

PATTERNS AND TRENDS THAT IMPACT TEACHER ATTRITION AND
RETENTION: A RETROSPECTIVE STUDY

by

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This dissertation was prepared under the direction of the candidate's dissertation advisor, Dr. Charles Dukes, Department of Special Education, and has been approved by all members of the supervisory committee. It was submitted to the faculty of the College of Education and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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ABSTRACT

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This study intended to examine factors potentially contributing to teacher retention and attrition at the local (district) level and the costs associated with this teacher movement. A secondary data set from a large urban school district in the southern United States served as the unit of analysis for this study. Demographic data on 25,724 teachers, from 2010-2019 were used in the analysis. A correlation, multiple regression, chi-square, and a demographic frequency distribution were run for each of the three criterion variables: teacher job attrition, teacher school attrition, and teacher retention. The predictor variables used in the analysis were gender, certification, total number of years teaching, and race/ethnicity. Student demographic data from the district were used as a comparison to teacher data from the same school district. Results indicated trends particular in teacher movement, whether job or school, impact the number of years a teacher stays in teaching. Special education certified teachers appear to be the most

vulnerable to teacher movement. Teacher retention (leaving) averages over 17% each year over 10 years, costing \$36 million dollars annually or over \$367 million dollars over 10 years. At that rate, this district could experience a complete turnover of staff in only 5.7 years. Latino teachers are underrepresented in this teacher population and are out of proportion with the majority Latino student population. Black teachers change jobs and schools at statistically significantly higher rates than their White or Latino peers. National data are not longitudinal, and do not track teacher job movement, only teacher school movement. Current local data are critical for educational agencies, administrators, and decision makers to combat the teacher shortage. Findings from this study may inform the field about factors, trends, or patterns that contribute to teacher retention and attrition.

DEDICATION

This manuscript is dedicated to my husband, Richard, whose continued support and encouragement helped me achieve my dream. It is also dedicated to my family, whose love, support, and encouragement have made this possible. Finally, it is also dedicated to all teachers and exceptional education students. You are the ones who inspired me on this journey, and I am very grateful.

PATTERNS AND TRENDS THAT IMPACT TEACHER ATTRITION AND
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INTRODUCTION AND LITERATURE REVIEW

Teacher shortages are at critically high levels and have been for some time (Sutcher et al., 2019). Declining enrollment in teacher preparation programs has made it difficult for school districts to meet the shortage demand (National Center for Education Statistics [NCES], 2016). Special education teachers represent the highest critical shortage for over 40 years (Dewey et al., 2017). Special education shortages can erode the intent of IDEA, especially with less available qualified personnel (Peyton et al., 2021). There is more to *the teacher shortage* than simply an insufficient number of teachers to fill the positions available. To understand teacher shortages, it is necessary to know how teachers move within and in/out of school districts, often referred to as teacher attrition and retention (Carver-Thomas & Darling-Hammond, 2019). Current knowledge on teacher attrition and retention is primarily based on findings from the National Teacher Principal Survey (NTPS), formally known as the School and Staffing Survey (SASS), from the NCES. The Institute of Educational Statistics (IES)/(NCES), School and Staffing Survey (SASS), National Teacher and Principal Survey (NTPS), and Teacher Follow-up Survey (TFS) define teacher attrition as teachers who move from one school to another. These teachers are called *movers*. Teacher attrition can be problematic, especially for large urban districts that annually experience large-scale movement (Barnes et al., 2007). Whether a teacher leaves a school for another position within a district or leaves that district all together, the result for the school is the same—the loss of a teacher (Carver-Thomas & Darling-Hammond, 2019). Hiring another teacher or

moving a teacher around within the school may still leave a resource gap (Olsen & Huang, 2019; Sorenson & Ladd, 2020).

Teacher retention describes teachers who discontinue their employment (e.g., retirement, a job outside the profession). These individuals are referred to as *leavers* (NCES, n.d.; IES/NCES, SASS, n.d.; IES/NCES, NTPS, n.d.). The cost of teacher retention is in the billions each year throughout the United States, costing as much as \$21,000 per teacher per year for an urban school district (Learning Policy Institute, n.d.). The estimate from the Learning Policy Institute is based on previous work from Barnes et al. (2007), Milanowski & Odden (2007), and Shockley et al. (2006). Since these studies were conducted, costs have increased to estimates as high as \$40,000 per year, per teacher, in large urban school districts (Learning Policy Institute, n.d.). Thus, large school districts lose millions of dollars annually due to teachers moving and/or leaving the district. These financial costs do not consider other costs of student achievement and outcomes, possible loss of teacher experience, and costs associated with teacher attrition (teachers moving, not leaving). Approximately 8% of the teacher population leaves the profession each year (Carver-Thomas & Darling-Hammond, 2017a). At that rate, in 12 years, a large urban school district could be faced with the daunting task of replacing its entire teacher workforce. Often, novice teachers fill retention gaps. Thus, the position is filled, but in many cases, the teaching experience is not replaced (Olsen & Huang, 2019). Title 1, low-income, and high minority student population schools experience the highest retention rates; unfortunately, these are the areas with the most need (Barnes et al., 2007; Carver-Thomas & Darling-Hammond, 2019). Teacher attrition and retention are particularly impactful on students with disabilities and students of color (Carver-Thomas

& Darling-Hammond, 2019). This pattern can lead to great knowledge loss in addition to financial costs (Barnes et al., 2007; Ronfeldt et al., 2013).

National trends provide some insight into the teacher movement. The SASS, now known as the NTPS, and the TFS, are national surveys that track teachers' and administrators' (i.e., principals') demographics and movement. Much current research on teacher attrition and retention is based on data from these national surveys. These surveys are conducted using a robust sampling procedure. Surveys from the United States Department of Education are sent to random teachers and principals every 2 to 4 years. These data are critical to inform future research, make predictions, and make local, state, and national decisions.

The Condition of Education, published by the Institute for Educational Science (IES) National Center for Educational Statistics (NCES) provides data on the diversity of the teacher workforce regarding race/ethnicity. In 1999–2000, 84% of the teacher population was White, 8% Black, and 6% Latino. In 2017–2018 teacher data shifted somewhat to reflect 79% of White, 7% Black, and 9% Latino (IES/NCES 2019, IES/NCES 2020). These teacher trends are similar to student population trends and predictions. Nationally in 2000, the percentage of White students was 61%, 17% Black, and 16% Latino. By 2017, the student population was 48% White, 15% Black, and 27% Latino. The projection for 2029 is vastly different from 2000, as 44% of the student population is projected to be White, 15% Black, and 28% Latino (IES, NCES 2020). The number of students from non-White backgrounds is rising to equal or exceed the white student population by 2029.

For this study, a large data set from a large urban school district in the southern United States spanning 10 years, 2009 through 2019, was analyzed for teacher retention and attrition trends.

The purpose of this study was to analyze trends and patterns related to teacher attrition and retention in a single school district. The current study was conducted to answer the following research questions:

1. What teacher and school variables predict teacher retention in a large, urban public school system?
2. What teacher and school variables predict teacher job attrition in a large, urban public school system?
3. What teacher and school variables predict teacher school attrition in a large, urban public school system?
5. What is the cost of teacher retention in one local school district data?
6. What are the comparisons between teacher and student demography?

Theoretical Framework

This study used Bronfenbrenner's Bioecological Systems Theory as a conceptual framework to understand teacher attrition and retention. The theory provides a lens for conceptualizing and understanding this phenomenon. Each system is embedded within the other, yet all are interrelated (Brownell & Smith, 1993). The theory is used here to understand the multi-factor teaching ecosystem that catalyzes attrition and retention (Sass et al., 2012). The theory fits well when studying teacher attrition and retention. Each of the studied variables can be found in any of the environments. Bronfenbrenner posits that an individual exists at the center of the ecosystem. For this study, the teacher is the

center. The first environment closest to the teacher is the *microsystem*. The microsystem would include specific teacher demographics and personal factors such as race/ethnicity, gender, and years of teaching. The microsystem consists of all environments and the people within these environments that the teacher would interact face to face with. These environments evolve and change depending on each teacher. Some examples of teacher environments include the teacher's classroom, home, school, district, and faith groups, to name a few. Teachers might interact with colleagues, parents, administrators, and community stakeholders (Rosa & Trudge, 2013).

The environment next to the microsystem is the *mesosystem*. This system focuses on the interactions between environments, including the people in them. One can see connections between environments and how one environment can impact and/or influence another. For example, the mismatch between teacher and student race/ethnicity may contribute to teacher retention and attrition. The teaching force has long been white and female (NCES, 2019). Thus, the teaching force does not represent the general student population in many urban districts (Adams, 1996; Watlington et al., 2010). A diverse workforce representative of the general student population can provide a balanced environment with both culture and gender.

Years of experience are a personal factor affecting teacher retention and attrition. Novice teachers are more likely to leave the teaching profession within their first 5 years. (Elfers et al., 2006; Papay et al., 2017). Teachers with more experience and education tend to remain in the field longer. Finding ways to support novice teachers with induction programs or mentoring could keep them in the field longer (Nguyen et al., 2020). Job satisfaction also affects teacher retention and attrition. The more satisfied teachers are in

their position, the more likely they will remain in the teaching profession (Kokka, 2016; Larkin et al., 2018; Lemons et al., 2015; Olsen & Huang, 2019;). Teaching can be a lonely profession, as teachers are very independent and can even be isolated in their position (Gersten et al., 2001). Diminished involvement in decision making about school, class, or individual student matters can leave teachers feeling devalued, thus, also causing them to leave (Carver-Thomas & Darling-Hammond, 2019). Teachers report being dissatisfied for many reasons; however, the more satisfied teachers are, the more likely they are to stay in their positions (Nguyen et al., 2020, Olsen & Huang, 2019). Providing opportunities for collegiality and collaboration among all staff (Carver-Thomas & Darling-Hammond, 2017b) can help teachers feel they are valued school community members, possibly impacting attrition and retention. The race/ethnicity of a teacher can influence colleague relationships, administrative interactions, and district hiring of a diverse workforce. These variables are interdependent and interconnected. No one variable solely moderates the teacher's movement. Rather, teacher movement is likely moderated by several variables dynamically interacting within multiple environments (e.g., district, school, classroom). In short, the complexity of multiple factors interacting within and between environments cannot be ignored.

In the *ecosystems*, teachers are not participants but are influenced or affected by this system. For example, teachers contribute to student achievement, but several factors contribute to student success and failure. Teachers cite working conditions, paperwork, workload, lack of support, and lack of resources as pivotal considerations when determining whether to stay or leave. This leaves teachers feeling unvalued, nor can they speak openly for fear of consequences from their administrator (Brownell et al., 1994).

School climate and working conditions can impact teacher attrition and retention (Ingersoll et al., 2019). Collegiality and collaboration among peers have been identified as essential variables for teachers (Newberry & Allsop, 2017). Many have expressed feelings of being on an island, isolated in their classroom, or staying because of the students (Brownell et al., 1994). These factors are not something a teacher can control or participate in; however, they are influenced and affected by these factors. Having opportunities to connect positively with colleagues can provide that emotional boost needed. Building trust and reducing stress can help deter teacher attrition and retention (Guin, 2004). Administrators can create working environments that are supportive and positive for all staff, valuing staff input and feedback that is collaborative.

The *macrosystem* focuses on the previous three systems' overall patterns, trends, or belief systems. Examples include social classes, social and economic resources, or ethnic groups. The Socio-Economic Status (SES) of students in a school and the racial/ethnic make-up of the population are predictors of high teacher attrition and retention. As poverty increases and the number of students from racial/ethnic backgrounds other than White also increases, teacher attrition and retention rates tend to increase as well. Marginalized schools and student populations are the most impacted by teacher attrition and retention. Teachers are more likely to leave if they do not have administrative support (Bettini et al., 2020; Campoli, 2017; Ingersoll et al., 2019; Olsen & Huang, 2019). Teacher attrition and retention negatively impact student academic outcomes, predominantly among minority students (Elfers et al., 2006). Schools with high minority student populations within high-poverty areas are most affected by teacher attrition and retention (Borman & Dowling, 2008). This can significantly impact student

academic performance in key subject areas, including state assessments (Guin, 2004). Keeping teachers in these schools can help to improve academic outcomes. Lack of student motivation and parent involvement can also significantly impact teacher attrition and retention. The macrosystem relates to the perceived quality of the schools and the financial viability of a district, with factors related to school ratings and teacher salaries. School ratings can be influenced significantly by teachers leaving. Schools have to fill vacancies. Vacancies are often filled with less experienced teachers (Papay & Kraft, 2015), leaving a professional knowledge gap in the school. Professional development is one of the ways teachers gain experience. Districts provide professional development as part of their requirements, but teachers report that it is not always targeted to their specific needs (Guin, 2004). Nevertheless, if teachers leave, all the professional development they obtain is lost. Hiring new teachers is costly, but losing experienced teachers is a hardship. Teachers' salaries are low, considering their educational level, job requirements, and experience needed (Hughes, 2012). Salaries are one of the predominant reasons why teachers leave; it is also a key reason why individuals do not go into the teaching field (Igo & Perry, 2019; Lemons et al., 2015). What was once an opportunity for many who may not have found employment elsewhere, teaching is now only one of many career choices, particularly for women. This requires the teaching profession to be more competitive in the job-seeking market (Igo & Perry, 2019). Teachers' opportunities for advancement and potential salary growth within their profession can be limited (Larkin et al., 2016). Compared to teacher salaries, tuition costs make it a debt-producing field for many. Districts might need to develop creative financial ways to entice students into the profession and keep existing teachers, especially in marginalized schools.

The last system, the *chronosystem*, is the most outer circle within the ecosystem. This system focuses on historical interactions over time, affecting the teacher at the center. This might include factors related to teacher preparation programs and retention/recruitment of a diverse workforce. It is challenging for large districts to fill hundreds of positions each year amid a teacher shortage. Districts are often left scrambling to fill open vacancies. The number of teachers graduating from teacher preparation programs is not meeting the demand (Sutcher et al., 2016). Policymakers have offered alternate routes to certification to mitigate the problem; however, data show these individuals leave schools at higher rates than those from traditional teacher preparation programs (Mason-Williams et al., 2020). Teachers interviewed felt ill-prepared when first starting their teaching career. Student behavior, culturally and linguistically diverse student populations, and work demands were not addressed in prior field experiences, pre-service coursework, or practicums (Brownell et al., 1994). A diverse workforce that reflects the student population is critical (Lemons et al., 2015). The current teacher workforce is not culturally diverse and does not represent the student population. Districts can benefit from a more diverse teacher workforce. Students can benefit from seeing themselves represented in the teaching workforce. Students of color being taught by teachers of their same race/ethnicity look to these teachers as role models; these teachers also tend to set higher expectations, encourage student interests, motivate students, and help them to perform better academically (Gershenson & Papageorge, 2018). Universities and state agencies need to find effective recruitment strategies to bring a diverse population into teacher preparation programs.

Definitions

The SASS, NTPS, and TFS national surveys use the terms *movers*, *leavers*, and *stayers* for teacher attrition and retention. Movers refer to teachers that move from one school to another. Leavers refer to teachers that have left the teaching profession. Stayers refer to teachers who have stayed in their current position and school. This study expands on the definition of a few terms. For this study, attrition is used in place of movers, to include teachers who move to a different school and teachers who move to a different job (i.e., job attrition and/or school attrition). Retention replaces leavers, including those who left teaching. Variable definitions include the following:

- Attrition for job and/or school.
 - Attrition-job or position job change was defined as any change in a position from one year to the next.
 - Attrition-school location change was defined as any change in a school location from one year to the next. If there was a change in position and school location in the same year, the combination was counted as two changes (one for position change and one for school location change).
- Retention was defined as either being employed or not employed for that school year.
- Gender was either male or female, as reported in the school district data.
- Race/ethnicity, although a total of seven ethnicities were reported in the school district data, only White, Black, and Latino were used. The other four ethnic groups accounted for less than 7% of the total teacher population.

- Certification was defined binomially as non-special education certified or special education certified.
- Years of service are determined by the school year the teacher was hired (regardless of when they started within the year) until their exit date. Each year counts for one year.
- Position Held was defined binomially as teaching in a non-special education position or a special education position for each year.

METHOD

Data Set

A large urban school district data set was chosen to provide a large, rich data source. The data set comprised data on all teachers employed by the district from 2009 through 2019. The total number of teachers in this data set was 25,724. The following variables were explored:

- demographic (gender, race/ethnicity)
- position held (job code)
- certification
- school teaching in (school code)
- hire date
- exit date
- number of years teaching
- position held in special education or general education

Data Collection Procedure

De-identified teacher data were obtained by written request to a school district in the southern United States via a formal public records request (Note: an available option to anyone according to state law). Student demographic data were obtained through public records available and accessible through the state department of education for the same state and county as the teacher data set. National survey information was accessed through the IES/NCES website.

Data Coding

All data were coded using Excel for each variable, yearly job change, yearly school change, yearly retention, certification, race/ethnicity, gender, years of service in teaching, position working in, and degree earned. Variables were all coded in Excel before uploading into SPSS. Variable coding is below.

- gender:
 - female = 2
 - male = 1
- certification:
 - not special education certified = 2
 - special education certified = 1
- race/ethnicity: each race/ethnicity was also dummy coded in SPSS for analysis beyond frequencies.
 - White = 6
 - Black = 3
 - Latino = 5
 - *Note: 3,033 teachers had a “10/Not Assigned” category. These teachers were left blank and not included in any race/ethnicity analysis but in other analyses.
- retention:
 - not retained (only recorded for the first time they left teaching – after a “1”) = 0
 - retained = 1

- not Started = blank
- after the first 0 for not retained = blank
- *Note we only wanted to count the person once when they were not retained.
- years of service teaching (total number of years teaching as defined above):
 - *Note, the district data did not count the teacher as completing a year until it was a full calendar year from their start date.
 - *Note, the district did not count someone who started but did not complete a full calendar year as completing a year of teaching.
- teacher attrition was coded as any change in either school (school ID code) or job change (job code) throughout the teacher's employment.
 - attrition job:
 - no change in the job from the previous position held at the school district = 0
 - *Note, this could even be after they left and came back. If they came back in the same position, it was coded as a 0. If they came back in a different position, it was coded as a 1.
 - not teaching that year or had not started teaching yet = blank
 - a change in a job or position from the previous year or the previous time they worked = 1
 - attrition school:
 - no change in school from the previous school in the school district = 0

- *Note, this could even be after they left and came back. If they returned to the same school, it was coded as a 0. If they returned to a different school, it was coded as a 1.
- not teaching that year or had not started teaching yet = blank
- a change in a school from the previous year or the last time they worked = 1

Data Analysis

Data analysis included frequency distributions on demographic variables in determining patterns in the data. For each teacher and year in the data set, frequencies were run to determine distributions for race/ethnicity, gender, certification, number of years teaching, number of teachers who changed their job, number of teachers who moved schools, number of teachers who leave the district, and teacher demographic population compared to student demographic population

Regression and correlation analysis were used to determine relationships between the variables, allowing exploration into hypothesized relations between teacher race/ethnicity and attrition, race/ethnicity and retention, gender and attrition, gender and retention, certification and attrition, certification and retention, years teaching and attrition, and years teaching and retention. All Chi-square, χ^2 analyses regarding race/ethnicity were confined to three groups: White, Hispanic/Latino, and Black teachers, as the other races/ethnicities made up < 7% of the total teacher population.

Analysis included teacher race/ethnicity, attrition for an annual job change, attrition for annual school change, annual retention for each teacher. Yearly attrition rates for job and school change were analyzed for each of the 10 years. Retention rates (i.e.,

employed or not employed) were also analyzed for the same 10-year period. These data were then compared to the student population in the same area.

The variables above allowed for a direct comparison to the SASS and NTPS. The analysis used for this study expands the definitions used as part of the SASS and NTPS and offers a yearly cost for teacher attrition and retention.

RESULTS

The data were analyzed to detect possible relationships among the criterion variables, (teacher job attrition, teacher school attrition, and teacher retention) and predictor variables (teacher certification, total number of years teaching, gender, and race/ethnicity). A correlation was run for each criterion variable. The correlation provides a matrix that shows not only the correlation or relationship between each criterion variable and the predictor variables, it also shows the correlations among the predictor variables.

A multiple regression was also run to detect possible variables that might be predictors for the criterion variable. Since race/ethnicity is a nominal variable, a χ^2 was run for further analysis of this variable on each criterion variable. Descriptives and frequencies were run for all demographics and predictor variables. All tables contain accompanying statistics and are longitudinal over the 10 years of this data set.

Teacher Job Attrition

Table 1 shows the data for the correlation matrix for all the predictor variables (gender, certification, total number of years teaching, and race/ethnicity) with the criterion variable, teacher job attrition, and it also includes the intercorrelation matrix among the predictor variables. Table 1 displays the variables on the far left side under Total *n*. Each variable on the left margin shows the mean (*M*), standard deviation (*SD*), and Pearson correlations with the other variables under it. So, the first variable is Job Attrition by Year, including the *M*, *SD*, and the Pearson Correlations Gender with Job

Attrition, Certification with Job Attrition, Total number years of service with Job Attrition, Black with Job Attrition and Hispanic/Latino with Job Attrition. The next Variable is Gender and under that the *M*, *SD*, and Pearson Correlations which repeats with all the intercorrelations among the predictor variables and Gender. Across the top, 10 years of the data set for all of the variables is displayed. This allows for a longitudinal look at the data set for each variable making it easier to identify trends and patterns.

Table 1, correlation of all predictors with teacher job attrition from 2010-2019, revealed the following analysis:

- Gender and teacher job attrition were positively correlated for all 10 years, $p < .01$. Since female is coded as number 2 and male is coded as number 1 and the correlation is positively correlated, female teachers may have more teacher job attrition than males.
- Teacher job attrition and certification were significant, $p < .01$ for 5 of the 10 years, and every year was a negative correlation. Since certification is coded as not special education certified is a number 2 and special education certified is a 1, and there is a negative correlation for every year, special education teachers may have higher teacher movement and this was significant for 5 of the 10 years. Interestingly, of the 5 years that were significant, two of them were in the last 5 years of the data set.
- Teacher job attrition and total number of years teaching also had a negative correlation for 9 out of the 10 years and were only significant for 3 out of the 10 years, $p < .01$ for 2 years and $p < .05$ for 1 year. This indicates that the more teacher job movement, the less numbers of years a teacher stays teaching in the field. Of

further interest, 2 of the 3 years that were significant were the two most recent, 2018 and 2019.

- Race/ethnicity and teacher job attrition are correlated, $p < .01$ for every year of the data. The χ^2 was used to further analyze the race/ethnicity variable and teacher job attrition, see Table 3 for further explanation.
- Gender and the total number of years teaching is positively correlated, $p < .01$ for 9 out of the 10 years, and $p < .05$ for the other year. This would indicate that female teachers have more total numbers of years teaching.
- Certification and the total number of years teaching, are negatively correlated, $p < .01$ for every year. Indicating special education certified teachers have a higher number of years teaching and those not certified in special education.
- Gender and certification were the last two variables for teacher job attrition that were negatively correlated for all 10 years, but only significant for 2 of those being years 2010 and 2011, $p < .05$, indicating most special education certified teachers are female.

Other variables are correlated with each other but not with the same consistency over all 10 years. It is important to note that while many statistics are statistically significant, the effect sizes are very small.

Table 1*Correlation of All Predictors With Teacher Job Attrition 2010-2019*

Variables	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total <i>n</i>	11,152	10,026	9,275	9,288	9,597	9,905	9,967	10,383	10,365	10,288
Job Attrition by Year										
M	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1
SD	0.3	0.4	0.3	0.4	0.3	0.4	0.4	0.3	0.3	0.4
Pearson Correlation										
Gender	.042**	.057**	.037**	.044**	.060**	.050**	.046**	.046**	.032**	.033**
Certification	-.001	-.057**	-.039**	-.054**	-.034**	-.010	-.013	-.060**	-.007	-.002
Total # Years Teaching	-.041**	-.015	-.019	-.015	.002	-.012	-.005	-.016	-.030**	-.021*
Black	.040**	.053**	.048**	.030**	.039**	.041**	.026**	.064**	.052**	.058**
Hispanic	-.029**	-.039**	-.027**	-.005	-.021*	-.033**	-.015	-.039**	-.032**	-.031**
Gender										
M	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.7
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pearson Correlation										
Certification	-.023*	-.024*	-.016	-.014	-.021	-.004	-.008	.007	-.001	.009
Total # Years Teaching	.056**	.055**	.044**	.033**	.026*	.032**	.029**	.026**	.034**	.035**
Black	.025**	.023*	.016	.020**	.015	.013	.018	.019	.022*	.016
Hispanic	-.022**	-.008	.000	-.002	<.001	-.004	-.001	-.004	-.003	.011
Certification										
M	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pearson Correlation										
Total # Years Teaching	-.032**	-.039**	-.042**	-.050**	-.043**	-.060**	-.074**	-.086**	-.075**	-.079**
Black	-.126**	-.136**	-.138**	-.136**	-.127**	-.127**	-.126**	-.123**	-.130**	-.144**
Hispanic	.15**	.151**	.136**	.127**	.132**	.126**	.139**	.137**	.144**	.146**
Total # of Years Teaching										
M	14.7	14.8	14.7	13.8	12.7	11.8	11.1	10.3	9.7	8.9
SD	9.7	9.4	9.2	9.2	9.2	9.1	8.9	8.7	8.7	8.6
Pearson Correlation										
Black	.104**	.101**	.099**	.081**	.070**	.062**	.040**	.036**	.030**	.029**
Hispanic	-.059**	-.041**	-.036**	-.016	.005	-.008	-.017	-.020*	-.019	-.011
Black										
M	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
SD	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Pearson Correlation										
Hispanic	-.378**	-.387**	-.399**	-.404**	-.416**	-.433**	-.465**	-.486**	-.507**	-.532**
Hispanic										
M	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5

p's are 2-tailed

* denotes the correlation is significant at $p < .05$ ** denotes the correlation is significant at $p < .01$

Table 2 details the regression for teacher job attrition. A regression is used to identify any variables that may be a predictor of teacher job attrition. It also examines the percentage of teacher job attrition that can come from each of the variables as noted in the R^2 . Table 2 shows the regression for teacher job attrition and all the predictor variables as seen on the far left margin of the table after Cook's Distance. At the top of the R^2 , F , df , p , and Cook's Distance are displayed. These are the results of the regression run for teacher job attrition. Under that, all predictor variables, gender, certification, total number of years teaching, Black and Hispanic/Latino are included. Under each of these predictor variables, related statistics in relation to teacher job attrition are shown. The most significant part under each of the predictor variables is their p -value. Over the top of the table you will see that there is data for each of the variables for all 10 years. This longitudinal data can show trends and patterns in the data over time.

Across the 10 years, regression for teacher job attrition was statistically significant $p < .001$. Of the predictor variables, gender was significant for every year, $p < .001$. Certification was significant for 3 out of the 10 years and the total number of years of teaching significant only two out of the 10 years, $p < .001$. The R^2 values range from .003 - .009 over the 10 years. This indicates that .3% to .9% of teacher job attrition could come from these predictor variables. The year, 2016 had the lowest $R^2 = .003$, $F(5, 9961) = 5.849$, $p < .001$. While, 2011 had one of the highest $R^2 = .009$, $F(5, 10,020) = 18.422$, $p < .001$. With the contribution of each variable to the model, there is no collinearity among the variables as reported, with VIF scores ranging from 1.001 to 1.406. Analysis of the residuals were calculated, using Cook's Distance to determine if any data, such as extreme outliers, severely changed the results. Cook's Distance has a

minimum of .000 and a maximum of .004. There is not much variance between the minimum and maximum, indicating no influential cases were problematic for the least squares.

Table 1*Regression Predicting Teacher Job Attrition With Demographic Variable 2010-2019*

Variables	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total <i>n</i>	11,152	10,026	9,275	9,288	9,597	9,905	9,967	10,383	10,365	10,288
<i>R</i> ²	.006	.009	.005	.006	.006	.005	.003	.009	.005	.005
<i>F</i>	13.144	18.422	10.046	11.065	11.462	9.260	5.849	19.900	9.976	10.212
<i>df</i> (,)	(5, 11146)	(5, 10020)	(5, 9269)	(5, 9282)	(5, 9591)	(5, 9899)	(5, 9961)	(5, 10377)	(5, 10359)	(5, 10282)
<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Cook's Distance										
Min	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Max	.004	.002	.003	.002	.002	.002	.003	.002	.002	.002
Gender										
<i>B</i>	0.029	0.045	0.026	0.035	0.047	0.041	0.037	0.036	0.025	0.026
<i>SE</i>	0.006	0.008	0.007	0.008	0.008	0.008	0.008	0.008	0.007	0.008
<i>t</i>	4.582	5.642	3.524	4.179	5.852	4.971	4.592	4.721	3.289	3.313
<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
95% CI LL	0.017	0.029	0.012	0.019	0.031	0.025	0.021	0.021	0.010	0.011
95% CI UL	0.042	0.06	0.041	0.052	0.062	0.057	0.052	0.052	0.039	0.042
VIF	1.004	1.004	1.002	1.002	1.001	1.001	1.001	1.001	1.002	1.002
Certification										
<i>B</i>	0.004	-.044	-.027	-.049	-.025	-.004	-.009	-.051	-.002	0.004
<i>SE</i>	0.007	-.009	0.009	0.010	0.009	0.010	0.009	0.009	0.009	0.01
<i>t</i>	0.594	-4.796	-3.129	-5.007	-2.735	-.459	-.967	-5.517	-.234	.436
<i>p</i>	.553	<.001	.002	<.001	.006	.646	.333	<.001	.815	.663
95% CI LL	-.010	-.062	-.044	-.068	-.043	-.023	-.028	-.069	-.020	-.015
95% CI UL	0.019	-.026	-.010	-.030	-.007	0.014	0.009	-.033	0.015	0.023
VIF	1.030	1.032	1.029	1.027	1.026	1.026	1.030	1.031	1.031	1.034
Total # of Years Teaching										
<i>B</i>	-.001	-.001	-.001	-.001	0.000	-.001	0.000	-.001	-.001	-.001
<i>SE</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>t</i>	-5.119	-2.453	-2.564	-2.087	-.300	-1.586	-.776	-2.413	-3.356	-2.353
<i>p</i>	<.001	.014	.010	.037	.764	.113	.438	.016	<.001	.019
95% CI LL	-.002	-.002	-.002	-.002	-.001	-.001	-.001	-.002	-.002	-.002
95% CI UL	-.001	0.000	0.000	0.000	0.001	0.000	0.000	0.000	-.001	0.000
VIF	1.014	1.014	1.013	1.010	1.008	1.008	1.007	1.009	1.007	1.008
Black										
<i>B</i>	0.024	0.031	0.029	0.022	0.024	0.024	0.017	0.039	0.033	0.042
<i>SE</i>	0.007	0.008	0.008	0.009	0.008	0.008	0.008	0.008	0.008	0.008
<i>t</i>	3.675	3.775	3.810	2.610	3.002	2.897	2.028	4.897	4.224	5.001
<i>p</i>	<.001	<.001	<.001	.009	.003	.004	.043	<.001	<.001	<.001
95% CI LL	0.011	0.015	0.014	0.006	0.008	0.008	0.001	0.024	0.018	0.026
95% CI UL	0.037	0.047	0.044	0.039	0.040	0.041	0.033	0.055	0.049	0.059
VIF	1.182	1.195	1.210	1.213	1.224	1.243	1.284	1.317	1.354	1.406
Hispanic										
<i>B</i>	-.013	-.013	-.004	0.011	-.003	-.015	-.002	-.004	-.005	-.001
<i>SE</i>	0.007	0.009	0.008	0.009	0.009	0.009	0.009	0.008	0.008	0.009
<i>t</i>	-1.754	-1.481	-.526	1.215	-.293	-1.659	-.239	-.454	-.651	-.060
<i>p</i>	.079	.139	.599	.225	.769	.097	.811	.650	.515	.952
95% CI LL	-.027	-.030	-.020	-.007	-.020	-.033	-.019	-.020	-.021	-.018
95% CI UL	0.001	0.004	0.012	0.029	0.015	-.003	0.015	0.013	0.011	0.017
VIF	1.182	1.190	1.199	1.204	1.220	1.239	1.287	1.321	1.358	1.406

Table 3 is the χ^2 analysis of race/ethnicity and teacher job attrition. χ^2 is used for this analysis because race/ethnicity is a nominal variable; therefore, the results obtained

from a correlation or regression are not as detailed or inclusive of all ethnicities as compared to the χ^2 . The top section on the left margin of Table 3 provides all the details of the overall analysis, including the n , χ^2 , p , and contingency coefficient. The χ^2 has the (2) representing the df . The df is consistent throughout the analysis; therefore, it was not repeated in the table. Below the Contingency Coefficient there are the three ethnicities analyzed in this data set: Black, Hispanic/Latino, and White. Under each race/ethnicity the crosstabulation for no change or change and for count, expected count, and the percentage within the criterion variable (teacher job attrition in this table) and the percentages for each is displayed. Across the top, the data for all 10 years of the study are shown. These longitudinal data can show trends and patterns over time for each variable.

The relationship between race/ethnicity and teacher job attrition was significant at $p < .001$ for all 10 years. Black teachers changed jobs at statistically higher rates (46.54% average over 10 years) than Hispanic/Latino teachers (27.94% average over 10 years) or White teachers (25.54% average over 10 years). The contingency coefficient explains how much job attrition is explained by race/ethnicity, which ranged from 5.0% to 8.8% over the 10 years.

Table 3*Teacher Job Attrition With Race/Ethnicity χ^2 2010-2019*

	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<i>n</i>	9348	8441	7869	7992	8368	8777	9148	9723	9885	10022
χ^2 (2)	25.617	49.103	38.109	36.766	31.659	39.645	23.298	75.597	48.228	48.866
<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Contingency Coefficient	.052	.076	.069	.068	.061	0.067	.050	.088	.070	.070
Black										
Count										
No Change	3142	2661	2578	2537	2740	2820	2995	3132	3259	3232
Change	407	539	388	490	484	575	540	624	569	662
Expected Count										
No Change	3211.5	2767.4	2656.9	2608.1	2818.7	2917.3	3062.0	3268.1	3365.2	3347.3
Change	337.5	432.6	309.1	418.9	405.3	477.7	473.0	487.9	462.8	546.7
% Change within Job Change Attrition										
No Change	37.1%	36.5%	36.6%	36.8%	37.5%	37.4%	37.8%	37.0%	37.5%	37.5%
Change	45.8%	47.2%	47.3%	44.3%	46.0%	46.6%	44.1%	49.4%	47.6%	47.1%
Hispanic										
Count										
No Change	2398	2143	2126	2010	2151	2277	2444	2703	2817	2848
Change	213	286	222	337	291	339	373	355	349	419
Expected Count										
No Change	2362.7	2100.7	2103.3	2022.2	2135.0	2247.9	2440.1	2660.8	2783.3	2808.3
Change	248.3	328.3	244.7	324.8	307.0	368.1	376.9	397.2	382.7	458.7
% Change within Job Change Attrition										
No Change	28.3%	29.4%	30.2%	29.2%	29.4%	30.3%	30.8%	32.0%	32.4%	33.1%
Change	24.0%	25.1%	27.1%	30.5%	27.7%	27.4%	30.5%	28.1%	29.2%	29.8%
White										
Count										
No Change	2919	2486	2345	2339	2425	2445	2485	2625	2614	2535
Change	269	316	210	279	277	321	311	284	277	326
Expected Count										
No Change	2884.8	2431.9	2288.8	2255.7	2362.3	2376.8	2421.9	2531.1	2541.5	2459.3
Change	303.2	380.1	266.2	362.3	339.7	389.2	374.1	377.9	349.5	401.7
% Change within Job Change Attrition										
No Change	34.5%	34.2%	33.3%	34.0%	33.1%	32.4%	31.4%	31.0%	30.1%	29.4%
Change	30.3%	27.7%	25.6%	25.2%	26.3%	26.0%	25.4%	22.5%	23.2%	23.2%
Total										
Count										
No Change	8459	7300	7049	6886	7316	7542	7924	8460	8690	8615
Change	889	1141	820	1106	1052	1235	1224	1263	1195	1407
Expected Count										
No Change	8459.0	7300.0	7049.0	6886.0	7316.0	7542.0	7924.0	8460.0	8690.0	8615.0
Change	889.0	1141.0	820.0	1106.0	1052.0	1235.0	1224.0	1263.0	1195.0	1407.0

Teacher School Attrition

Table 4 shows the analysis of the correlation matrix for the criterion variable teacher school attrition and the predictor variables of gender, certification, total number

of years teaching, Black, and Hispanic/Latino. Table 4 is read in the same manner as Table 1 with all the variables on the far left margin and all the correlation variables and statistics underneath. The data are inclusive of all 10 years as noted at the top of the table. This a helpful tool to find trends and patterns in the data.

Teacher school attrition did not have consistent, statistically significant correlations across all 10 years with any of the variables except for race/ethnicity. This will be examined further using χ^2 . The analysis revealed the following:

- Teacher school attrition and certification were negatively correlated and only statistically for 4 out of 10 years, $p < .01$. Indicating that special education certified teachers move schools more than non-certified special education teachers.
- Teacher school attrition and the total number of years teaching were negatively correlated 4 out of 10 years, $p < .05$. Indicating that the more teacher school attrition (movement) increases, the fewer years teachers stay teaching.
- Gender and the total number of years teaching are positively correlated with teacher school attrition, $p < .01$ for 8 out of the 10 years and 1 year $p < .05$. Indicating that female teachers stay teaching in the profession longer than males.
- Certification and the total number of years teaching are negatively correlated, $p < .01$ for 9 out of 10 years. Indicating that special education teachers have a higher number of years they teach.
- Teacher school attrition and gender were positively correlated for 3 of the 10 years at $p < .05$. Indicating that female and male teachers change schools almost equally.

Other variables are correlated with each other but not with the same consistency over all 10 years. It is important to note that while many statistics are statistically significant, the effect sizes are small.

Table 4*Correlation of All Predictors With Teacher School Attrition 2010-2019*

Variables	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total <i>n</i>	11,152	10,026	9,275	9,288	9,597	9,905	9,967	10,383	10,365	10,288
School Attrition by Year										
M	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
SD	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3
Pearson Correlation										
Gender	.015	-.006*	-.005	.019	-.006	.001	-.023*	.009	.005	-.022*
Certification	-.031**	-.064	-.035**	-.015	-.012	-.009	-.019	-.039**	-.013	-.030**
Total # Years Teaching	-.007	-.011*	-.015	-.049**	-.007	-.006	.017	-.023*	-.016	-.023*
Black	.003	.076	.038**	.023*	.027**	.025*	.027**	.037**	.054**	.042**
Hispanic	.006	-.063	-.030**	-.008	-.013	.007	-.029**	-.022*	-.029**	-.009
Gender										
M	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.7
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pearson Correlation										
Certification	-.023*	-.024*	-.016	-.014	-.012	-.004	-.008	.007	-.001	.009
Total # Years Teaching	.056**	.055	.044**	.033**	.026*	.032**	.029**	.026**	.034**	.035**
Black	.025**	.023*	.016	.020	.015	.013	.018	.019	.022*	.016
Hispanic	-.022*	-.008*	.000	-.002	-.001	-.004	-.001	-.004	-.003	.011
Certification										
M	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pearson Correlation										
Total # Years Teaching	-.032**	-.039	-.042**	-.050**	-.043**	-.060**	-.074**	-.086**	-.075**	-.079**
Black	-.126**	-.136	-.138**	-.136**	-.127**	-.127**	-.126**	-.123**	-.130**	-.144**
Hispanic	.150**	.151	.136**	.127**	.132**	.126**	.139**	.137**	.144**	.146**
Total # of Years Teaching										
M	14.7	14.8	14.7	13.8	12.7	11.8	11.1	10.3	9.7	8.9
SD	9.7	9.4	9.2	9.2	9.2	9.1	8.9	8.7	8.7	8.6
Pearson Correlation										
Black	.104**	.101	.099**	.081**	.070**	.062**	.040**	.035**	.030**	.029**
Hispanic	-.059**	-.041	-.036**	-.016	.005	-.008	-.017	-.020*	-.019	-.011
Black										
M	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
SD	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Pearson Correlation										
Hispanic	-.378**	-.387	-.399**	-.404**	-.416**	-.433**	-.465**	-.486**	-.507**	-.532**
Hispanic										
M	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5

p's are 2-tailed

* denotes the correlation is significant at $p < .05$

** denotes the correlation is significant at $p < .01$

Table 5 shows the regression for the criterion variable, teacher school attrition, and all the predictor variables of gender, certification, total number of years teaching,

Black, and Hispanic/Latino. Table 5 is read in the same manner as Table 2. The top left side margin has all the regression statistics below that has all the specific predictor variable data. Across the top are the 10 years of data for each year of the analysis.

The regression was statistically significant, $p < .001$ for 7 of the 10 years. The only variable with some significance was the certification variable statistically significant for 3 of the 10 years at $p < .001$. The R^2 values range from .001 - .010 over the 10 years, indicating that .1% to 1.0% of teacher school attrition could come from these predictor variables. The year 2014 was one of the years with the lowest $R^2 = .001$, $F(5, 9591) = 1.823$, $p = .105$. The highest R^2 was in 2011, $R^2 = .010$, $F(5, 10,020) = 20.457$, $p < .001$. With the contribution of each variable to the model, we see there is no collinearity among the variables, as reported with VIF scores ranging from 1.001 to 1.406. Analysis of the residuals used Cook's Distance to determine if any data, such as extreme outliers, severely changed the results. Cook's Distance has a minimum of .000 and a maximum of .005. There is not much variance between the minimum and maximum, indicating no influential cases were problematic for the least squares.

Table 5

Regression Predicting Teacher School Attrition With Demographic Variables 2010-2019

Variables	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total <i>n</i>	11,152	10,026	9,275	9,288	9,597	9,905	9,967	10,383	10,365	10,288
<i>R</i> ²	.001	.010	.003	.004	.001	.001	.002	.003	.003	.004
<i>F</i>	3.131	20.457	5.504	6.934	1.823	2.204	4.122	7.090	6.786	7.879
<i>df</i> (,)	(5, 11146)	(5, 10020)	(5, 9269)	(5, 9282)	(5, 9591)	(5, 9899)	(5, 9961)	(5, 10377)	(5, 10359)	(5, 10282)
<i>p</i>	.008	<.001	<.001	<.001	.105	.051	<.001	<.001	<.001	<.001
Cook's Distance										
Min	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Max	.002	.002	.007	.003	.003	.004	.002	.004	.005	.004
Gender										
<i>B</i>	0.010	-.005	-.003	.014	-.004	0.001	-.019	0.006	0.003	-.013
<i>SE</i>	0.006	0.007	0.006	0.007	0.007	0.007	0.008	0.007	0.006	0.006
<i>t</i>	1.574	-.788	-.521	1.922	-.574	.083	-2.354	.991	.477	-2.216
<i>p</i>	.116	.431	.603	.055	.566	.934	.019	.322	.634	.027
95% CI LL	-0.003	-.019	-.015	0.000	-.017	-.012	-.035	-.006	-.008	-.024
95% CI UL	0.023	0.008	0.009	0.029	0.010	0.013	-.003	0.019	0.014	-.001
VIF	1.004	1.004	1.002	1.002	1.001	1.001	1.001	1.001	1.002	1.002
Certification										
<i>B</i>	-.025	-.041	-.019	-.011	-.007	-.006	-.013	-.029	-.005	-.020
<i>SE</i>	0.007	0.008	0.007	0.009	0.008	0.008	0.010	0.008	0.007	0.007
<i>t</i>	-3.402	-5.161	-2.838	-1.322	-.906	-.743	-1.326	-3.729	-.785	-2.770
<i>p</i>	<.001	<.001	.005	.186	.365	.458	.185	<.001	.433	.006
95% CI LL	-.040	-.056	-.033	-.029	-.023	-.021	-.031	-.045	-.018	-.033
95% CI UL	-.011	-.025	-.006	0.005	0.008	0.009	0.006	-.014	0.008	-.006
VIF	1.030	1.032	1.029	1.027	1.026	1.026	1.030	1.031	1.031	1.034
Total # of Years Teaching										
<i>B</i>	0.000	-.001	-.001	-.002	0.000	0.000	0.001	-.001	-.001	-.001
<i>SE</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>t</i>	-.861	-1.992	-1.896	-5.038	-.905	-.790	1.572	-2.855	-1.853	-2.608
<i>p</i>	.389	.046	.058	<.001	.365	.430	.116	.004	.064	.009
95% CI LL	-.001	-.001	-.001	-.002	-.001	-.001	0.000	-.002	-.001	-.001
95% CI UL	0.000	0.000	0.000	-.001	0.000	0.000	0.001	0.000	0.000	0.000
VIF	1.014	1.014	1.013	1.010	1.008	1.008	1.007	1.009	1.007	1.008
Black										
<i>B</i>	0.003	0.038	0.016	0.017	0.016	0.020	0.012	0.019	0.027	0.027
<i>SE</i>	0.007	0.007	0.006	0.008	0.007	0.007	0.008	0.007	0.006	0.006
<i>t</i>	0.454	5.375	2.602	2.285	2.346	3.052	1.406	2.840	4.562	4.323
<i>p</i>	.650	<.001	.009	.022	.019	.002	.160	0.005	<.001	<.001
95% CI LL	-.010	0.024	0.004	0.002	0.003	0.007	-.005	0.006	0.015	0.015
95% CI UL	0.016	0.051	0.028	0.032	0.030	0.033	0.028	0.033	0.038	0.039
VIF	1.182	1.195	1.210	1.213	1.224	1.243	1.284	1.317	1.354	1.406
Hispanic										
<i>B</i>	0.009	-.023	-.009	0.002	-.001	0.014	-.015	-.001	-.001	0.012
<i>SE</i>	0.007	0.008	0.006	0.008	0.008	0.007	0.009	0.007	0.006	0.006
<i>t</i>	1.243	-3.035	-1.333	0.280	-.077	1.989	-1.726	-.176	-.165	1.865
<i>p</i>	.214	.002	.183	.780	.939	.047	.084	.860	.869	.062
95% CI LL	-.005	-.038	-.021	-.014	-.015	0.000	-.033	-.015	-.013	-.001
95% CI UL	0.023	-.008	0.004	0.018	0.014	0.028	0.002	0.013	0.011	0.025
VIF	1.182	1.190	1.199	1.204	1.220	1.239	1.287	1.321	1.358	1.406

Table 6 provided the χ^2 analysis of race/ethnicity and teacher school attrition. The table is read in the same manner as Table 3 above. The top left margin has the *n*, χ^2 , *p*

and Contingency Coefficient. Below that are the three race/ethnicity categories that were analyzed: Black, Hispanic/Latino, and White. Across the top are the 10 years of data analysis.

The relationship between race/ethnicity and teacher school attrition was significant at $p < .001$ for all years except the first year of data (2010). Black teachers changed schools at statistically higher rates (46.56% average over 10 years) than Hispanic/Latino teachers (28.44% average over 10 years) or White teachers (25.01% average over 10 years). Hispanic/Latino teachers changed jobs at the next highest rate, followed by White teachers. The contingency coefficient explains how much school attrition is explained by race/ethnicity, which ranged from 2.1% to 6.9% over the 10 years.

Table 6

Teacher School Attrition With Race/Ethnicity χ^2 2010-2019

	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<i>n</i>	9348	8441	7869	7992	8368	8777	9148	9723	9885	10022
χ^2 (2)	4.207	88.406	24.214	16.936	19.630	42.492	15.986	31.523	54.646	27.716
<i>p</i>	.122	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Contingency Coefficient	.021	.102	.055	.046	.048	.069	.042	.057	.074	.053
Black										
Count										
No Change	3190	2774	2729	2672	2887	3066	2975	3355	3508	3565
Change	359	426	237	355	337	329	560	401	320	329
Expected Count										
No Change	3203.1	2896.0	2780.2	2717.9	2937.7	3119.2	3039.6	3426.5	3590.2	3623.2
Change	345.9	304.0	185.8	309.1	286.3	275.8	495.4	329.5	237.8	270.8
% Change within School Change Attrition										
No Change	37.8%	36.3%	37.0%	37.2%	37.9%	38.0%	37.8%	37.8%	37.8%	38.2%
Change	39.4%	53.1%	48.1%	43.5%	45.4%	46.1%	43.7%	47.0%	52.1%	47.2%
Hispanic										
Count										
No Change	2342	2267	2223	2106	2230	2380	2453	2805	2991	3047
Change	269	162	125	241	212	236	364	253	175	220
Expected Count										
No Change	2356.5	2198.2	2200.9	2107.4	2225.2	2403.5	2422.2	2789.7	2969.3	3039.8
Change	254.5	230.8	147.1	239.6	216.8	212.5	394.8	268.3	196.7	227.2
% Change within School Change Attrition										
No Change	27.8%	29.7%	30.1%	29.3%	29.2%	29.5%	31.2%	31.6%	32.3%	32.7%
Change	29.5%	20.2%	25.4%	29.5%	28.5%	33.1%	28.4%	29.7%	28.5%	31.6%
White										
Count										
No Change	2905	2598	2424	2398	2508	2618	2438	2710	2772	2713
Change	283	214	131	220	194	148	358	199	119	148
Expected Count										
No Change	2877.3	2544.8	2394.9	2350.7	2462.1	2541.3	2404.2	2653.8	2711.4	2662.0
Change	310.7	267.2	160.1	267.3	239.9	224.7	391.8	255.2	179.6	199.0
% Change within School Change Attrition										
No Change	34.4%	34.0%	32.9%	33.4%	32.9%	32.5%	31.0%	30.6%	29.9%	29.1%
Change	31.1%	26.7%	26.6%	27.0%	26.1%	20.8%	27.9%	23.3%	19.4%	21.2%
Total										
Count										
No Change	8437	7639	7376	7176	7625	8064	7866	8870	9271	9325
Change	911	802	493	816	743	713	1282	853	614	697
Expected Count										
No Change	8437.0	7639.0	7376.0	7176.0	7625.0	8064.0	7866.0	8870.0	9271.0	9325.0
Change	911.0	802.0	493.0	816.0	743.0	713.0	1282.0	853.0	614.0	697.0

Teacher Retention

Table 7 shows the correlation matrix for the criterion variable teacher retention and the predictor variables, gender, certification, total number of years teaching and race/ethnicity. Table 7 is read in the same manner as Tables 1 and 4. The variables are all on the left side margin with all the statistics below each variable. The top row left to right has all 10 years of the data. This can help show trends and patterns over time.

The analysis revealed the following:

- Teacher retention was positively correlated with the total number of years teaching $p < .01$ for all 10 years. This would make sense as teachers stay teaching increases so does the number of years they teach.
- Race/ethnicity, while significant, will be discussed further in the χ^2 .
- Gender and the total number of years teaching are positively correlated, $p < .01$ for all 10 years. Indicating that female teachers have more total number of years teaching.
- Certification and the total number of years teaching are negatively correlated, $p < .01$ for all 10 years. Indicating that special education teachers have a higher number of years teaching.
- Teacher retention and gender are positively and negatively correlated and are statistically significant for only 1 of the 10 years, $p < .01$. Possibly indicating more females stay teaching in the profession than males.
- Teacher retention and certification are positively and negatively correlated and are statistically significant for 2 of the 10 years, $p < .01$. Possibly indicating special

education certified teachers have higher retention or stay in the teaching profession longer.

- Gender and certification were negatively correlated for all 10 years but only statistically significant $p < .05$ for 2 of the 10 years. Possibly indicating there are more female special education teachers.

It is important to note that while many statistics are statistically significant, the effect sizes for all of these are small.

Table 7*Correlation of All Predictors With Teacher Retention 2010-2019*

Variables	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total <i>n</i>	12,548	12,301	11,035	10,984	11,207	11,605	11,755	11,972	12,102	12,225
Teacher Retention by Year										
M	0.9	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.9
SD	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4
Pearson Correlation										
Gender	-.001	.003	.029**	-.002	.006	.005	-.015	.000	.003	-.017
Certification	-.004	.011	.002	-.027**	-.033**	-.011	-.014	.005	-.014	.005
Total # Years Teaching	.173**	.174**	.136**	.141**	.106**	.113**	.143**	.113**	.108**	.075**
Black	.014	.020*	.011	.043**	.040**	.039**	.022*	.022*	.015	.026*
Hispanic	.087**	.056**	.072**	.019*	.034**	.053**	.072**	.069**	.069**	.071
Gender										
M	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.8	1.8
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pearson Correlation										
Certification	-.021*	-.023*	-.017	-.015	-.014	-.011	-.005	.001	.005	.001
Total # Years Teaching	.053**	.060**	.050**	.035**	.028**	.029**	.031**	.027**	.029**	.033**
Black	.020*	.021*	.018	.017	.017	.014	.013	.016	.022*	.020*
Hispanic	-.020*	-.021*	-.005	-.005	-.005	-.005	-.004	-.004	-.005	.001
Certification										
M	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Pearson Correlation										
Total # Years Teaching	-.031**	-.046**	-.045**	-.056**	-.053**	-.055**	-.069**	-.082**	-.080**	-.077**
Black	-.122**	-.127**	-.134**	-.133**	-.127**	-.120**	-.123**	-.124**	-.125**	-.130**
Hispanic	.138**	.142**	.141**	.130**	.129**	.124**	.126**	.136**	.139**	.139**
Total # of Years Teaching										
M	14.1	14.0	14.1	13.3	12.3	11.3	10.6	9.9	9.3	8.6
SD	9.9	9.8	9.5	9.3	9.3	9.1	9	8.8	8.7	8.6
Pearson Correlation										
Black	.104**	.104**	.099**	.092**	.067**	.062**	.044**	.034**	.025**	.022*
Hispanic	-.031**	-.045**	-.034**	-.022*	-.005	.000	-.015	-.016	-.018	-.014
Black										
M	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
SD	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Pearson Correlation										
Hispanic	-.362**	-.372**	-.383**	-.393**	-.402**	-.415**	-.446**	-.468**	-.489**	-.509**
Hispanic										
M	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
SD	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5

p's are 2-tailed

* denotes the correlation is significant at $p < .05$

** denotes the correlation is significant at $p < .01$

Table 8 shows the regression for the criterion variable, teacher retention, and the predictor variables of gender, certification, total number of years teaching, and race/ethnicity. Table 8 is read in the same manner as Tables 2 and 5. The top left margin has all the statistics for the regression and below Cook's Distance, are the predictor variables with the specific statistics for each variable underneath.

The regression for teacher retention was statistically significant: $p < .001$ for all 10 years. The total number of years of teaching and race/ethnicity were the only statistically significant predictor variables, $p < .001$. Race/ethnicity will be analyzed more with the χ^2 . The R^2 values range from .016 - .040 over the 10 years. Indicating that 1.6% to 4.0% of teacher retention could come from these predictor variables. The year 2019 was one of the years with the lowest $R^2 = .016$, $F(5, 12,219) = 40.506$, $p < .001$. 2010 had the highest $R^2 = .040$, $F(5, 12,542) = 103.684$, $p < .001$. With the contribution of each variable to the model, we see there is no collinearity among the variables, as reported with VIF scores ranging from 1.001 to 1.360. Analysis of the residuals used Cook's Distance to determine if any data, such as extreme outliers, severely changed the results. Cook's Distance has a minimum of .000 and a maximum of .004. There is not much variance between the minimum and maximum, indicating no influential cases were problematic for the least squares.

Table 8

Regression Predicting Teacher Retention With Demographic Variables 2010-2019

Variables	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total <i>n</i>	12,548	12,301	11,035	10,984	11,207	11,605	11,755	11,972	12,102	12,225
<i>R</i> ²	.040	.035	.026	.023	.016	.019	.029	.021	.020	.016
<i>F</i>	103.684	89.479	58.458	50.567	36.212	45.285	70.567	51.784	48.932	40.506
<i>df</i> (,)	(5, 12542)	(5, 12295)	(5, 11029)	(5, 10978)	(5, 11201)	(5, 11599)	(5, 11749)	(5, 11966)	(5, 12096)	(5, 12219)
<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Cook's Distance										
Min	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Max	.003	.002	.002	.002	.002	.002	.003	.004	.003	.003
Gender										
<i>B</i>	-.006	-.005	0.019	-.007	0.002	0.001	-.016	-.003	-.001	-.018
<i>SE</i>	0.006	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.008
<i>t</i>	-1.005	-.667	2.386	-.845	.254	.125	-2.182	-.377	-.091	-2.423
<i>p</i>	.315	.505	.017	.398	.799	.900	.029	.706	.928	.015
95% CI LL	-.019	-.021	0.003	-.022	-.013	-.014	-.031	-.016	-.015	-.033
95% CI UL	0.006	0.010	0.034	0.009	0.017	0.016	-.002	0.011	0.014	-.003
VIF	1.004	1.004	1.003	1.002	1.001	1.001	1.001	1.001	1.001	1.002
Certification										
<i>B</i>	-.007	0.012	0.000	-.018	-.026	-.007	-.009	0.009	-.012	0.006
<i>SE</i>	0.007	0.009	0.009	0.009	0.009	0.009	0.009	0.008	0.009	0.009
<i>t</i>	-1.006	1.328	-.026	-2.010	-2.952	-.800	-1.043	1.011	-1.325	.672
<i>p</i>	.314	.184	.979	.044	.003	.424	.297	.312	.185	.501
95% CI LL	-.021	-.006	-.018	-.036	-.043	-.024	-.027	-.008	-.029	-.012
95% CI UL	0.007	0.030	0.018	0.000	-.009	0.010	0.008	0.025	0.006	0.024
VIF	1.026	1.029	1.029	1.028	1.026	1.024	1.026	1.030	1.030	1.030
Total # of Years Teaching										
<i>B</i>	0.005	0.007	0.005	0.005	0.004	0.004	0.006	0.004	0.004	0.003
<i>SE</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<i>t</i>	19.690	19.566	14.289	14.417	10.767	11.779	15.501	12.442	11.858	8.381
<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
95% CI LL	0.005	0.006	0.004	0.005	0.003	0.004	0.005	0.004	0.004	0.002
95% CI UL	0.006	0.008	0.006	0.006	0.005	0.005	0.006	0.005	0.005	0.004
VIF	1.014	1.015	1.013	1.012	1.008	1.008	1.007	1.008	1.008	1.007
Black										
<i>B</i>	0.022	0.025	0.024	0.034	0.040	0.048	0.045	0.047	0.045	0.063
<i>SE</i>	0.006	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.008	0.008
<i>t</i>	3.464	3.140	3.037	4.289	5.252	6.372	5.856	6.494	5.946	8.003
<i>p</i>	<.001	.002	.002	<.001	<.001	<.001	<.001	<.001	<.001	<.001
95% CI LL	0.010	0.009	0.009	0.019	0.025	0.034	0.030	0.033	0.030	0.048
95% CI UL	0.035	0.041	0.040	0.050	0.055	0.063	0.060	0.061	0.060	0.079
VIF	1.169	1.178	1.191	1.201	1.206	1.220	1.257	1.288	1.321	1.357
Hispanic										
<i>B</i>	0.080	0.067	0.076	0.035	0.049	0.065	0.082	0.076	0.079	0.090
<i>SE</i>	0.007	0.009	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.008
<i>t</i>	11.125	7.624	8.662	4.065	5.838	7.914	9.974	9.785	9.952	10.876
<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
95% CI LL	0.066	0.050	0.059	0.018	0.032	0.049	0.066	0.061	0.064	0.074
95% CI UL	0.094	0.085	0.093	0.052	0.065	0.081	0.098	0.091	0.095	0.107
VIF	1.164	1.173	1.183	1.192	1.202	1.218	1.256	1.291	1.325	1.360

Table 9 shows the χ^2 analysis of race/ethnicity and teacher retention. Table 9 is read in the same manner as Tables 3 and 6. The top left margin has the *n*, χ^2 , *p*, and

Contingency Coefficient for teacher retention and race/ethnicity. Below the contingency coefficient are the three race/ethnicity categories used in the analysis: Black, Hispanic/Latino, and White. Under each race/ethnicity are their specific statistics including the percent change within teacher retention. Along the top is each year of the data. This allows for a rich longitudinal analysis for trends and patterns over time.

The relationship between race/ethnicity and teacher retention was significant at the $p < .001$ for all 10 years. Black teachers left teaching (37.65 average over 10 years, 36.38% in the first 5 years, 38.93% over the last 5 years) more in the last 5 years. Hispanic/Latino teachers had the lowest retention (21.26% average over 10 years). White teachers left teaching at higher rates in the first 5 years of the data but the trend is lower than Black teacher over the last 5 years of the data (38.6% average over 10 years, 40.88% first 5 years, 36.32% over last 5 years). Average percentages do not look at data trends over time which reveal that Black teachers *not retained* numbers are increasing each year, surpassing White teachers. The contingency coefficient explains how much teacher retention is explained by race/ethnicity, which ranged from 4.0% to 8.6% over the 10 years.

Table 9*Teacher Retention With Race/Ethnicity χ^2 2010-2019*

	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<i>n</i>	10391	10308	9285	9357	9689	10155	10590	11089	11385	11699
χ^2 (2)	77.498	57.798	58.217	14.760	28.534	37.168	29.646	48.763	35.033	32.121
<i>p</i>	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
Contingency Coefficient	.086	.075	.079	.040	.054	.060	.053	.066	.055	.052
Black										
Count										
Not Retained	416	673	538	459	454	494	583	525	605	666
Retained	3549	3200	2966	3027	3224	3395	3535	3756	3828	3894
Expected Count										
Not Retained	398.0	701.5	534.4	508.5	501.5	527.7	560.7	527.4	584.1	653.7
Retained	3567.0	3171.5	2969.6	2977.5	3176.5	3361.3	3557.3	3753.6	3848.9	3906.3
% Change within Teacher Retention										
Not Retained	39.9%	36.0%	38.0%	33.6%	34.4%	35.8%	40.4%	38.4%	40.3%	39.7%
Retained	38.0%	37.9%	37.7%	37.9%	38.5%	38.7%	38.6%	38.6%	38.7%	38.9%
Hispanic										
Count										
Not Retained	167	413	298	390	342	339	347	323	374	442
Retained	2611	2429	2348	2347	2442	2616	2817	3058	3166	3267
Expected Count										
Not Retained	278.8	514.7	403.5	399.3	379.6	401.0	430.8	416.5	466.4	531.7
Retained	2499.2	2327.3	2242.5	2337.7	2404.4	2554.0	2733.2	2964.5	3073.6	3177.3
% Change within Teacher Retention										
Not Retained	16.0%	22.1%	21.0%	28.6%	25.9%	24.6%	24.1%	23.6%	24.9%	26.4%
Retained	27.9%	28.8%	29.8%	29.4%	29.2%	29.8%	30.8%	31.5%	32.0%	32.6%
White										
Count										
Not Retained	460	781	580	516	525	545	512	518	521	569
Retained	3188	2812	2555	2618	2702	2766	2796	2909	2891	2861
Expected Count										
Not Retained	366.2	650.8	478.1	457.2	440.0	449.3	450.4	422.2	449.5	491.7
Retained	3281.8	2942.2	2656.9	2676.8	2787.0	2861.7	2857.6	3004.8	2962.5	2938.3
% Change within Teacher Retention										
Not Retained	44.1%	41.8%	41.0%	37.8%	39.7%	39.6%	35.5%	37.9%	34.7%	33.9%
Retained	34.1%	33.3%	32.5%	32.8%	32.3%	31.5%	30.6%	29.9%	29.2%	28.5%
Total										
Count										
Not Retained	1043	1867	1416	1365	1321	1378	1442	1366	1500	1677
Retained	9348	8441	7869	7992	8368	8777	9148	9723	9885	10022
Expected Count										
Not Retained	1043.0	1867.0	1416.0	1365.0	1321.0	1378.0	1442.0	1366.0	1500.0	1677.0
Retained	9348.0	8441.0	7869.0	7992.0	8368.0	8777.0	9148.0	9723.0	9885.0	10022.0

Teacher Retention and Associated Cost

The number of teachers that leave each year from the school district data ranged from 1396 (11.1%) to 2275 (18.5%). Using the Learning Policy Institute (LPI) Teacher

Replacement Cost Calculator, we can estimate the amount of money it costs to replace teachers from an urban school district. The LPI costs range from \$21,000 to \$40,000 per teacher per year. The associated costs at \$21,000 per teacher times the number of teachers that left ranged from \$29,316,000.00 to \$47,775,000.00 yearly. Using the \$40,000 cost per teacher, per year times the number of teachers that left, the cost range would be \$55,840,000.00 to \$91,000,000.00 yearly. Adding the overall costs to this school district over the 10 years of data at the \$21,000 cost per teacher, 10-year cumulative costs are \$367,248,000.00. Cumulative costs over the 10 years at \$40,000 per teacher are \$699,520,000.00.

Comparison of Teacher and Student Data

The student population 10-year average for each of the ethnicities included 221,390 (19.4%) Black students, 265,540 (23.3%) White students, and 560,411 (48.9%) Hispanic/Latino students. Corresponding school district teacher data showed 8,515 (33.1%) Black teachers, 6,232 (24.2%) Hispanic/Latino teachers, and 7,944 (30.9%) White teachers.

Demographics and Frequencies Data

Key demographics show that 41.2% of teachers in this data set had only 1 to 3 years of experience. 17.1% had 4 to 6 years, 11.3% had 7 to 10 years, 8.4% had 11 to 14 years, and 22% had 15 years or more.

Special education certified teachers made up 15.84% of this school district population, with non-special education certified teachers making up 84.15%. Of the teachers certified in special education 7.13% were Black, 1.89% were Hispanic/Latino, and 4.79% were White.

Table 10*Descriptive Statistics and Frequencies for School District Data 2010-2019*

Variables	<i>n</i>	%
Total Teacher <i>n</i>	25,724	
Gender		
Female	19,151	74.4
Male	6,573	25.6
Race/Ethnicity		
Black	8,515	33.1
Hispanic	6,232	24.2
White	7,944	30.9
Missing	3,033	11.8
Certification		
Special Education Total	4,076	15.84
Black	1,835	7.13
Hispanic	487	1.89
White	1,233	4.79
Other	521	2.03
Non-Special Education Total	21,648	84.15
Black	6,680	25.97
Hispanic	5,745	22.33
White	6,711	26.09
Other	2,512	9.77
Years of Experience		
1 to 3	10,616	41.2
4 to 6	4,391	17.1
7 to 10	2,893	11.3
11 to 14	2,164	8.4
15 plus	5,660	22
Student Population 10 year average		
Black	221,390	19.4
White	265,540	23.3
Hispanic	560,411	48.9

DISCUSSION

The purpose of this study was to analyze trends and patterns related to teacher attrition (movement of job and school) and teacher retention (leave or stay teaching) in a single large urban school district.

This analysis included the following: regression and correlation findings for all three criterion variables (teacher job attrition, teacher school attrition, and teacher retention), χ^2 analysis of race/ethnicity for all three criterion variables, the cost of teacher retention, and comparison of local student data to the teacher population. The data used for this study spanned 10 consecutive years (2009-2019), giving a rich, longitudinal look at teacher movement.

The data revealed a number of findings regarding teacher movement. Female teachers certified in special education tended to stay in the field longer than non-certified special education teachers. Certification was significant for teacher job attrition 10 out of the 10 years at $p < .01$, teacher school attrition 9 out of the 10 years at $p < .01$, and retention for 10 out of the 10 years at $p < .01$. Gender and the total number of years teaching was significant for all three criterion variables for every year except one in school attrition. Teachers certified in special education are in high demand (Billingsley & Bettini, 2019; Sutchter et al., 2016). Filling such vacancies is a big challenge for many school districts (Sutchter et al., 2016).

Race/ethnicity was revealed as a factor for contributing to job attrition. Results indicated that Black teachers move jobs at statistically significant higher rates than any other racial group. This finding was statistically significant for every year except the first, 2010. It is unclear if teachers leave voluntarily; knowing why could deter teacher movement. Understanding why Black teachers move more than any other racial group would be critical to supporting the representation of Black teachers in school districts. The number of Black teachers in education has been steadily increasing (Villegas et al., 2012). Still, as these data show, their movement, both job, and school, is at statistically significant levels compared to their White and Hispanic/Latino counterparts. Students benefit academically and socially from having a Black or Hispanic/Latino teacher (Harry & Klingner, 2014). Knowing why they are moving could inform administrators in combatting the teacher shortage, especially teachers from various ethnic backgrounds.

Race/ethnicity was revealed as a factor for contributing to retention. The χ^2 analyzing teacher retention and race/ethnicity was significant at $p < .001$ for all 10 years. It is important to note that within the first 5 years, White teachers had a higher percentage of leaving compared to Black and Hispanic/Latino teachers. The last 5 years of the data revealed Black teachers had a higher percentage of leaving compared to White and Hispanic/Latino teachers. Also, the trend over the 10 years, with the number of Black teachers leaving, increased more than White or Hispanic/Latino teachers. This would indicate that Black teachers have higher teacher retention based on the last 5 years and an ascending trend over 10 years.

Teacher movement (job and school) has a tremendous impact on education. These data are not often tracked, especially over time, as noted with NCES, SASS, and NTPS.

When teachers move or leave, so does their experience, professional development, and knowledge, all skills which cannot be easily replaced with new hires and are very costly for districts (Milanowski & Odden, 2007). The impact on student outcomes, especially marginalized students, is the most important but is often not discussed or mentioned and has been challenging to measure (Sutcher et al., 2016).

National and Local Data Comparison

NCES National data survey is a representative random sample of mostly teachers throughout the United States. They are asked to complete a survey known as the NTPS (formerly known as the SASS). This survey is distributed approximately every 4 years, with the data aggregated by IES/NCES. A TFS (Follow-Up Survey) is sent out the year after NTPS or SASS to follow up on specific questions with teachers that had taken the primary survey. One of the significant differences between this school district data set and the national data set is that the national data is not longitudinal, making it difficult to see trends and patterns over time. Also, the national data only considers *movers* as those teachers who change from one school to another. For this study, movers were part of attrition, both teacher school attrition (change a school from one year to the next) and teacher job attrition (change a job from one year to the next). This data set has revealed vital information related to teacher job movement as opposed to looking at only school movement. Understanding the full movement of teachers is essential to informing administrators in their future decision making to help combat the teacher shortage. It is important to mention that attrition (job or school) is still a vacancy that needs to be filled, and there are associated costs to this which are not always factored in.

National data can provide valuable information; however, caution should be taken when using it, especially in research.

Cost of Teacher Retention

The Learning Policy Institute (LPI) Teacher Replacement Cost Calculator estimated costs based on Barnes (2007), Milanowski and Odden (2007), and Watlington et al. (2010). Inflation was estimated in the cost, providing a range of \$21,000 to \$40,000 per teacher replacement cost per year. It is noted that each district and school could have varied replacement costs. Some associated costs of losing a teacher include hiring new staff (advertising, etc.) and professional development or required training (onboarding).

This school district retains, on average, 10,025 teachers per year over the 10 years. The average number of teachers not retained each year was 1,748 (17.4%) over the 10 years. This means that every 5.7 years, this school district has a total turnaround in staff. It is a perpetual problem with significant costs.

Teacher retention costs for this district average \$36 million dollars a year with cumulative estimates at \$367,248,000.00 over the 10 years at the conservative end of \$21,000 per teacher. Cumulative costs over the 10 years at the higher inflation end of \$40,000 per teacher per year are \$699,520,000.00. This can choke an already tight school district budget. Reducing teacher retention numbers by 10% to 20% can significantly impact the bottom line and the teacher shortage. These numbers are only the financial costs of losing a teacher. Lost teacher experience and student outcomes, especially from our most vulnerable populations, have been hard to quantify in research (Mason-Williams et al., 2020). Given all this information, it would be questionable whether any

organization would be able to function with turnover rates averaging 17% a year at costs in the tens of millions.

Student and Teacher Comparisons, Demographics, and Frequencies

The Hispanic/Latino student population has been steadily increasing over the 10 years of data. Hispanic/Latino students now account for over 50% of the total student population in this school district. There is a significant racial disparity between students and teachers. Hispanic/Latino teachers in this same school district make up only 24.2% of the teacher population over the 10 years. Black teachers account for 33.1%, the majority of teachers, and White teachers account for 30.9% of the total teacher population for this school district. This is interesting as the student racial majority is Hispanic/Latino at over 50%, the White student population is next highest at 23.3%, and the Black student population is lowest of the three at 19.4%. Racial disparities between students and teachers can significantly affect student achievements and outcomes (Frank et al., 2021). Students being taught by teachers of their same race/ethnicity have better outcomes academically and socially in school (Harry & Klingner, 2014). Students have noted they prefer being taught by teachers of color (Cherng & Halpin, 2016). These students look to these teachers as role models for their future success (Gershenson & Papageorge, 2018). All students benefit from having teachers from varied racial backgrounds, which is only possible if teachers are actively recruited.

The special education teacher population makes up 15.84% of the total population. Of those teachers, only 1.89% are Hispanic/Latino teachers, 7.13% are Black teachers, and 4.79% are White teachers. While we do not know the number or race/ethnicity of special education students in this school district, we could infer the

number of Hispanic/Latino special education teachers seems low, especially if over half of the student population is Hispanic/Latino. Increasing the number of Hispanic/Latino teachers certified in special education will be important to have an equitable representation of teacher – student race/ethnicity. As mentioned, students benefit from having a teacher of their same race/ethnicity (Frank et al., 2021).

In summary, job or school, teacher movement is not analyzed nearly enough nor considered part of the teacher shortage problem as much as it should be. Teacher movement could significantly affect the number of years a teacher may stay teaching and the type of teacher (special education certified) that may stay or leave. Also, with yearly teacher retention loss averaging over 17%, it would be hard to maintain a quality teacher workforce for any length of time. Finding ways to keep teachers in their classrooms with little movement seems like a trend that might need to be considered to lower school district costs and, more importantly, combat the teacher shortage.

Limitations

The study findings should be considered in the context of the following limitations. The accuracy of the data reported from the school district may not be 100%. The data depends on the results of the public records request and the variables requested, including the person interpreting the request.

This school district data is from a specific region only, allowing interpretations based on data from this region only. A representative sample of school district data from multiple areas could provide a rich understanding of teacher attrition (job and school) and teacher retention trends, patterns, and costs.

Implications for Future Research

Accurate data and record keeping on a national, state, and local level is paramount to combat the teacher shortage crisis. Uniformity in accumulated data and its reporting could help explain the trends and patterns related to teacher attrition (job and school) and teacher retention.

Some of the data that would be helpful to accumulate would be to include teacher movement for both job and school, costs associated with teacher retention (leaving), the number of vacancies and what positions those vacancies are in, teachers' demographics, certification types, number of years a teacher teaches, qualifications/educational background, and the effect of COVID 19 on the teacher shortage to name a few. Understanding all teacher movement can give us more information regarding the teacher shortage.

It is difficult for a school district to lose 17% of its workforce yearly. School districts must find creative, visionary ways to reverse the cycle of teachers leaving by using associated retention cost funds in a proactive, innovative way. Keeping teachers in their current positions is critical in navigating the teacher shortage. Programs that are self-sustaining and build relationships or partnerships between school districts, universities, and community stakeholders could have the best chance for success.

APPENDICES

Appendix A: IRB Approval



Institutional Review Board
Division of Research
777 Glades Rd.
Boca Raton, FL 33431
Tel: 561.297.1383
fau.edu/research/researchint

Charles Dukes, Ed.D., Ph.D., Chair

DATE: June 24, 2021

TO: Charles Dukes
FROM: Florida Atlantic University Social, Behavioral and Educational Research IRB

PROTOCOL TITLE: Analyzing Trends and Factors to Improve Teacher Attrition and Retention
IRBNET ID #: 1766890-1

SUBMISSION TYPE: New Project
ACTION: APPROVED

APPROVAL DATE: June 23, 2021
NEXT REPORT DATE: June 23, 2022

REVIEW TYPE: Expedited Review
REVIEW CATEGORY: Expedited review category # B5

Thank you for your submission of New Project materials for this research study. The Florida Atlantic University Social, Behavioral and Educational Research IRB has APPROVED your New Project. This approval is based on an appropriate risk/benefit ratio and a study design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission. NO CONTINUE REVIEW IS REQUIRED FOR THIS PROTOCOL. Please submit VIA e-mail a brief progress report on or before the "Next Report Date".

- This study is approved for secondary data analysis.
- Please submit a progress report before the indicated date.
- It is important that you use the approved, stamped consent documents or procedures listed below:
- *****Please note that any revision to previously approved materials or procedures, including modifications to numbers of subjects, must be approved by the IRB before it is initiated.*** Please use the amendment form to request IRB approval of a proposed revision.
- All SERIOUS and UNEXPECTED adverse events or unanticipated problems must be reported to this office. Please use the appropriate serious adverse event (SAE)/ Unanticipated Problems (UP) report form for this procedure. All regulatory and sponsor reporting requirements should also be followed, if applicable.
- Please report all NON-COMPLIANCE issues or COMPLAINTS regarding this study to this office.
- Please note that all research records for federally funded or non-funded investigator initiated studies must be retained for a minimum of three years after completion of the research. For multisite, international studies conducted under ICH Guidelines, records must be retained until notification by the sponsor that all marketing applications have been completed. Research records involving protected health information (PHI) must be retained for a minimum of six years.

- Please submit an IRB final report when the study is completed or discontinued.

If you have any questions or comments about this correspondence, please contact Donna Simonovitch at:

Institutional Review Board
Research Integrity/Division of Research
Florida Atlantic University
Boca Raton, FL 33431
Phone: 561-297-0777
researchintegrity@fau.edu

* Please include your protocol number and title in all correspondence with this office.

**This letter has been electronically signed in accordance with all applicable regulations,
and a copy is retained within our records.**

Appendix B: IRB Amendment



Institutional Review Board
Division of Research
777 Glades Rd.
Boca Raton, FL 33431
Tel: 561.297.1383
fau.edu/research/researchint

Patricia Maslin-Ostrowski, Ed.D., Chair

DATE: June 24, 2022
TO: Charles Dukes
FROM: Florida Atlantic University Social, Behavioral and Educational Research IRB
PROTOCOL #: 1766890-2
PROTOCOL TITLE: [1766890-2] Analyzing Trends and Factors to Improve Teacher Attrition and Retention
SUBMISSION TYPE: Amendment/Modification
ACTION: APPROVED
EFFECTIVE DATE: June 23, 2022

Thank you for your submission of Amendment materials for this research protocol. The Florida Atlantic University IRB has approved your request to modify your protocol as outlined below:

- Progress report and amendment. Minor change of when to destroy the identifiable data, extension to the end of the dissertation (Fall 2022 anticipated completion)
- Next brief progress report due 6/23/2023

Please use the stamped, revised (consents, instruments, etc.) that accompany this approval letter.

- ◦ Protocol - HISD Protocol 2021_v2_06092022revision.doc (stamped)

If you have any questions or comments about this correspondence, please contact Donna Simonovitch at:

Institutional Review Board
Research Integrity/Division of Research
Florida Atlantic University
Boca Raton, FL 33431
Phone: 561.297.1383
researchintegrity@fau.edu

* Please include your protocol number and title in all correspondence with this office.

**This letter has been electronically signed in accordance with all applicable regulations,
and a copy is retained within our records.**

Appendix C: License Access

I obtained access to a license with NCES to use the National Survey Data Sets. This was obtained under Dr. Robert Shockley's license. Below is the email sent to Dr. Shockley.

From: IESData.Security@ed.gov <IESData.Security@ed.gov>

Sent: Thursday, October 14, 2021 5:04 PM

To: Robert Shockley <SHOCKLEY@fau.edu>

Cc: IESData.Security@ed.gov

Subject: #14120011: Approve User

EXTERNAL EMAIL : Exercise caution when responding, opening links, or opening attachments.

License Number: 14120011

Robert Shockley,

Your add user request for Kerry Wittel has been approved.

EFFECTIVE IMMEDIATELY:

Until ED Offices are fully reopened, all mail must be sent to: IES Data Security

IES Data Security, NCES, PCP 4165

400 Maryland Avenue SW

Washington, DC 20202

Office: 202-245-7674

IESData.Security@ed.gov

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