefore have valuable implications for policymakers seeking to make our schooling systems more equitable. The findings of this study suggest that expanding charter school offerings may not be the most effective approach to solving educational inequities for students designated as English learners. This study also contributes to the fairly small but growing body of educational research that employs spatial theories and analytic tools. In the words of Soja (2010), "geographies [...] are consequential, not merely the background onto which our social life is projected or reflected" (p. 104).

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