Expert Report: Access to Educators in Pennsylvania

Prepared by

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For consideration in the proceeding:

Executive Summary

Access to a stable cadre of well-qualified educators is essential for improving student outcomes. Indeed, research demonstrates that experience, qualified, long-tenured teachers improve student cognitive and non-cognitive outcomes. Similarly, recent research has found counselors have a profound influence on student outcomes. Finally, research also suggests access to a librarian is associated with improvements in student outcomes as well, particularly in early-grade reading.

In this report, I find that Pennsylvania does not currently provide an adequate supply of teachers. Indeed, over the last 15 years, Pennsylvania has seen one of the greatest declines in the production of teachers of any state in the nation. This decline in the production of teachers has led to an expanding shortage of teachers across a number of subject areas as well as a dramatic increase in the reliance on emergency certificates to fill teaching positions.

The impact of these shortages falls on those who can least afford to experience them. That is, because of the manner in which the state school finance system works, some districts are able to generate more revenue than other districts. These "wealthier" districts are able to offer higher salaries to recruit teachers than are "poorer" districts within the same labor market. Thus, even if the state provided an adequate supply of well-qualified teachers, the state system of financing creates an unequal playing field in which wealthier districts can offer higher salaries than poorer districts in an effort to recruit the best available teachers as well as retain such teachers over time.

The predictable consequence of the state's inability to produce an adequate supply of teachers and the decision to not ensure the fiscal ability of all districts to compete equally for teachers within the same labor market is an inequitable distribution of teachers. Indeed, as shown below, students in both poorer districts and districts enrolling greater percentages of economically disadvantaged students are:

- More likely to be taught by an inexperienced teacher;
- More likely to be taught by a teacher on an emergency permit or by a substitute teacher; and,
- More likely to experience a revolving door of teachers.

Classroom teachers are not the only area where poor districts and poor children experience inequity; there is also an inequitable distribution of principals, counselors, and librarians. Indeed, students in the poorest districts and in the districts enrolling the greatest percentages of economically disadvantaged students are

- Less likely to have principals that remain for extended periods of time at their school;
- Less likely to have access to a counselor who is responsible for 500 or fewer students;
- Less like to have access to a full-time librarian.

In sum, the system of education created by the Commonwealth of Pennsylvania creates a system of "haves" and "have nots" where students in poorer districts and districts serving high percentages of economically disadvantaged students have less access to the various professionals who substantially influence student outcomes. In short, the Pennsylvania education system gives fewer resources to the very students who are most in need of them.

Introduction

This report focuses on access to important human resources in school settings, the degree to which access is inequitable across district characteristics, and the potential explanatory factors driving any existing inequities. In particular, this report focuses on access to teachers, principals, counselors, and librarians. Differences in access is examined by district type, district wealth, and district percentage of economically disadvantaged students. In addition, I examine access in Focus Districts (the six plaintiff districts and Philadelphia City School District)

Before examining the degree of access to educators, I first review the state of teacher production, demand, and shortages for Pennsylvania. This review is necessary because an adequate supply of well-qualified teachers is a necessary pre-condition for ensuring an equitable distribution of teachers.

Subsequently, I then review the research on three measures of teacher quality: teacher experience, teacher assignment in-field, and teacher turnover. Following the review of literature, I examine the access to teacher quality using these three measures.

Next, I investigate some potential causes of differences in access to teachers. Specifically, I examine principal turnover, working conditions, and salary.

The last two sections of this report focus on student access to counselors and librarians. With respect to both counselors and librarian, I examine the percentage of schools employing at least one full-time equivalent (FTE) of a counselor or librarian position. In addition, with respect to counselors, I also examine the percentage of schools meeting the national recommendation of 250 students for every one counselor as well as a less stringent standard of 500 students for every one counselor.

The final section of the study is the conclusion in which I review all of the findings of the report.

Definition of Terms

In this section, I define some of the terms used throughout this study.

District Categories

In this report, I compare districts by district type, wealth, and the percentage of economically disadvantaged students enrolled in the district.

District Type

District type is defined by the Pennsylvania Department of Education (PDE) and included in a number of data files on their web site. In this report, I generally focus on three district types: school districts, charter schools, and Career and Technical Centers (CTCs). Some analyses also include Intermediate Units (IUs).

Quintiles of District Wealth

My measure of district wealth is taken from Dr. Kelly's expert witness report.

Quintiles of the Percentage of Economically Disadvantaged Students

In order to include a greater percentage of teachers and students, especially students living in poverty, I also include analyses based on the percentage of economically disadvantaged students in the district. This approach includes both Career and Technical Centers (CTCs) as well as charter schools. The percentage of economically disadvantaged students is based on reports of economically disadvantaged students provided to PDE. The majority of such students are identified based on eligibility for the federal free-and reduced-price meals program. The data for this measure was based on the percentage of "low-income students" by district from the PDE website.

To create quintiles, I sorted districts in ascending order based on their percentage of economically disadvantaged students. I then included an approximately equal number of districts in each of the five quintiles. Thus, each quintile includes about the same number of districts.[1] This process was repeated separately for each academic year. In the analyses, Quintile 1 districts have the lowest percentages of economically disadvantaged students while Quintile 5 districts have the greatest percentage of economically disadvantaged students.

Teacher Experience

In this report, I identify three types of teachers based on their years of education experience—beginning teachers, novice teachers, and inexperienced teachers. I define each below. It is important to note that these groupings overlap in a way that beginning teaches are subsumed in the novice teacher group and both beginning teachers and novice teachers are subsumed in the inexperienced teacher group.

It is important to note that the educator experience information included in the PDE employment files needed some data corrections to account for out-of-state experience and self-evident coding errors. Based on my 25 years of experience using such data from multiple states and districts, I corrected the information as best possible. I explain this process in the appendix. As a result of these corrections, my report shows Pennsylvania teachers to be more experienced than they otherwise appear in the publicly reported data.

Beginning Teachers

Beginning teachers are those individuals with no prior teaching experience and who are employed for the first time as a teacher in a Pennsylvania public school district. This measure is based on all experience as an educator, including in private schools and schools in other states.

[1] Districts include both school districts and charter schools..

Novice Teachers

Novice teachers are those individuals with between 1 and 3 years of education experience.

Inexperienced Teachers

I define inexperienced teachers as those with between 1 and 5 years of education experience.

Full-Time Equivalent

A full-time equivalent (FTE) is the amount of time a person is employed. A 1.0 FTE indicates full-time employment while a 0.5 FTE indicates half-time employment.

Focus District Comparisons

I use two basic approaches in making comparisons for Focus Districts. First, I compare the Focus Districts to all districts in the wealthiest quintile of districts within the same core-based statistical area (CBSA). The CBSA is a U.S. geographic area defined by the Office of Management and Budget that consists of one or more counties (or equivalents) anchored by an urban center of at least 10,000 people plus adjacent counties that are socioeconomically tied to the urban center by commuting. The most recent CBSA designations were made in 2015 and were based on data from the 2010 census. Second, I compare Focus Districts to all districts in the Wealthiest Quintile across the Commonwealth.

Three Year Rolling Average

In most of the analyses, I employ a year three rolling average to dampen the effects of one-time external influences to the employment or attrition of educators. The three year rolling average is calculated by taking the average of the target year and the two preceding years. So, for example, the three year rolling average for 2016 is the average of the 2016, 2015, and 2014 years.

Teacher Supply, Demand, and Shortages in Pennsylvania

In this section, I examine the overall trends for teacher supply and demand in Pennsylvania as well as the balance of supply and demand across the Commonwealth.

Number of Teachers

As shown in Table 1, Pennsylvania employed the equivalent of 121,855 teacher full-time equivalents (FTEs) in the 2017-18 school year. This was a decline of nearly 1,200 teacher FTEs over the six year period. While the overall teacher FTEs in the Commonwealth are declining, the number of teacher FTEs has increased over time for charter schools. Indeed, the number of teacher FTEs employed in charter schools has increased by nearly 1,400 FTEs or about 20% over the six year time period. Concomitantly, there was a decrease of nearly 2,200 FTEs or about -2%) in school districts over the same time period. The relatively large fluctuations are due

primarily to changes in employment in Philadelphia City School District where the number of teachers can increase or decrease between 500 and 1,000 FTEs per year.

Table 1: Number of Teacher FTEs by District Type and Year

District Type	Spring of Academic Year						Change 13 to 18
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	
Career & Tech Ctr	2,033.0	2,012.5	2,030.5	2,004.7	2,016.5	2,014.8	-18.2
Charter School	6,893.4	7,318.4	7,616.1	7,615.7	7,829.5	8,270.6	1,377.2
Intermediate Unit	4,381.2	4,340.5	4,209.9	4,082.3	4,032.9	4,018.2	-363.0
School District	109,736.3	107,591.3	108,106.9	107,121.7	108,612.6	107,551.8	-2,184.5
Total	123,043.9	121,262.7	121,963.4	120,824.3	122,491.6	121,855.4	-1,188.5

*Excludes state special education schools and juvenile justice centers;
Data Source: PDE educator enrollment files and district type files.

With respect to school districts, there has been an increase in the number of teacher FTEs in wealthier districts and a decrease in poorer districts as shown in Table 2. This is due primarily to the transfer of relatively large numbers of students from urban school districts serving high proportions of economically disadvantaged students to urban charter schools of the state—particularly in the greater Philadelphia region. A decline in student enrollment eventually leads to a decline in the number of teachers employed.

Table 2: Rolling Three Year Average of the
Number of Teacher FTEs by District Wealth and Year

District Wealth	Spring of Academic Year				Change: 2013-14 to 2016-17	
	2013-14	2014-15	2015-16	2016-17	N	%
Wealthiest	23,591.1	23,636.7	23,795.3	23,912.4	321.3	1.4
Quintile 2	22,783.9	22,821.6	22,869.5	22,922.8	138.9	0.6
Quintile 3	22,423.6	22,280.1	22,217.4	22,157.4	-266.2	-1.2
Quintile 4	21,776.0	21,656.5	21,551.0	21,369.7	-406.3	-1.9
Poorest	18,040.2	17,348.5	17,513.8	17,399.9	-640.4	-3.5
All Districts	108,614.8	107,743.3	107,947.1	107,762.0	-852.8	-0.8

Data Source: PDE educator employment files and PDE school finance files.

Table 3 includes CTCs, school districts, and charter schools but excludes Intermediate Units and State schools[2]. Quintile 1 includes districts with the lowest percentages of economically disadvantaged students and Quintile 5 includes districts with the highest percentages of economically disadvantaged students.

[2] State schools are schools that provide educational services for incarcerated youth and children with profound disabilities. There are very few students and teachers in such schools.

Table 3: Three Year Rolling Average of the Number of Teacher FTEs
by Percentage of Economically Disadvantaged Students in the District and Year

District % Econ	Spring of Academic Year				Change: 2014 to 2017	
Disadv Students	2013-14	2014-15	2015-16	2016-17	N	%
Quintile 1	23,759.8	23,783.6	23,563.5	23,669.1	-90.7	-0.4
Quintile 2	23,250.6	23,001.8	23,317.5	23,120.2	-130.4	-0.6
Quintile 3	23,940.7	24,159.1	24,109.9	24,233.7	293.0	1.2
Quintile 4	23,584.3	23,505.1	23,827.9	24,050.8	466.5	2.0
Quintile 5	22,052.2	21,509.8	21,505.0	21,262.0	-790.1	-3.6
All Districts	116,587.6	115,959.3	116,323.8	116,335.8	-251.8	-0.2

Data Source: PDE educator employment files and student enrollment files.

As shown in Table 4, the majority of charter schools enroll a high proportion of economically disadvantaged students. Thus, charter schools have a relatively large impact on the trends for Quintile 5.

Table 4: Quintiles of Percentage of Economically Disadvantaged Students
Enrolled in the District by District Type (2017-18 School Year)

% Eco Dis	School Districts		Charter Schools		CTCs		All Districts	
Students	N	%	N	%	N	%	N	%
Quintile 1	73	14.6	15	8.3	0	0.0	88	12.7
Quintile 2	100	20.0	12	6.7	0	0.0	112	16.2
Quintile 3	158	31.7	16	8.9	5	41.7	179	25.9
Quintile 4	134	26.9	64	35.6	5	41.7	203	29.4
Quintile 5	34	6.8	73	40.6	2	16.7	109	15.8
Total	499	100.0	180	100.0	12	100.0	691	100.0

Data Source: PDE data files on student enrollment and district type

Teacher Attrition and the Replacement of Teachers

As shown in Table 5, from 2013 to 2018, the average annual attrition[3] for teachers in Pennsylvania was between 7.5% from 2013 to 2014 and 6% for both 2016 to 2017 and 2017 to 2018. This is the percentage of individual teachers employed in any Pennsylvania public school (school district, charter school, or CTC) who did not return as a teacher in a Pennsylvania public school in the following year. [4]

[3] Attrition measures whether a teacher is no longer employed in any Pennsylvania public school district.
[4] This does not include teacher that transfer from one district to another, but only includes those individuals no longer employed as a teacher of record in Pennsylvania public and charter schools.

Table 5: Annual Teacher Attrition for Pennsylvania by Year

Employees Leaving Teaching	Academic Year Transitions				
	2012-13 to 2013-14	2013-14 to 2014-15	2014-15 to 2015-16	2015-16 to 2016-17	2016-17 to 2017-18
Number	8,191.7	8,393.2	8,089.7	6,720.0	6,827.1
Percent	7.2	7.5	7.3	6.0	6.0

Data Source: PDE educator employment data files

To replace at least some of the teachers leaving the profession, Pennsylvania school districts must recruit between 6,000 and 8,500 newly hired teachers each year as shown in Table 6 below. As shown in Table 7, approximately one-half of these newly hired teachers will be beginning teachers with no prior teaching experience (Fuller & Pendola, 2020).

Table 6: Number of Newly Hired[5] Teacher FTEs in Pennsylvania Public Schools by Year

Newly Hired Teachers	Spring of Academic Year				
	2013-14	2014-15	2015-16	2016-17	2017-18
Number (FTEs)	7,023.3	6,987.0	8,389.9	7,979.2	6,154.8

Data Source: PDE data files

Table 7: Number of Beginning[6] Teacher FTEs Hired in Pennsylvania Public Schools by Year

Beginning Teachers	Spring of Academic Year				
	2013-14	2014-15	2015-16	2016-17	2017-18
Number (FTEs)	3,651.80	3,587.80	3,569.90	3,528.50	2,942.29

Data Source: PDE data files

Given this demand for new teachers, the question arises as to whether the Commonwealth can currently meet the demand for new teachers. This is a critically important question for this case because an inadequate supply of teachers leads to shortages of teachers and there is widespread consensus within the research community that teacher shortages typically result in a decline in teacher quality. More importantly, shortages of teachers tend to disproportionately affect economically disadvantaged students, particularly those enrolled in under-funded districts and districts serving high proportions of economically disadvantaged students.

The Production of Teachers in Pennsylvania

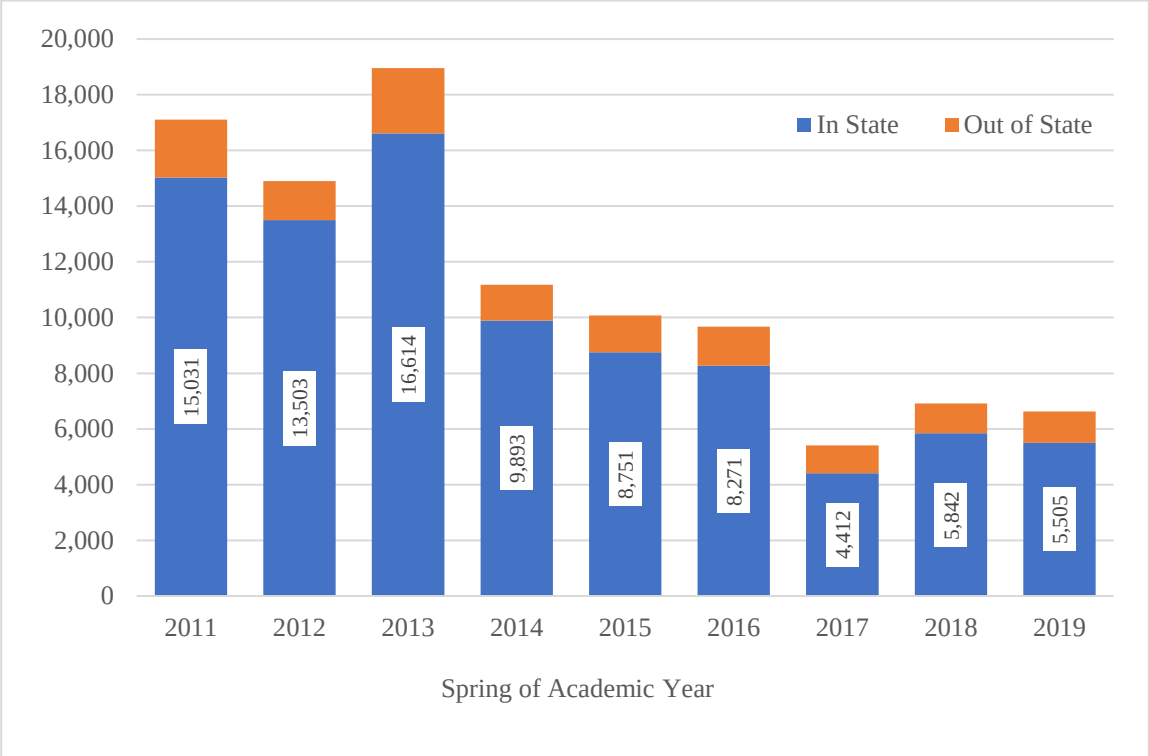
In Pennsylvania, individuals in teacher preparation programs must obtain an Instructional I license in order to obtain a teaching position in a Pennsylvania public school with the exception of some teaching positions in charter schools. An Instructional I license is intended for graduates of teacher preparation programs or individuals entering the Pennsylvania teaching profession from outside of Pennsylvania.

[5] Newly hired indicates that the individual was not employed in a Pennsylvania public school district in the prior school year.
[6] A beginning teacher is defined as a teacher with no prior teaching experience.

As shown in Figure 1, the production of newly licensed teachers from in-state teacher preparation programs has declined precipitously since 2013[7]. Indeed, the number of in-state individuals obtaining Instructional I licensure declined from 16,614 to 5,505 in 2019—a 67% decrease. Even if we average the number of newly licensed teachers across the 2011, 2012, and 2013 years to average out the effects of policy changes, there was still an approximately 63% decline in the number of newly licensed individuals from Pennsylvania teacher preparation programs.

Thus, even if every newly licensed teacher from Pennsylvania teacher preparation programs chose to enter teaching in a Pennsylvania public school, there would still be positions left unfilled. Even if out-of-state teachers are included, the number of individuals obtaining initial Level I licensure is simply not large enough to meet the demand for new teachers.

Figure 1: Number of Individuals Obtaining Level I Liecensure in Pennsylvania by In-State and Out-of-State Entry into Teaching by Year

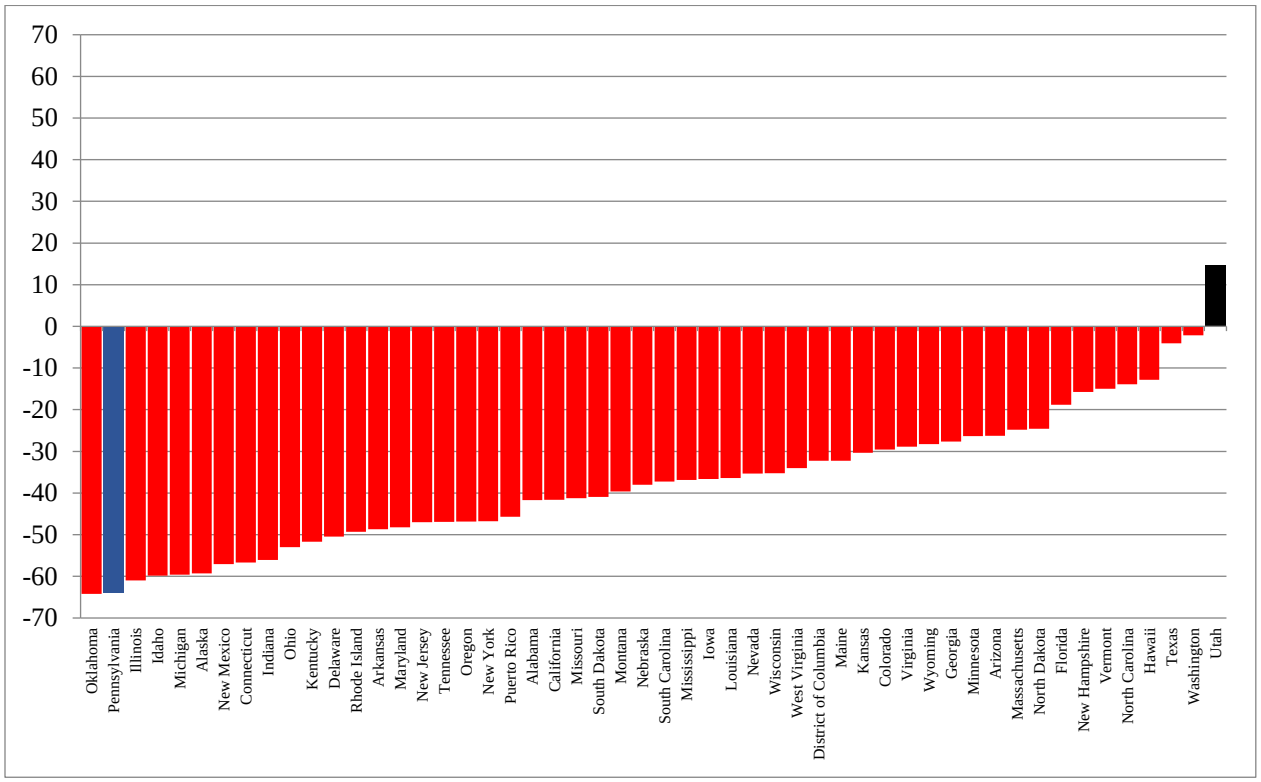


Data Source: Act 82 Report of 2018 from PDE

While teacher production has declined across the US over the last 15 years, the decline in Pennsylvania has been greater than in most states as shown in Figures 2 and 3. Specifically, Figure 2 shows that the decline in the number of students enrolled in teacher preparation programs from 2009-11 to 2015-17 in Pennsylvania was greater than 60% which was the greatest decline for any state/territory with the exception of Oklahoma.

[7] The 2013 year is the high point in licensure due to changes in licensure requirements (Fuller & Pendola, 2020)

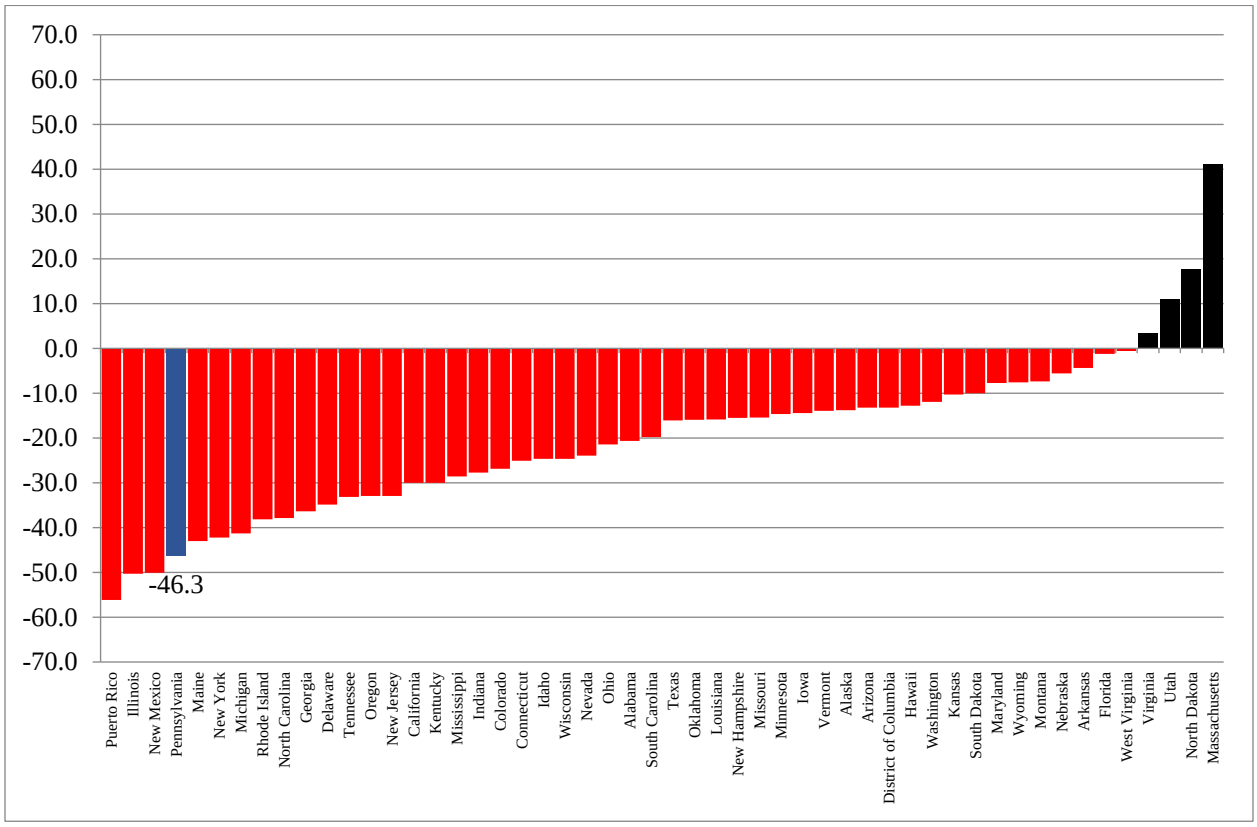
Figure 2: Percentage Change in Teacher Preparation Program Enrollees by State
(Average of 2008-09, 2009-10, and 2010-11 to average of 2014-15, 2015-16, and 2016-17)



Data Source: Title II Teacher Preparation Program Data Tools (https://title2.ed.gov/Public/DataTools/Tables.aspx)

Similarly, as shown in Figure 3, the decline in the number of individuals completing Pennsylvania teacher preparation programs from 2009-11 to 2015-17 was 46.3%. This large decline was greater than the declines for all states and territories with the exception of Puerto Rico, Illinois, and New Mexico.

Figure 3: Percentage Change in the Number of Teacher Preparation Program Completers by State (Average of 2008-09, 2009-10, and 2010-11 to average of 2014-15, 2015-16, and 2016-17)



Data Source: Title II Teacher Preparation Program Data Tools (https://title2.ed.gov/Public/DataTools/Tables.aspx)

An additional source of data that can inform policymakers' perspectives on the future supply of newly licensed teachers is the number and percentage of students taking the SAT who declared education as their intended college major. When students take the SAT, they are also invited to complete a survey about their personal information and goals about college. The data for Pennsylvania is displayed in Table 10 below. The data from the College Board suggest there will be no increase in the number of students graduating with education majors in the coming years. Indeed, Table 8 below shows that the percentage of students taking the SAT and indicating education would be their likely college major declined from 10 percent in 2011 to 6 percent in 2014 and has remained constant at six percent from 2014 through 2018. Moreover, the number of students taking the SAT declined from nearly 106,000 to just over 95,794 in 2019. Given that students taking the SAT represent the larger pool from which individuals choose to be teachers, these trends suggest that there will be no substantial increase in the number of individuals obtaining an initial teaching license in Pennsylvania for at least the next five years.

Table 8: Number and Percentage of Pennsylvania College-Bound Seniors Indicating Education as a Major (2011 to 2019)

Category	Year									Change	
	2011	2012	2013	2014	2015	2016	2017	2018	2019	#	%
Education (#)	8,900	7,649	5,976	5,259	5,020	4,415	4,469	4,763	4,744	-4,156	-46.7
Education (%)	10	9	7	6	6	6	6	6	6	-4	-40.0
Respondents	89,000	84,989	85,371	87,650	83,667	73,583	74,483	79,383	83,137	-5,863	-6.6
Test-Takers	105,907	104,220	101,368	99,460	96,826	92,569	89,218	96,740	95,794	-10,113	-9.5

Data Source: The College Board's "College-Bound Seniors" reports for 2011 through 2019

As Fuller and Pendola (2020) note, there is no research consensus on why there have been substantial declines across a majority of states. Theories as to the cause include declining wage competitiveness relative to competing occupations such as nursing, increasing costs of higher education, and verbal attacks on the teaching profession over the last 15 years.

Regardless of the cause, the supply of teachers has declined dramatically in Pennsylvania over recent years. This decline, coupled with the on-going demand for teachers due to annual attrition, has substantially shrank the pool of teachers from which districts can fill vacant positions. Indeed, in their recent analysis for the Center for Rural Pennsylvania, Fuller and Pendola (2020) conclude that a decline in the production of teachers in the Commonwealth has likely negatively impacted the ability of school districts to recruit high-quality individuals for vacant positions. Moreover, a disproportionate number of the vacancies are in the poorest districts and districts serving high proportions of economically disadvantaged students.

The Balance of Supply and Demand for Teachers in Pennsylvania

When there is a decline in the number of newly licensed teachers to hire without a concomitant decline in the demand for teachers, districts must choose from one of five options: (1) hire from the reserve pool[8] of teachers; (2) attempt to recruit teachers from out-of-state; (3) hire under-qualified individuals to fill vacancies, or (4) choose to increase class sizes rather than hire a new teacher. Of these options, recruiting teachers from the reserve pool can be more difficult for districts because such individuals are more likely to have roots in a particular community and, thus, less likely to move for an available position.

One of the more accurate strategies to estimate a shortage of teachers is to compare the number of individuals who obtained their initial teaching license in the prior three years who were not employed in a Pennsylvania public school but still residing in the Commonwealth. Unfortunately, PDE cannot provide such a data file because of legislative restrictions on what information can be collected and provided to the public and PDE's inability to track where an individual resides. Given this data limitation, the primary estimate of supply versus demand is a comparison of the number of newly licensed teachers by subject area to the number of beginning teachers hired by subject area. This is designated as the supply-demand ratio.

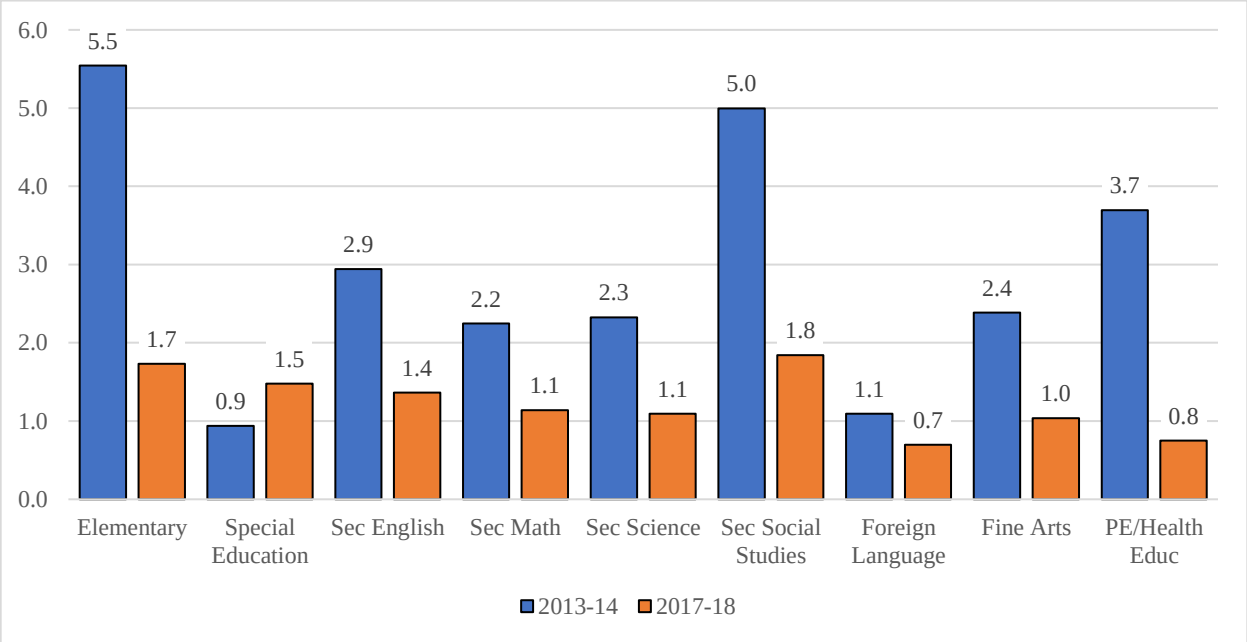
[8] The reserve pool is defined as those individuals holding a Pennsylvania teaching license but were not employed in a Pennsylvania public school district in the prior year.

Comparison of Newly Licensed Teachers to Number of Beginning Teachers Hired

As shown below in Figure 4, the overall supply-demand ratio of the number of new Instructional I licenses to the number of beginning teachers hired has substantially declined from the 2013-14 to 2017-18 academic years for all major subject areas with the exception of special education. By 2017-18, all of the supply-demand ratios were lower than two Instructional I licenses per one beginning teacher. The greatest supply-demand ratio decline was for elementary teachers—from a ratio of 5.5 to 1.0 in 2013-14 to a ratio of 1.7 to 1.0 in 2017-18.

More specifically, the supply-demand ratio declined to 1.1 licenses per one beginning teacher or lower for five of the nine major subject areas: secondary mathematics, secondary science, foreign language, fine arts, and physical/health education. This strongly suggests the available pool of individuals for districts to hire has dwindled in a rather dramatic fashion.

Figure 4: Ratio of Number of In-State New Instructional I Certificates
To the Number of Beginning Teachers Hired by Major Subject Area (2013-14 and 2017-18)



Data Source: PDE Aggregate Licensure files and Educator Employment Files; Analysis by Fuller and Pendola (2020)

Use of Emergency Permits

As noted above, one of the five options available to districts to meet the demand for teachers is to hire individuals with less than desired qualifications such as those on emergency permits. Emergency permits are used when districts cannot find an appropriately licensed teacher to fill a particular teaching position. This sometimes happens when a teacher gets sick or moves during the middle of the year. In such cases, districts might hire a long-term substitute. In other cases, districts simply cannot find a person willing to teach a particular subject who possesses the appropriate Pennsylvania license. Thus, the number and percentage of teachers on an emergency permit is a good indication of the difficulty districts are having in hiring appropriately qualified

teachers. Table 9 below shows the number of emergency permits by type of emergency permit from 2013 through 2019. Most relevant to the shortage of well-qualified teachers are type 1 (Vacant positions with educational obligation to pursue certification) and type 3 (Long-erm substitute teachers). In both cases, these permits reflect situations in which children are taught by individuals without appropriate certification. From 2013 to 2019, there was a 211% increase in the use of type 1 emergency certificates and nearly a 319% increase in the use of type 3 emergency permits. This strongly suggests districts must increasingly rely on teachers without appropriate certification to instruct children. Further, the 113% increase in the reliance of day-to-day substitute teachers suggests a lack of district internal capacities to manage teacher absences and a shrinking pool of individuals will to be employed as a substitute teacher. There is no reason to believe that teacher absences would increase (or decrease) substantially from one year to the next absent a policy change or a widespread disease such as Covid-19.

Table 9: Number of Emergency Permits in Pennsylvania Public Schools
by Type of Permit and Year (2013-2019)

Type of Emergency Certificate	Spring of Academic Year							Change: 13 to 19	
	2013	2014	2015	2016	2017	2018	2019	N	%
Type 01. Vacant Position w/ Educ Obligation to Pursue Certification	700	641	755	962	1,111	1,568	2,178	1,478	211.1
Type 02. Act 97 Waiver	3	1	1	3	3	5	7	4	133.3
Type 04. Long-Term Substitute/ No Educ Obligation	514	524	622	1,009	1,861	2,215	2,152	1,638	318.7
Type 06. Day-to-Day Substitute	8,036	7,623	7,570	12,358	15,223	15,798	17,172	9,136	113.7
Type 08. Cultural Exchange	16	23	14	25	18	10	3	-13	-81.3
Total	9,269	8,812	8,962	14,357	18,216	19,596	21,512	12,243	132.1

Data includes all educators employed in professional positions

Data Source: PDE Act 82 Report of 2018

Emergency permits are not distributed equally across subject areas. Indeed, as shown in Table 10, the number of Type 1 and Type 4 emergency permits and the change in the use of emergency permits varied by subject area. The greatest number of permits as well as the greatest increase in the use of permits was for elementary teachers. This may reflect change in licensure requirements for elementary teachers from PK-6 licensure to PK-4 and Grades 4 -8 licensure. However, at least some of the change indicates increasing difficulty in finding any properly licensed teachers to fill positions. Across all other subject areas, the increases were all greater than 200% with the exception of foreign language with an increase of 198%. English, Social Studies, and Fine Arts all experienced increases of at least 500%. Importantly, the increase for special education was 222% while the increase for English Language Learner students was

430%--indicating some of the most vulnerable students are increasingly likely to be taught by a teacher without the appropriate license.[9]

Table 10: Number of Teachers on Type1 and Type 4 Emergency Permits
by Academic Year and Subject Area (2011-12 to 2017-18)

Subject	Academic Year							CHG: 11-12 to 17-18	
Area	11-12	12-13	13-14	14-15	15-16	16-17	17-18	N	%
Elementary	70	69	105	186	337	742	1033	963	1,375.7
English Language Arts	30	40	48	43	106	141	187	157	523.3
Mathematics	39	53	44	73	87	133	165	126	323.1
Science	55	84	57	80	111	131	187	132	240.0
Social Studies	13	26	17	24	40	37	84	71	546.2
Health/Physical Education	11	15	8	12	15	45	64	53	481.8
Fine Arts	12	23	29	33	37	66	89	77	641.7
Foreign Language	45	61	75	77	108	128	134	89	197.8
Computer Science	1	2	8	2	1	4	6	na	na
Special Education	268	321	319	329	479	697	864	596	222.4
ELL	27	23	33	43	59	110	143	116	429.6

Data includes on teachers employed in positions that fall within the subject areas listed above.
Data Source: PDE Act 82 Report of 2018 as presented in Fuller & Pendola, 2020.

Thus, to reiterate, as the number of teachers has decreased across the state from 2011-12 to 2017-18, the number of teachers on emergency permits has increased dramatically. This is a very strong indication that districts are increasingly having difficulty in hiring appropriately qualified individuals to fill vacant teaching positions

Shortage Designations from Pennsylvania Department of Education

The US Department of Education requires all state education agencies to identify educator shortage areas and submit this information to the US Department of Education each year. Table 11 includes the designations provided by PDE for the most recent eight academic years. As shown in the table, the number of designations has increased over time. This evidence suggests the shortage of teachers has become more acute over the past eight years, thus reflecting the difficulty districts face in finding appropriately qualified individuals to fill vacancies.

[9] Data on emergency permits by subject area provided in PDE's Act 82 Report of 2018 for the 2018-19 academic year is incorrect. The total of emergency permits is less than 25% of the total number of emergency permits on the prior page. Thus, I did not include the information since it was clearly inaccurate.

Table 11: Statewide Teacher Shortages Areas as Designated
by the Pennsylvania Department of Education (2013-14 to 2020-21)

Area	Subject	Grades	Spring of Academic Year							
			2014	2015	2016*	2017	2018	2019	2020	2021
Core Subjects	Elem Educ	P-8				X	X	X	X	X
Core Subjects	Elem Educ	4-8				X	X	X	X	X
Language Arts	English	7-12				X	X	X	X	X
Language Arts	Reading & Literacy	P-12						X	X	X
Language Arts	Communications	7-12								X
Mathematics	-	7-12				X	X	X	X	X
Science	General	7-12					X	X	X	
Science	Life Sciences	7-12				X				X
Science	Physical Science	7-12				X				
Science	Chemistry	7-12		X						
World Languages		P-12					X	X	X	X
Art & Music Education		P-12					X	X	X	X
English as a Second Language		P-12		X		X	X	X	X	X
Special Education	General	P-12	X	X		X	X	X	X	X
Special Education	Hearing Impaired	P-12	X	X		X	X	X	X	X
Special Education	Visually Impaired	P-12	X	X		X	X	X	X	X
Special Education	Language & Speech	P-12	X	X		X	X	X	X	X
Career & Technical Education		7-12	X	X		X	X	X	X	X

Data Source: https://tsa.ed.gov/#/reports *No data was submitted to USDoE in 2015-16

Summary

As shown above, the production of teachers has declined dramatically in Pennsylvania over the last decade—to a much greater extent than most states across the nation. This decline in production has led to shortages of teachers across the state and forced districts to increasingly rely on teachers on emergency permits rather than appropriately certified teachers. Moreover, the shortage of teachers has expanded into areas outside of the typical shortage areas of mathematics, science, special education, and English Language Learner instruction. District and school administrators, in fact, report great difficulty in recruiting appropriately qualified teachers (Fuller & Pendola, 2020). In short, the Commonwealth of Pennsylvania has failed to create a system that provides an adequate supply of appropriately licensed teachers to ensure all children have access to a teacher with the appropriate training to teach the subject area to which they are assigned and the situation is getting worse. As shown throughout the remainder of this report, this statewide shortage of teachers is felt most acutely by the poorest districts and those serving the greatest percentages of economically disadvantaged students. These are the very districts in which children are most in need of being taught by a well-qualified teacher.

The Importance of Teacher Quality and Accepted Measures of Teacher Quality

There is widespread consensus among the education research community that teacher quality is the one of the most important *school* factors that influence student cognitive and non-cognitive outcomes (Podolsky, Kini, & Darling-Hammond, 2019). Indeed, evidence suggests children assigned to high value-added teachers enjoy greater earnings when they are adults (Chetty, Friedman & Rockoff, 2011).

With respect to the observable characteristics of teachers, there is evidence that teacher experience and possession of a certificate appropriate to the grade level and subject area to which a teacher is assigned are associated with teacher effectiveness in improving student cognitive and non-cognitive outcomes. There is also a growing consensus within the research community that teacher turnover negatively affects school effectiveness through a decline in the instructional capacity of schools. I briefly review these three areas below.

Teacher experience

There is widespread consensus within the research community that teaching experience is the teacher characteristic most strongly indicative of teacher effectiveness in improving student cognitive and non-cognitive outcomes. (Podolsky, et al., 2019). Indeed, this finding has widespread acceptance based on research using a wide array of data sources and methodologies over the past 30 years (Clotfelter, Ladd, & Vigdor, 2010; Hanushek, Kain, & Rivkin, 2005; Jacob, 2007; Ladd & Sorensen, 2017; Papay & Kraft, 2015; Podolsky, et al., 2019; Staiger & Rockoff, 2010). The general consensus is that, all other factors held equal, "Teachers with less experience in the classroom are on average much less effective at improving student outcomes than their more experienced counterparts" (Ladd & Sorenson, 2017).

In addition, teacher experience also influences student outcomes through peer assistance of beginning teachers. Indeed, recent research has found that beginning teachers surrounded by experienced peers can build their instructional capacity more quickly. Similarly, beginning teachers with more effective and experienced principals can also more rapidly develop their effectiveness because of the quality of instructional support provided.

Teachers Assigned In-Field

The preponderance of the available research evidence suggests appropriately certified teachers, when defined as holding the appropriate state certification for both the grade level and subject area to which a teacher is assigned, are associated with greater student achievement. For example, a teacher with a license to teach secondary English Language Arts would be considered in-field if teaching a middle or high school English Language Arts class. However, such a person would not be considered in-field if assigned to either an elementary classroom or, for example, a social studies class in a middle or high school.

For example, in their study of all North Carolina elementary school students in grades 3, 4, and 5 for the 1995 through 2004 academic years, Clotfelter and colleagues (Clotfelter, Ladd, & Vigdor,

2007) found that, " . . . a teacher's experience, test scores and regular licensure all have positive effects on student achievement, with larger effects for math than for reading" (p. 1).

The same team of researchers (Clotfelter, et al., 2010) examined four cohorts of 10th grade students taking the state's End of Course examinations in the 1999-2000 through 2003-04 academic years to analyze the relationship between teacher credentials and student achievement on the tests. They concluded, " . . . being taught by a teacher who is certified in the subject she is teaching or in a related subject area leads to higher test scores, and that the effects are large relative to those for the other teacher credentials" (p. 671). Similarly, Lubienski, Lubienski, & Crane (2008) examined the relationship between student scores on the National Assessment of Educational Progress in both 4th and 8th grade for 270,000 students and found that teacher certification, "was a significant, positive predictor of (mathematics) achievement at both grades 4 and 8" (p. 126).

Thus, when students are taught by teachers without the appropriate certification/license, then student outcomes tend to suffer. This would include teachers on emergency permits who either do not have the appropriate certificate or who are a long-term substitute teacher.

Teacher Turnover

The preponderance of evidence suggests that teacher turnover has negative effects on the organizational efficiency and efficacy of a school as well as on student outcomes. Indeed, a number of studies from the past decade reach the conclusion that teacher turnover—regardless of the quality of the teacher lost to the school-has negative impacts on student outcomes. For example, research by Ronfeldt, Loeb, and Wyckoff (2013) indicates that high turnover rates have a negative effect on student achievement disruptive beyond what would be expected on the basis of replacing experienced with inexperienced teachers alone. Turnover during the school year has a particularly strong negative effect which underscores why students being taught by long-term substitute teachers is an indicator of a lack of access to well-qualified teachers.

Educator Quality and the Distribution of Educator Quality in Pennsylvania

In this section, I review the state of teacher quality for the entire Commonwealth and then examine differences across districts of different types, of varying levels of wealth and district percentage of economically disadvantage students. I begin with teacher experience followed by teachers employed on emergency permits. I conclude this section with teacher attrition.

Teacher Experience

In the following sub-sections, I examine teacher experience for the Commonwealth, district type. districts by wealth, districts by the percentages of economically disadvantaged students enrolled in the district, and Focus Districts.

Commonwealth

As shown in Table 12, there was a small decline in the percentage of beginning teachers across the state, essentially no change in the percentage of novice teachers across the state and a decline of 1.4 percentage points in the percentage of inexperienced teachers. These three trends reveal a general decline of teachers with 5 or fewer years of experience which would suggest an improvement in overall teacher quality and effectiveness. However, since PDE did not provide the educator employment file for the 2018-19 school year, the 2018 data is a little more prone to error and more caution is warranted in interpreting the results for that year.

Table 12: Three Year Rolling Average of Teacher Experience for Pennsylvania School Districts

Measure of	Spring of Academic Year				Change: 15 to 18	
Experience	2015	2016	2017	2018	N	%
Beginning	3.2	3.1	3.1	2.9	-0.3	-9.5
Novice	10.5	10.7	10.9	10.7	0.2	1.9
Inexperienced	19.3	18.5	18.4	18.7	-0.6	-3.3

Data Source: PDE educator enrollment files

District Type

As shown in Table 13, the percentage of beginning teachers in Pennsylvania has remained fairly steady or declined for the four types of districts since 2015. The greatest decline was for charter schools. This decline is likely explained by newly opened charter schools remaining open and their teachers slowly gaining additional experience.

Table 13: Three Year Rolling Average of Percentage of Beginning Teachers by District Type

District	Spring of Academic Year				Change: 15 to 18	
Type	2015	2016	2017	2018	N	%
Career & Tech Ctrs	4.4	4.3	4.3	4.2	-0.2	-5.3
Charter Schools	11.2	9.6	9.3	8.8	-2.3	-20.9
Intermediate Units	4.2	3.9	3.7	3.8	-0.4	-10.2
School Districts	2.6	2.6	2.6	2.4	-0.2	-7.8
Total	3.2	3.1	3.1	2.9	-0.3	-9.5

Data Source: PDE educator enrollment files and district type files

As shown in Table 14, the percentage of novice teachers increased for all district types except for charter schools. The percentage increased very slightly for school districts, declined substantially for charter schools, and increased somewhat for CTCs and Intermediate Units.

Table 14: Three Year Rolling Average of the Percentage of Novice Teachers by District Type

District	Spring of Academic Year				Change: 15 to 18	
Type	2015	2016	2017	2018	N	%
Career & Tech Ctrs	13.6	14.3	14.8	14.8	1.2	8.8
Charter Schools	35.0	32.7	30.4	29.0	-6.0	-17.2
Intermediate Units	13.6	13.9	14.1	14.5	0.9	6.6
School Districts	8.7	9.0	9.3	9.2	0.5	5.8
Total	10.5	10.7	10.9	10.7	0.2	1.9

Data Source: PDE educator enrollment files and district type files

As shown in Table 15, the percentage of inexperienced teachers—those with five or fewer years of experience--declined marginally for school districts, declined for charter schools, and increased somewhat for CTCs and IUs.

Table 15: Three Year Rolling Average of the Percentage of Inexperienced Teachers by District Type

District	Spring of Academic Year				Change: 15 to 18	
Type	2015	2016	2017	2018	N	%
Career & Tech Ctrs	22.3	22.7	23.3	24.2	1.9	8.5
Charter Schools	52.6	51.2	49.1	47.5	-5.1	-9.8
Intermediate Units	23.4	23.1	23.6	24.8	1.4	5.8
School Districts	16.8	15.9	15.9	16.2	-0.6	-3.4
Total	19.3	18.5	18.4	18.7	-0.6	-3.3

Data Source: PDE educator enrollment files and district type files

Overall, the above data suggests teacher experience—and, therefore, teacher quality--has increased marginally across all district types and increased the most for charter schools. As a practical matter, this is likely the result of fewer young teachers entering the system, which will have serious, deleterious long-term effects for the Commonwealth.

District Wealth

As shown in Table 16, there was a slightly greater percentage of beginning teachers employed in the poorest districts in comparison to the wealthiest districts and the gap has grown larger over time. While the differences are relatively small, the odds of having a beginning teacher are greater for students in the poorest districts than in the wealthiest districts each and every year, thus there is a cumulative effect on student learning of having been taught by ore than one beginning teacher.

Table 16: Three Year Rolling Average of the Percentage of Beginning Teachers Employed by District Wealth and Year

Wealth Quintile	Spring of Academic Year				Change: 15 to 18	
of Districts	2015	2016	2017	2018	N	%
Wealthiest Quintile	2.2	2.2	2.0	1.9	-0.3	-15.2
Quintile 2	2.5	2.4	2.2	2.1	-0.4	-17.3
Quintile 3	2.3	2.4	2.2	2.0	-0.3	-13.0
Quintile 4	2.9	2.8	2.5	2.4	-0.5	-17.4
Poorest Quintile	3.1	3.5	4.3	3.7	0.6	19.4
Wealthiest-Poorest	-0.9	-1.3	-2.3	-1.9	-0.9	100.0

Data Source: PDE data files on employment and district characteristics

As shown in Table 17, the percentage of novice teachers (years of experience is three or fewer) employed in the poorest districts was greater than in the wealthiest districts for all Moreover, the gap between the poorest and wealthiest districts increased over time such that the last gap was about 5 percentage points. On average, about 11% of teachers in the poorest districts were novice teachers compared to just under 8% in the wealthiest districts. Thus, children in the poorest districts are more likely to be taught by novice teachers than children in the wealthiest districts.

Table 17: Three Year Rolling Average of the Percentage of Novice Teachers Employed by District Wealth and Year

Wealth Quintile	Spring of Academic Year				Change: 15 to 18	
of Districts	2015	2016	2017	2018	N	%
Wealthiest Quintile	7.7	8.1	8.0	7.8	0.0	0.4
Quintile 2	8.9	9.0	8.8	8.5	-0.4	-4.9
Quintile 3	8.0	8.3	8.4	8.2	0.2	2.9
Quintile 4	9.7	9.9	9.8	9.2	-0.5	-5.1
Poorest Quintile	9.0	9.8	12.0	12.9	3.9	43.2
Wealthiest - Poorest	-1.3	-1.7	-4.0	-5.2	-3.9	310.5

Data Source: PDE data files on employment and district characteristics

Table 18 displays the percentage of teachers with between one and five years of experience by district wealth and reveals a greater percentage of “inexperienced” teachers were employed in the poorest districts as compared to the wealthiest districts. For the poorest districts, between 17 and nearly 20% of teachers were had five or fewer years of experience while only about 14.5% of teachers in the wealthiest districts had five or fewer years of experience.

Table 18: Percentage of Teachers with Between One and Five Years of Experience by District Wealth and Year

Wealth Quintile of Districts	Spring of Academic Year				Change: 15 to 18	
	2015	2016	2017	2018	N	%
Wealthiest Quintile	14.7	14.4	14.4	14.7	0.0	0.0
Quintile 2	16.9	16.3	16.1	16.0	-0.8	-4.9
Quintile 3	15.8	14.9	14.7	14.9	-0.9	-5.5
Quintile 4	17.9	17.1	16.8	16.6	-1.4	-7.6
Poorest Quintile	19.1	17.3	17.9	19.6	0.4	2.3
Wealthiest - Poorest	-4.4	-2.8	-3.5	-4.9	-0.5	10.6

Data Source: PDE data files on employment and district characteristics

The above tables suggest teacher quality, as measured by teacher experience, is lower in the poorest districts and greater than in the wealthiest districts. Importantly, these are annual rates. Thus, students in schools located in poor districts are more likely to be taught by one or more beginning, novice, or inexperienced teachers and research makes abundantly clear this is likely to have a cumulative negative effective on the academic outcomes of such students.

Districts by Percentage of Economically Disadvantaged Students Enrolled

When all district type are included in the analysis, we see a similar pattern as above, albeit the disparities are even greater. These analyses do not include the 2017-18 academic year because my approach to identifying the correct teacher experience requires a "following" or "trail year" to determine the accurate number of years of experience. As shown in Table 19, the average percentage of beginning teachers employed in Quintile 5 districts was between 4.7% (2016) and 5.8% (2018) while the percentage for Quintile 1 districts was between 2.4% (2016) and 2.0% (2018). Thus, the percentage of beginning teachers in Quintile 5 districts was more than twice the percentage for Quintile 1 districts. Moreover, the gap between Quintile 5 and Quintile 1 districts grew over time.

Table 19: Three Year Rolling Average of the Percentage of Beginning Teachers Employed by the Percentage of Economically Disadvantaged Students Enrolled in the District and Year

District % of Econ Disadv Students	Academic Years in Average			CHG: Avg 3 – Avg 1	
	2012-13 thru 2014-15	2013-14 thru 2015-16	2014-15 thru 2016-17	N	%
Quintile 1	2.4	2.2	2.0	-0.4	-16.8
Quintile 2	2.4	2.2	2.1	-0.3	-12.2
Quintile 3	2.8	2.7	2.5	-0.3	-10.7
Quintile 4	3.3	3.3	2.9	-0.4	-13.0
Quintile 5	4.7	4.9	5.8	1.1	22.6
Q5 - Q1	**2.4**	**2.7**	**3.8**	**1.5**	**62.5**

Data Source: PDE data files on employment and district characteristics

As shown in Table 20, there was a greater percentage of novice teachers employed in Quintile 5 districts than in Quintile 1 districts for each of the three rolling averages. For Quintile 5 districts, the percentage of teachers with 3 or fewer years of experience was between 14.4% (2016) and 16.6% (2018). In comparison, the percentages for Quintile 1 districts were between 8.5% (2016) and 8.2% (2018). Thus, the percentage for Quintile 5 districts was about twice the percentage for Quintile 1 districts. Further, as with the trend for beginning teachers, the gap between Quintile 5 and Quintile 1 districts grew over time.

Table 20: Three Year Rolling Average of the Percentage of Novice Teachers Employed by the Percentage of Economically Disadvantaged Students Enrolled in the District and Year

District % of Econ Disadv Students	Academic Years in Average			CHG: Avg 3 – Avg 1	
	2012-13 thru 2014-15	2013-14 thru 2015-16	2014-15 thru 2016-17	N	%
Quintile 1	8.5	8.5	8.2	-0.3	-3.7
Quintile 2	9.0	9.1	8.7	-0.3	-3.1
Quintile 3	9.0	9.2	9.4	0.4	4.3
Quintile 4	11.0	11.3	11.2	0.2	2.0
Quintile 5	14.4	15.0	16.6	2.2	15.6
Q5 - Q1	**5.8**	**6.5**	**8.4**	**2.6**	**43.7**

Data Source: PDE data files on employment and district characteristics

As shown in Table 21, there was a greater percentage of inexperienced teachers employed in Quintile 5 districts than in Quintile 1 districts. The average for Quintile 5 districts was about 25% while the average for Quintile 1 districts was about 15.5%. Thus, one out of every four teachers in Quintile 5 districts had five or fewer years of teaching experience. Overall, the percentage of inexperienced teachers for Quintile 5 districts was about 10 percentage points greater percentage for Quintile 1 districts.

Table 21: Three Year Rolling Average of the Percentage of "Inexperienced" Teachers by the Percentage of Economically Disadvantaged Students Enrolled in the District and Year

District % of Econ Disadv Students	Academic Years in Average			CHG: Avg 3 – Avg 1	
	2012-13 thru 2014-15	2013-14 thru 2015-16	2012-13 thru 2014-15	N	%
Quintile 1	16.3	15.7	15.4	-0.9	-5.8
Quintile 2	16.9	16.3	15.8	-1.1	-6.7
Quintile 3	16.8	15.9	16.2	-0.6	-3.5
Quintile 4	19.8	19.2	18.7	-1.1	-5.7
Quintile 5	26.0	24.9	25.3	-0.7	-2.8
Q5 - Q1	**9.7**	**9.2**	**9.9**	**0.2**	**2.2**

Data Source: PDE data files on employment and district characteristics

Focus District Comparisons

In this section, I present and review the data on teacher experience for the six plaintiff districts and the School District of Philadelphia, where one petitioner sends her children. I organize the data by comparison approach and refer to these districts as Focus Districts.

As shown in Table 22, five of the seven Focus Districts had greater percentages of beginning, novice, and inexperienced teachers than all of the districts in the wealthiest quintile of districts in the CBSA and across the state. The two exceptions were the Wilkes-Barre Area School District and Philadelphia City School District, both of which had essentially the same percentages of beginning, novice, and inexperienced teachers as districts in comparison districts within the CBSA. Wilkes-Barre SD had lower percentages of beginning, novice, and inexperienced than the wealthiest quintile across the state while Philadelphia City SD had slightly greater percentages of beginning, novice, and inexperienced teachers than districts in the state's wealthiest quintile.

The greatest disparities by far were for the William Penn School District which had substantially greater percentages of beginning, novice, and inexperienced teachers than comparison districts

Table 22: Teacher Experience for Focus and Comparison Districts (CBSA and Wealth Quintile)

Focus District & Comparison District	Teacher Experience		
	Beginning	Novice	Inexperienced
Panther Valley	3.5	12.3	18.5
Wealthiest Quintile in CBSA	2.4	7.8	13.7
Wealthiest Quintile in State	2.0	8.2	15.4
PV - Wealthiest Quintile in CBSA	**1.1**	**4.5**	**4.8**
PV - Wealthiest Quintile in State	**1.5**	**4.1**	**3.1**
Greater Johnstown	2.6	9.7	17.5
Wealthiest Quintile in CBSA	2.1	7.6	14.1
Wealthiest Quintile in State	2.0	8.2	15.4
GJ - Wealthiest Quintile in CBSA	**0.5**	**2.1**	**3.4**
GJ - Wealthiest Quintile in State	**0.6**	**1.5**	**2.1**
Lancaster	5.3	14.7	23.5
Wealthiest Quintile in CBSA	2.5	10.8	19.9
Wealthiest Quintile in State	2.0	8.2	15.4
L - Wealthiest Quintile in CBSA	**2.8**	**3.9**	**3.6**
L - Wealthiest Quintile in State	**3.3**	**6.5**	**8.1**
William Penn	5.2	16.2	26.9
Wealthiest Quintile in CBSA	1.8	7.2	14.4
Wealthiest Quintile in State	2.0	8.2	15.4
WP - Wealthiest Quintile in CBSA	**3.4**	**9.0**	**12.5**
WP - Wealthiest Quintile in State	**3.2**	**8.0**	**11.5**
Shenandoah Valley	4.4	10.8	18.6
Wealthiest Quintile in CBSA	2.0	6.4	12.0
Wealthiest Quintile in State	2.0	8.2	15.4
SV - Wealthiest Quintile in CBSA	**2.4**	**4.4**	**6.6**
SV - Wealthiest Quintile in State	**2.4**	**2.6**	**3.2**
Wilkes-Barre Area	0.6	4.0	11.1
Wealthiest Quintile in CBSA	1.0	4.7	11.2
Wealthiest Quintile in State	2.0	8.2	15.4
WBA - Wealthiest Quintile in CBSA	**-0.4**	**-0.7**	**-0.1**
WBA - Wealthiest Quintile in State	**-1.4**	**-4.2**	**-4.3**
Philadelphia	2.0	8.8	16.6
Wealthiest Quintile in CBSA	1.8	7.2	14.4
Wealthiest Quintile in State	2.0	8.2	15.4
P - Wealthiest Quintile in CBSA	**0.2**	**1.6**	**2.2**
P - Wealthiest Quintile in State	**0.0**	**0.6**	**1.2**

Data Source: PDE data files on employment and district characteristics

Teachers Assigned In-Field

PDE makes available the total number of emergency permits used y each district for each academic year used in each of seven academic years (2011-12 through 2018-19). Ideally, I would restrict the use of emergency permits to only those used for long-term positions rather than those for daily absences of instructional personnel. However, even the use of short-term substitutes

indicates an important issue for student learning given that teacher absences tend to have a negative effect on student learning (Miller, Murnane, & Willett, 2008).

Commonwealth

Table 23 below shows the number of emergency permits by type of emergency permit from 2013 through 2019. Most relevant to the shortage of well-qualified teachers are type 1 (Vacant positions with educational obligation to pursue certification) and type 3 (Long-erm substitute teachers). In both cases, these permits reflect situations in which children are taught by individuals without appropriate certification. From 2013 to 2019, there was a 211% increase in the use of type 1 emergency certificates and nearly a 319% increase in the use of type 3 emergency permits. This strongly suggests districts must increasingly rely on teachers without appropriate certification to instruct children.

Table 23: Number of Emergency Permits in Pennsylvania Public Schools by Type of Permit and Year (2013-2019)

Type of Emergency	Spring of Academic Year							Change: 13 to 19	
Certificate	2013	2014	2015	2016	2017	2018	2019	N	%
Type 01. Vacant Position w/ Educ Obligation to Pursue Certification	700	641	755	962	1,111	1,568	2,178	1,478	211.1
Type 02. Act 97 Waiver	3	1	1	3	3	5	7	4	133.3
Type 04. Long-Term Substitute/ No Educ Obligation	514	524	622	1,009	1,861	2,215	2,152	1,638	318.7
Type 06. Day-to-Day Substitute	8,036	7,623	7,570	12,358	15,223	15,798	17,172	9,136	113.7
Type 08. Cultural Exchange	16	23	14	25	18	10	3	-13	-81.3
Total	9,269	8,812	8,962	14,357	18,216	19,596	21,512	12,243	132.1

Data Source: PDE Act 82 Report of 2018

If we assume that 20 students are enrolled in a classroom, the more than 4,300 Type 1 and Type 4 permits affect 86,000 students. If we assume 25 students are in the average class, the number of students affected increases to more than 100,000 students. As shown below, a disproportionate percentage of potentially affected students are economically disadvantaged.

District Type

For references, Table 24 presents the number of teacher FTEs by district type. As reviewed previously, the number of teacher FTEs decreased for Career and Technical Centers, Intermediate Units, and school districts while the number of teacher FTEs increased in charter schools.

Table 24: Number of Emergency Permits in Pennsylvania Public Schools
by Type of Permit and Year (2013-2019)

District Type	Spring of Academic Year						Change: 12-13 to 17-18	
	2012-13	2013-14	2014-15	2014-16	2016-17	2017-18	N	%
Career & Technical Ctr	2,033.0	2,012.5	2,030.5	2,004.7	2,016.5	2,014.8	-18	-0.9
Charter School	6,893.4	7,318.4	7,616.1	7,615.7	7,829.5	8,270.6	1,377	20.0
Intermediate Unit	4,381.2	4,340.5	4,209.9	4,082.3	4,032.9	4,018.2	-363	-8.3
School District	109,736.3	107,591.3	108,106.9	107,121.7	108,612.6	107,551.8	-2,184	-2.0
Total	123,105.9	121,324.0	122,023.6	120,878.6	122,551.9	121,917.7	-1,188	-1.0

Data Source: PDE data files on teacher employment

As shown in Table 25, the number of emergency permits increased substantially for all district types from 2013 to 2018. There were particularly large percentage increases for charter schools (360%) and school districts (134%). In raw numbers of emergency permits, the greatest increase was for school districts which experienced an increase of more than 6.700 emergency permits.

Table 25: Number of Emergency Permits in Pennsylvania
by Type of District and Year (2013-2019)

District Type	Academic Year						Change: 12-3 to 17-18	
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Career & Technical Ctr	343	261	287	344	348	490	147	42.9
Charter School	187	229	301	364	764	860	673	359.9
Intermediate Unit	4,177	3,732	3,534	5,772	6,462	6,831	2,654	63.5
School District	4,345	4,349	4,610	4,941	10,287	11,050	6,705	154.3
Total	9,052	8,571	8,732	11,421	17,861	19,231	10,179	112.5

Data Source: PDE data files on district characteristics and Act 82 Report of 2018

As shown in Table 26, the ratio of teacher FTEs to emergency permits decreased for all four district types. Charter schools experienced a 74% decrease in the ratio and school districts experienced a 62% decrease. These decreases indicate that all types of school districts have had to increasingly rely on emergency permits.

Table 26: Ratio of Teacher FTEs to Number of
Long-Term Emergency Permits by District Wealth and Year

District	Spring of Academic Year						Change: 12-13 to 17-18	
Type	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Career & Technical Ctr	5.93	7.71	7.08	5.83	5.79	4.11	-1.8	-30.6
Charter School	36.86	31.96	25.30	20.92	10.25	9.62	-27.2	-73.9
Intermediate Unit	1.05	1.16	1.19	0.71	0.62	0.59	-0.5	-43.9
School District	25.26	24.74	23.45	21.68	10.56	9.73	-15.5	-61.5
Total	13.60	14.16	13.97	10.58	6.86	6.34	-7.3	-53.4

Data Source: PDE data files on district characteristics and Act 82 Report of 2018

District Wealth

For reference purposes, I include the number of teacher FTEs by district wealth from 2013 to 2018 in Table 27. These counts are necessary to properly interpret the use of emergency permits. Note there has been on overall decrease in the number of teacher FTEs in the Commonwealth as well as decreases for the Quintile 3, Quintile 4, and the Poorest Quintile.

Table 27: Number of Teacher FTEs by District Wealth and Year

District	Academic Year						Change: 12-13 to 17-18	
Wealth	2012-13	2013-14	2014-5	2015-16	2016-17	2017-18	N	%
Wealthiest	23,585.8	23,130.8	23,646.7	23,722.5	24,016.8	23,997.8	412	1.7%
Quintile 2	22,787.1	22,764.0	22,800.6	22,900.2	22,907.8	22,960.4	173	0.8%
Quintile 3	22,630.2	22,367.7	22,272.9	22,199.6	22,179.8	22,092.8	-537	-2.4%
Quintile 4	21,902.7	21,721.8	21,703.5	21,544.2	21,405.4	21,159.4	-743	-3.4%
Poorest	18,830.5	17,607.0	17,683.2	16,755.3	18,102.9	17,341.4	-1489	-7.9%
Total	109,736.3	107,591.3	108,106.9	107,121.7	108,612.6	107,551.8	-2184	-2.0%

Data Source: PDE data files on teacher employment

Table 28 displays the number of all types of emergency permits utilized by districts of differing wealth. Despite the overall decrease in the number of teacher FTEs across the Commonwealth, there has been a 154% increase in the use of emergency permits. Moreover, there have been increases in the use of emergency permits for each of the five quintiles. Despite the Poorest Quintile having a nearly 8% decrease in teacher FTEs (Table 27 above), the same districts evidence a 288% increase in the number of emergency permits. This suggests increasing difficulty in finding short-term and long-term substitute teachers as well as finding appropriately licensed teachers to fill vacant positions.

Table 28: Number of Emergency Permits by District Wealth and Year

District Wealth	Academic Year						Change: 12-13 to 17-18	
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	N	%
Wealthiest	587	675	546	589	1,366	1,469	882	150.3%
Quintile 2	532	478	700	759	1,554	1,737	1205	226.5%
Quintile 3	1,016	866	850	933	1,477	1,474	458	45.1%
Quintile 4	1,037	1,031	1,141	1,243	1,667	1,818	781	75.3%
Poorest	1,173	1,299	1,373	1,417	4,223	4,552	3379	288.1%
Total	4,345	4,349	4,610	4,941	10,287	11,050	6705	154.3%

Data Source: PDE data files on district characteristics and Act 82 Report of 2018

As shown in Table 29, the ratio of teacher FTEs to the number of emergency permits has declined substantially for districts in all five wealth quintiles—indicating a shortage of teachers affecting districts across the Commonwealth. However, the greatest decline was for districts in the Poorest Quintile. Moreover, there remains a large gap between districts in the Wealthiest Quintile and districts in the Poorest Quintile. Indeed, in 2012-13, the ratio for the wealthiest districts was 2.5 times greater than the ratio for the poorest districts. In 2017-18, the ratio for districts in the Wealthiest Quintile was 4.3 times greater than the ratio for the districts in the Poorest Quintile. Moreover, by 2017-8, the poorest districts had only four teacher FTEs for every one emergency permit—thus suggesting the widespread use of such permits in the poorest districts in the Commonwealth.

Table 29: Ratio of Teacher FTEs to Number of
Long-Term Emergency Permits by District Wealth and Year

District Wealth	Academic Year						CHG: 12-13 to 17-18	
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	Ratio	%
Wealthiest	40.2	34.3	43.3	40.3	17.6	16.3	-24.0	-59.3
Quintile 2	42.8	47.6	32.6	30.2	14.7	13.2	-30.0	-69.1
Quintile 3	22.3	25.8	26.2	23.8	15.0	15.0	-7.0	-32.7
Quintile 4	21.1	21.1	19.0	17.3	12.8	11.6	-9.0	-44.9
Poorest	16.1	13.6	12.9	11.8	4.3	3.8	-12.0	-76.3
Wealthiest -Poorest	24.1	20.7	30.4	28.5	13.3	12.5	-11.6	-61.5

Data Source: PDE data files on district characteristics and Act 82 Report of 2018

Districts by Percentage of Economically Disadvantaged Students Enrolled

For reference purposes, I include in Table 30 the number of teacher FTEs by district percentage of economically disadvantaged students from 2012-13 to 2017-18. These counts are necessary to properly interpret the use of emergency permits. Note there has been an overall decrease in the number of teacher FTEs in the Commonwealth as well as decreases for Quintile 3, Quintile 4, and the Poorest Quintile.

Table 30: Number of Teacher FTEs by District Percentage of Economically Disadvantaged Students and Year

District % Econ	Spring of Academic Year						Change: 13 to 18	
Disadv Students	2013	2014	2015	2016	2017	2018	N	%
Quintile 1	23,585.8	23,540.8	23,646.7	23,722.5	24,016.8	23,997.8	412	1.7
Quintile 2	22,787.1	22,764.0	22,800.6	22,900.2	22,907.8	22,960.4	173	0.8
Quintile 3	22,630.2	22,367.7	22,272.9	22,199.6	22,179.8	22,092.8	-537	-2.4
Quintile 4	21,902.7	21,721.8	21,703.5	21,544.2	21,405.4	21,159.4	-743	-3.4
Quintile 5	18,830.5	17,607.0	17,683.2	16,755.3	18,102.9	17,341.4	-1,489	-7.9
Q5 - Q1	**758.0**	**1,012.0**	**1,133.0**	**1,038.0**	**3,452.0**	**3,997.0**	**3,239**	**427.3**

Data Source: PDE data files on teacher employment

As shown in Table 31, the number of emergency permits increased for districts in each of the five quintiles. The greatest increases were for districts in Quintile 1 and Quintile 5—826 and 4,065, respectively. These numeric increases translate into percentage increases of 178% for Quintile I districts and 333% for Quintile 5 districts. Strikingly, in 2018, 55% of all emergency permits were used by the districts in Quintile 5.

Table 31: Number of Emergency Permits by District Percentage of Economically Disadvantaged Students and Year

District % Econ	Spring of Academic Year						Change: 13 to 18	
Disadv Students	2013	2014	2015	2016	2017	2018	N	%
Quintile 1	464	503	427	462	1,145	1,290	826	178.0
Quintile 2	773	604	851	912	1,192	1,406	633	81.9
Quintile 3	1,042	829	1,047	1,086	1,784	1,781	739	70.9
Quintile 4	1,096	1,172	1,063	1,390	2,374	2,185	1,089	99.4
Quintile 5	1,222	1,515	1,560	1,500	4,597	5,287	4,065	332.7
Q5 - Q1	**-4,755.3**	**-5,933.8**	**-5,963.5**	**-6,967.2**	**-5,914.0**	**-6,656.4**	**-1,901**	**40.0**

Data Source: PDE data files on teacher employment and Act 82 Report of 2018

As shown in Table 32, the ratio of teacher FTEs to the number of emergency permits has declined substantially for districts in all five quintiles—indicating a shortage of teachers affecting districts across the Commonwealth. The decline was greatest for Quintile 5 districts—those with the greatest percentage of economically disadvantaged students. Moreover, the ratio for the highest poverty districts was substantially lower than for the Wealthiest districts, thus suggesting that the poorest districts have greater difficulty with staffing their classrooms, teacher absenteeism/sickness, and the employment of well-qualified substitute teachers. In 2018, Quintile 1 districts had nearly 18 teacher FTEs for each emergency permit used. In contrast, Quintile 5 districts had only about four teacher FTEs per emergency permit used. In other words, Quintile 5 districts utilize emergency permits to a much greater extent than Quintile 1 districts and students in Quintile 5 districts are more often taught by a teacher highly unlikely to have the appropriate certification.

Table 32: : Ratio of Teacher FTEs to Number of Long-Term Emergency Permits by District Percentage of Economically Disadvantaged Students and Year

District % Econ	Spring of Academic Year						Change: 13 to 18	
Disadv Students	2013	2014	2015	2016	2017	2018	Ratio	%
Quintile 1	50.7	47.6	55.8	51.1	20.3	18.7	-32	-63.1
Quintile 2	30.7	37.8	27.2	25.2	19.9	16.1	-15	-47.7
Quintile 3	22.8	29.0	23.0	22.4	13.4	13.7	-9	-39.6
Quintile 4	22.0	20.2	21.7	17.2	10.4	10.8	-11	-50.7
Quintile 5	18.2	14.3	14.3	13.7	4.7	4.1	-14	-77.5
Q5 - Q1	**-32.6**	**-33.3**	**-41.4**	**-37.4**	**-15.6**	**-14.6**	**18**	**-55.1**

Data Source: PDE data files on teacher employment and Act 82 Report of 2018

Teacher Attrition

In this section, I present the data on teacher attrition. I begin with a review of overall state trends, then present the data on attrition by district type, district wealth, and percent of economically disadvantaged students enrolled in the school. I conclude the section with analyses examining attrition for focus and comparison districts.

Commonwealth

As shown in Table 33, annual teacher attrition from Pennsylvania public schools ranges from 6% to 7.5%. This is one of the lowest attrition rates in the nation.

Table 33: Annual Teacher Attrition for Pennsylvania by Year

Employees Leaving Teaching	Academic Year Transitions				
	2012-2013	2013-2014	2014-2015	2016-2017	2017-2018
Number	8,191.7	8,393.2	8,089.7	6,720.0	6,827.1
Percent	7.2	7.5	7.3	6.0	6.0

Data Source: PDE data files on teacher employment

The first year in each column represents the initial year of two consecutive academic years. So, for example, 2013-14 represents the percentage of teachers who were employed in the 2012-13 year who returned to teach in the 2013-14 year.

Districts, however, not only have to replace teachers leaving teaching positions in Pennsylvania, they also have to replace those teachers transferring to other Pennsylvania public school districts. This is important because a growing body of research suggests teacher turnover has harmful effects on organizational effectiveness and student outcomes. For example, in studying elementary students in New York City, Ronfeldt, Loeb, and Wyckoff (2013) report high teacher turnover rates have negative effects on student outcomes that cannot be explained solely by the effects of teacher turnover on teacher quality. In fact, even a school replacing effective teachers with other effective teachers will have a negative effect on student outcomes. Institutional memory, whether involving information about specific students, various school

strategies/policies, families, and/or community members, is impaired by teacher turnover. Such impairments negatively impact student outcomes. Indeed, in their recent study, Sorenson and Ladd (2020) conclude teacher, " . . . turnover has marked, and lasting, negative consequences for the quality of the instructional staff and student achievement" (p. 1).

In general, research suggests charter schools, districts with relatively lower funding, and districts serving high proportions of economically disadvantaged students may have more difficulty retaining teachers than other districts (Borman & Dowling, 2008). I consider district type, district wealth, and district percentage of economically disadvantaged students in the following analyses.

District Type

As shown in Table 34, charter schools have great difficulty in retaining teachers in the same district compared to school districts or CTCs. Indeed, on average, one-quarter of teachers employed in Pennsylvania charter schools leave their district each year. The vast majority of these teachers are in brick-and-mortar charter schools rather than cyber charter schools. With respect to school districts, about 7% of teachers leave their district each year—either to leave teaching in a Pennsylvania public district or to move to another district within Pennsylvania.

Table 34: Three Year Rolling Average of Annual Teacher Turnover by District Type and Year

District Type	Spring of Academic Year			Change: 15 to 18	
	2016	2017	2018	Rate	%
School District	7.5	7.2	6.8	-0.7	-9.8
Charter School	25.2	27.2	26.5	1.3	5.2
CTCs	9.4	9.1	9.1	-0.2	-2.5
Total	8.7	8.5	8.1	-0.6	-6.9

Data Source: PDE data files on employment and district characteristics

As shown in Table 35, greater than 60% of teachers in charter schools leave their school within four years. This was substantially greater than other district types. Indeed, in contrast, only 22% of school district teachers left their district. This four year turnover rate was less than the one year turnover rate for charter schools.

Table 35: Cohort Teacher Turnover by District Type

District Type	Turnover Years			
	1 Yr	2 Yrs	3 Yrs	4 Yrs
School District	7.1	12.7	17.5	22.0
Charter School	25.5	42.3	53.7	61.4
CTCs	9.2	16.8	23.6	29.5
Total	8.5	14.9	20.4	25.1

Data Source: PDE data files on employment and district characteristics

District Wealth

A number of studies also conclude that, all other factors being equal, wealthier districts tend to have lower rates of teacher (and other educator) attrition than relatively poor districts (Borman & Dowling, 2008; Hanushek, Kain, & Rivkin, 2004). As shown in Table 36, the annual attrition of teachers in the same district was greater for the wealthiest districts than for the poorest districts for each of the five transitions across academic years for which data was available. On average, the difference in the annual attrition rate between the wealthiest districts and the poorest districts was 5.4 percentage points. Thus, on average, the teacher attrition rate for the poorest districts was at least twice the rate of the attrition rate for the wealthiest districts.

Table 36: Three Year Rolling Average of Annual Teacher Turnover Rates by District Wealth Quintiles and Year

Wealth Quintile of Districts	Spring of Academic Year			Change: 15 to 18	
	2016	2017	2018	N	%
Wealthiest Quintile	6.0	5.6	5.5	-0.5	-7.8
Quintile 2	6.2	6.1	5.9	-0.3	-4.3
Quintile 3	7.0	6.8	5.9	-1.1	-15.8
Quintile 4	7.2	7.0	6.4	-0.8	-10.7
Poorest Quintile	12.2	11.2	11.0	-1.2	-9.9
Wealthiest - Poorest	**6.2**	**5.6**	**5.5**	**-0.7**	**-11.8**

Data Source: PDE data files on employment and district characteristics
2016 refers to the average annual one year turnover rates for the 2013-14, 2014-15, and 2015-16 academic years
2017 refers to the average annual one year turnover rates for the 2014-15, 2015-16, and 2016-17 academic years
2018 refers to the average annual one year turnover rates for the 2015-16, 2016-17, and 2017-18 academic years

In the following analysis, I report on four turnover rates, each based on the number of years after the base year. The first measure, indicated by "1 Yr", is the turnover rate after one year for five cohorts of teachers—2013, 2014, 2015, 2016, and 2017. The second measure, indicated by "2 Yrs", is the district-level turnover rate two years after the base year for four cohorts of teachers--2013, 2014, 2015, and 2016. The third measure, indicated by "3 Yrs", is the district-level turnover rate three years after the base year for three cohorts of teachers--2013, 2014, and 2015. The final measure, indicated by "4 Yrs", is the district-level turnover rate four years after the base year for two cohorts of teachers—2013 and 2014.

As shown in Table 37, the gap in turnover rates between the wealthiest and poorest districts increased with each successive year after the base year. Specifically, the difference in the annual turnover rate was -5.4 percentage points for after 1 year while the difference was -10.9 percentage points after 4 years. Thus, over time, the advantage of the wealthiest districts grows over time.

Table 37: Cohort Teacher Turnover by District Wealth

Wealth Quintile of Districts	Turnover Years			
	1 Yr	2 Yrs	3 Yrs	4 Yrs
Wealthiest Quintile	5.7	10.4	14.7	18.7
Quintile 2	6.0	11.3	16.0	20.6
Quintile 3	6.6	12.0	16.2	20.6
Quintile 4	6.9	12.7	17.4	22.1
Poorest Quintile	11.1	18.5	25.0	29.5
Wealthiest - Poorest	**-5.4**	**-8.1**	**-10.3**	**-10.9**

Data Source: PDE data files on employment and district characteristics

Districts by Percentage of Economically Disadvantaged Students Enrolled

When examining retention in the same district by the percentage of economically disadvantaged enrolled in the district, I include all districts—school districts, charter schools, and CTCs. This is important because the state has created an overall education system in which a substantial number and percentage of economically disadvantaged students (and students of color) are enrolled in charter schools. Moreover, many of these charter schools are racially segregated and becoming further segregated by student race (Kotok, Frankenberg, Schafft, Mann, & Fuller, 2017).

There also exists large differences between districts serving the lowest percentages of economically disadvantaged students and districts serving the greatest percentages of economically disadvantaged students as shown in Table 38. In fact, the average annual difference is 9 percentage points and the rate in Quintile 5 districts is nearly triple the rate than in Quintile 1 districts.

Table 38: Annual Teacher Turnover by the Percentage of Economically Disadvantaged Students Enrolled in the District and Year

District % Econ Disadv Students	Spring of Academic Year				Change: 15 to 18	
	2015	2016	2017	2018	N	%
Quintile 1	5.3	5.0	4.8	4.6	-0.7	-13.5
Quintile 2	5.9	5.5	4.8	4.9	-1.1	-17.7
Quintile 3	6.4	5.8	5.3	5.4	-1.0	-15.2
Quintile 4	6.7	6.3	5.9	6.1	-0.5	-8.2
Quintile 5	12.8	12.0	11.5	10.4	-2.4	-18.6
Q5 - Q1	**7.4**	**7.0**	**6.7**	**5.8**	**-1.7**	**-22.2**

Data Source: PDE data files on employment and district characteristics

2016 refers to the average annual one year turnover rates for the 2013-14, 2014-15, and 2015-16 academic years
2017 refers to the average annual one year turnover rates for the 2014-15, 2015-16, and 2016-17 academic years
2018 refers to the average annual one year turnover rates for the 2015-16, 2016-17, and 2017-18 academic years

As shown in Table 39, the districts with the lowest percentages of economically disadvantaged students (Quintile 1) had lower teacher turnover rates than districts with the greatest percentages of economically disadvantaged students (Quintile 5) for each year after the base year. Moreover,

the gap between the two sets of districts increased over time, from -9.5 percentage points after year 1 to -18,5 percentage points after year 4. Thus, teacher turnover was substantially greater over time in the districts with the greatest percentages of economically disadvantaged students.

Table 39: Cohort Teacher Turnover by District Percentage of Economically Disadvantaged Students Enrolled in the District

District % Students Eco Disadv	Turnover Years			
	1 Yr	2 Yrs	3 Yrs	4 Yrs
Quintile 1	5.6	10.4	14.9	19.0
Quintile 2	6.3	11.5	16.0	20.3
Quintile 3	7.1	12.8	17.5	22.1
Quintile 4	7.8	14.1	19.3	24.1
Quintile 5	15.1	24.9	32.3	37.4
Q5 - Q1	**-9.5**	**-14.4**	**-17.4**	**-18.5**

Data Source: PDE data files on employment and district characteristics

Focus and Comparison Districts

In the following analyses, I compare the district-level teacher turnover rates for focus districts and four sets of comparison schools. I report on four turnover rates, each based on the number of years after the base year. The first measure, indicated by "1 Yr", is the turnover rate after one year for five cohorts of teachers—2013, 2014, 2015, 2016, and 2017. The second measure, indicated by "2 Yrs", is the district-level turnover rate two years after the base year for four cohorts of teachers--2013, 2014, 2015, and 2016. The third measure, indicated by "3 Yrs", is the district-level turnover rate three years after the base year for three cohorts of teachers--2013, 2014, and 2015. The final measure, indicated by "4 Yrs", is the district-level turnover rate four years after the base year for two cohorts of teachers—2013 and 2014.

The analysis shown in Table 40 compares plaintiff districts to all districts in the wealthiest quintile of districts within the CBSA in which the particular plaintiff district is located. In this comparison, five of the six plaintiff districts had greater district-level teacher turnover rates than comparison schools. The only exception was the Wilkes-Barre Area School District. Again, the differences were quite large for the Panther Valley and William Penn School Districts.

Table 40: Cohort Teacher Turnover for Focus and Wealthiest Districts within the BSA and Across the Commonwealth

Focus District and Comparison Districts	Turnover Years			
	1 Yr	2 Yrs	3 Yrs	4 Yrs
Panther Valley	19.8	28.1	22.7	27.9
Wealthiest within CBSA	4.6	9	12.7	16.8
Wealthiest within State	5.7	10.4	14.7	18.7
PV - Wealthiest in CBSA	**15.2**	**19.1**	**10.0**	**11.1**
PV- Wealthiest in State	**14.1**	**17.7**	**8.0**	**9.2**
Greater Johnstown	7.2	13.3	18.3	22.1
Wealthiest within CBSA	5.6	10.2	14.1	19.8
Wealthiest within State	5.7	10.4	14.7	18.7
GJ - Wealthiest in CBSA	**1.6**	**3.1**	**4.2**	**2.3**
GJ- Wealthiest in State	**1.5**	**2.9**	**3.6**	**3.4**
Lancaster	8.7	16.1	22.7	29.3
Wealthiest within CBSA	6.9	13.2	19.2	24.4
Wealthiest within State	5.7	10.4	14.7	18.7
L - Wealthiest in CBSA	**1.8**	**2.9**	**3.5**	**4.9**
L- Wealthiest in State	**3.0**	**5.7**	**8.0**	**10.6**
William Penn	10.8	18.7	25.4	31.7
Wealthiest within CBSA	5.3	9.7	13.9	17.6
Wealthiest within State	5.7	10.4	14.7	18.7
WP - Wealthiest in CBSA	**5.5**	**9.0**	**11.5**	**14.1**
WP- Wealthiest in State	**5.1**	**8.3**	**10.7**	**13.0**
Shenandoah Valley	8.1	13.7	19.3	24.7
Wealthiest within CBSA	6.1	11	15.3	19.5
Wealthiest within State	5.7	10.4	14.7	18.7
SV - Wealthiest in CBSA	**2.0**	**2.7**	**4.0**	**5.2**
SV- Wealthiest in State	**2.4**	**3.3**	**4.6**	**6.0**
Wilkes-Barre Area	4.4	8.8	11.9	15.3
Wealthiest within CBSA	4.5	8.3	12.2	15.6
Wealthiest within State	5.7	10.4	14.7	18.7
WBA - Wealthiest in CBSA	**-0.1**	**0.5**	**-0.3**	**-0.3**
WBA- Wealthiest in State	**-1.3**	**-1.6**	**-2.8**	**-3.4**
Philadelphia City	14.3	22.8	30.5	34.2
Wealthiest within CBSA	4.5	8.3	12.2	15.6
Wealthiest within State	5.7	10.4	14.7	18.7
PC - Wealthiest in CBSA	**9.8**	**14.5**	**18.3**	**18.6**
PC- Wealthiest in State	**8.6**	**12.4**	**15.8**	**15.5**

Data Source: PDE data files on employment and district characteristics

Summary

As shown above, children enrolled in the poorest districts in the state and in districts serving the greatest percentages of economically disadvantaged students are more exposed to the least experienced teachers, are more likely to be taught by a teacher on an emergency permit, and more likely to experience teachers leaving their school and district than children in the wealthiest districts and districts serving the most affluent students. Indeed, Pennsylvania children most in need of access to a stable cadre of experienced and well-qualified teachers are the least likely to have access to such teachers. To provide an equal opportunity to learn, the state must, at the very least, provide sufficient funds to low wealth districts so they can be competitive with wealthier districts in competing for teachers and other educators.

Factors Influencing the Inequitable Distribution of Teachers

As shown above there is an inequitable distribution of teachers across school districts in the Commonwealth, with lower wealth districts and districts serving greater percentages of economically disadvantaged students having greater percentages of beginning, novice, and inexperienced teachers, greater reliance on emergency permits, and greater rates of teacher turnover.

What factors, then, might influence the inequitable distribution of teachers? Research suggests a number of factors. Three factors have wide research consensus—principal turnover, teacher working conditions, and teacher salaries.

In the following sections, I briefly review the literature in these areas and provide analyses of each using publicly available data. I begin with an analysis of principal turnover using data from PDE, then use analyses of national data to examine working conditions in Pennsylvania and PDE data to examine potential differences across districts within the Commonwealth, and finally use publicly available data to examine trends in teacher compensation and compare salaries for beginning teachers across districts in Pennsylvania.

Principal Turnover

Recent research finds principal turnover tends to be associated with increased teacher turnover, thus negatively impacting school fiscal resources, organizational efficacy, and student achievement (Kraft, Marinell, & Yee, 2016). Indeed, recent research has found that, similar to teacher turnover, principal turnover also has a direct negative effect on student outcomes (Bartanen, Grissom, & Rogers, 2019). Specifically, Bartanen and colleagues (2019) found that principal turnover reduced student achievement by 0.03 standard deviations—a fairly significant impact on annual student achievement. Other research also arrives at the same conclusion that principal turnover often leads to teacher turnover and both principal turnover and teacher turnover have a negative impact on student outcomes.

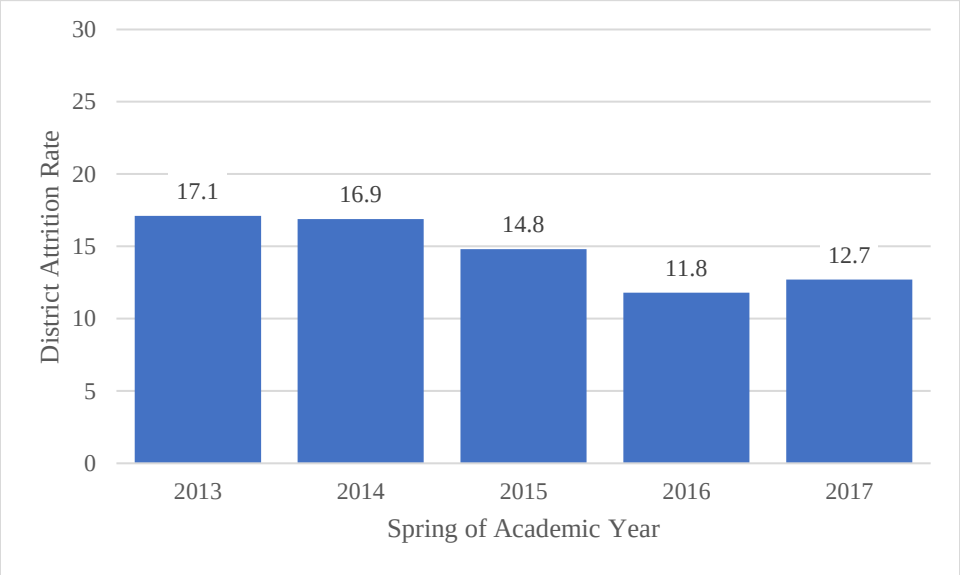
While the causes of principal turnover has received relatively little attention by researchers, the available evidence suggests salaries are an important factor (Baker, Punswick, Belt 2010; Boyce & Bowers, 2016; Pendola & Fuller, 2019; Yan, 2020). More recent research also suggests the

conditions under which principals work can also influence their decision to stay, move to another school or district, or leave the profession (Yan, 2020).

Commonwealth

As shown in Figure 5, the annual district turnover rate for principals ranged from a low of 11.8% in 2016 to a high of 17.1% in 2013. While there was a decrease from 2013 to 2016, there was a slight increase from 2016 to 2017. Thus, we do not know if the rate will likely stay steady, decrease, or increase over the coming years.

Figure 5: Annual Principal District Attrition Rate
for All Principals in Pennsylvania (2013-2017)



Data Source: PDE data files on educator employment

The year indicates the spring of the academic year in which the educator was last employed, thus 2013 indicates the turnover rate from 2013 to 2014.

Principal Attrition by District Type

As shown in Table 41, annual principal attrition was greater in charter schools and CTCs than in school districts. The differences were quite large—at least 15 or more percentage points between charter schools and school districts.

Table 41: Three Year Rolling Average
of Annual Principal School Attrition by District Type and Year

District Type	Three Included Years			CHG: 2014-16 to 2016-18		5 Year Average
	2014 thru 2016	2015 thru 2017	2016 thru 2018	N	%	
Career & Technical Ctr	25.6	28.0	25.4	-0.2	-0.6	76.7
Charter School	30.0	31.5	29.2	-0.8	-2.6	71.2
School District	14.8	13.8	12.4	-2.4	-16.2	86.2
Total	16.1	15.4	13.8	-2.3	-14.0	85.0

Data Source: PDE data files on educator employment and district characteristics
2014 thru 2016 refers to the average annual one year turnover rates for the 2013-14, 2014-15, and 2015-16 academic years
2015 thru 2017 refers to the average annual one year turnover rates for the 2014-15, 2015-16, and 2016-17 academic years
2016 thru 2018 refers to the average annual one year turnover rates for the 2015-16, 2016-17, and 2017-18 academic years

Principal Attrition by District Wealth

In Table 42, we see that a greater percentage of principals in the poorest districts leave their districts in a given year than principals in the wealthiest districts. Indeed, on average, about 17% of principals in the poorest districts leave their district as compared to only about 12% in the wealthiest districts. The difference was 7.9 percentage point—fairly substantial relative to the attrition rate of principals in the wealthiest districts.

Table 42: Three Year Rolling Average of the
Annual Principal Turnover in Pennsylvania by District Wealth and Year

District Wealth	Three Included Years			CHG: 2014-16 to 2016-18		5 Year Average
	2014 thru 2016	2015 thru 2017	2016 thru 2018	N	%	
Wealthiest Quintile	13.6	11.9	11.5	-2.1	-15.4	12.4
2	13.2	13.0	10.6	-2.5	-19.3	12.2
3	13.3	12.4	10.9	-2.4	-18.2	12.5
4	15.5	16.0	14.0	-1.5	-9.7	14.8
Poorest Quintile	18.8	15.8	15.2	-3.6	-18.9	17.2
Poorest - Wealthiest	**5.2**	**4.0**	**3.8**	**-1.5**	**-28.0**	**4.8**

Data Source: PDE data files on educator employment and district characteristics
2014 thru 2016 refers to the average annual one year turnover rates for the 2013-14, 2014-15, and 2015-16 academic years
2015 thru 2017 refers to the average annual one year turnover rates for the 2014-15, 2015-16, and 2016-17 academic years
2016 thru 2018 refers to the average annual one year turnover rates for the 2015-16, 2016-17, and 2017-18 academic years

As shown in Table 43, the same pattern appears when considering the percentage of economically disadvantaged students across all districts. Specifically, on average, 25% of principals in districts serving the greatest proportion of economically disadvantaged students (Quintile 5) while about 15% percent leave their school in districts serving the lowest percentage of economically disadvantaged students. Thus, on average, the difference in the annual school attrition rate for principals between Quintile 5 and Quintile 1 districts is 10 percentage points.

Table 43: Annual Principal Attrition in Pennsylvania by the Percentage of Economically Disadvantaged Students Enrolled in the District and Year

District % Econ Disadvantaged	Three Included Years			CHG: 2014-16 to 2016-18		5 Year Average
	2014 thru 2016	2015 thru 2017	2016 thru 2018	N	%	
Quintile 1	12.0	11.2	9.9	-2.1	-17.4	10.9
Quintile 2	14.1	13.3	12.2	-1.9	-13.6	13.5
Quintile 3	15.5	14.4	13.0	-2.4	-15.7	14.2
Quintile 4	17.2	17.8	15.4	-1.8	-10.6	16.4
Quintile 5	19.7	17.9	16.8	-2.9	-14.6	18.3
Q5-Q1	**7.7**	**6.8**	**6.9**	**-0.8**	**-10.2**	**7.4**

Data Source: PDE data files on educator employment and district characteristics

2014 thru 2016 refers to the average annual one year turnover rates for the 2013-14, 2014-15, and 2015-16 academic years
2015 thru 2017 refers to the average annual one year turnover rates for the 2014-15, 2015-16, and 2016-17 academic years
2016 thru 2018 refers to the average annual one year turnover rates for the 2015-16, 2016-17, and 2017-18 academic years

Working Conditions

Teacher recruitment and retention is affected by more than just salary. Indeed, teacher perceptions of working conditions—in particular, the abilities of the principal—exert a strong influence on teachers decisions to remain or leave a school (Ladd, 2011). Past research had concluded student characteristics such as the percentage of students living in poverty and the percentage of students of color influenced teacher perceptions of working conditions. This belief was bolstered by a number of studies that found teachers tend to transfer from schools and districts with high percentages of students living in poverty and students of color to districts with lower percentages of such students. However, with the availability of surveys of teacher perceptions of working conditions, a number of studies have found that student characteristics are not associated with teacher turnover decisions once salaries *and* working conditions are considered. In the absence of teacher working conditions information, student characteristic do serve as a proxy for teacher perceptions of working conditions.

Specifically, research has consistently shown that teachers tend to move from schools and districts serving high percentages of economically disadvantaged students and students of color to schools and districts with low percentages of economically disadvantaged students (Borman & Dowling, 2008; Hanushek, Kain, & Rivkin, 2004; Holme, Jabbar, Germain, & Dinning, 2018). More recent research, however, has found that the characteristics of students have little impact on teachers perceptions of schools and their decisions to stay or leave a school (Johnson, Kraft, & Papay, 2012; Ladd, 2011). The research, in fact, has found that teacher perceptions of their working conditions—especially regarding the abilities of school leaders, autonomy to make decisions, and support around discipline issues (Johnson, Kraft, & Papay, 2012; Ladd, 2011). However, the same research has found that working conditions tend to be correlated with student characteristics such as student racial/ethnic demographics and poverty status. In other words, student characteristics can serve as a reasonably good proxy for teacher working conditions.

Commonwealth

The Commonwealth does not currently collect teacher working condition data.

School Districts

Because Pennsylvania does not collect teacher working conditions data as many other states do, I use student characteristics as a proxy for working conditions. While student characteristics are not a perfect proxy for teacher working conditions, they do provide an indication of which schools likely have worse or better working conditions.

In the analyses below, I compare the percentage of economically disadvantaged students, students of color, and English Language Learner students enrolled in school districts in each of the five wealth quintiles. I include data from 2014 through 2019.

As shown in Table 44, the poorest districts have substantially greater percentages of economically disadvantaged students. Indeed, on average, there is almost a 50 percentage point difference in the percentage of economically disadvantaged students between districts in the wealthiest quintile and districts in the poorest quintile at the elementary school and middle school levels. At the high school level, the gap is still substantial nearly 40 percentage points.

Table 44: Percentage of Economically Disadvantaged Students by District Wealth and Year

District Wealth	Spring of Academic Year						Average Percentage
	2014	2015	2016	2017	2018	2019	
Elementary Schools							
Wealthiest	24.1	24.4	24.4	26.4	27.5	27.3	25.7
Quintile 2	29.7	31.6	33.3	33.9	33.8	35.1	32.9
Quintile 3	40.4	42.0	42.8	43.4	43.5	44.0	42.7
Quintile 4	54.2	55.0	55.5	56.6	56.8	57.8	56.0
Poorest	78.7	78.0	73.7	71.8	73.5	74.0	75.0
Wealthiest-Poorest	**-54.6**	**-53.7**	**-49.4**	**-45.4**	**-46.0**	**-46.8**	**-49.3**
Middle Schools							
Wealthiest	30.1	29.5	29.6	31.1	32.2	33.0	30.9
Quintile 2	29.0	30.3	32.1	32.1	32.9	33.8	31.7
Quintile 3	38.1	40.2	40.4	41.6	41.9	42.9	40.8
Quintile 4	52.6	54.4	55.6	56.5	57.2	56.9	55.5
Poorest	83.8	85.2	76.6	73.1	75.4	74.5	78.1
Wealthiest-Poorest	**-53.7**	**-55.7**	**-47.0**	**-42.0**	**-43.2**	**-41.6**	**-47.2**
High Schools							
Wealthiest	25.9	27.8	28.3	28.5	29.2	29.1	28.2
Quintile 2	25.1	27.7	29.2	30.1	30.3	31.3	29.0
Quintile 3	34.1	35.5	37.1	37.8	38.8	39.0	37.0
Quintile 4	43.3	44.9	46.5	48.0	48.9	49.3	46.8
Poorest	69.5	71.2	69.3	68.8	63.7	62.8	67.6
Wealthiest-Poorest	**-43.7**	**-43.4**	**-40.9**	**-40.3**	**-34.5**	**-33.7**	**-39.4**

Data Source: PDE data files on student enrollment and district characteristics

As shown in Table 45, the districts in the poorest quintile had substantially greater percentages of students of color at the elementary-, middle-, and high- school levels than district in the wealthiest quintile. At the elementary school level, about 55% of students were students of color compared to only about19% in the wealthiest districts. At the middle school level, about72% of the students in the poorest quintile of districts were students of color as compared to only about 21% in the wealthiest districts. Finally, at the high school level, about 52% of the students in the poorest districts were students of color as compared to only about 18% in the wealthiest districts.

Table 45: Percentage of Students of Color[10] by District Wealth and Year

District Wealth	Spring of Academic Year						Average Percentage
	2014	2015	2016	2017	2018	2019	
Elementary Schools							
Wealthiest	16.5	17.2	18.1	19.1	20.0	20.4	18.6
Quintile 2	16.2	17.0	17.7	18.3	19.0	20.0	18.0
Quintile 3	15.6	16.4	16.4	17.0	17.6	18.4	16.9
Quintile 4	17.0	17.6	18.3	19.1	19.9	21.2	18.8
Poorest	52.2	52.9	53.9	55.1	55.8	57.2	54.5
Wealthiest-Poorest	**-35.7**	**-35.7**	**-35.8**	**-36.0**	**-35.8**	**-36.8**	**-36.0**
Middle Schools							
Wealthiest	19.5	20.0	20.6	21.3	22.3	23.6	21.2
Quintile 2	14.9	15.5	16.0	16.9	18.1	19.3	16.8
Quintile 3	15.0	15.7	15.5	15.8	16.6	17.9	16.1
Quintile 4	20.1	20.5	21.6	22.5	23.5	24.6	22.1
Poorest	71.0	71.4	72.3	72.7	72.8	73.7	72.3
Wealthiest-Poorest	**-51.5**	**-51.3**	**-51.7**	**-51.4**	**-50.5**	**-50.0**	**-51.1**
High Schools							
Wealthiest	16.2	16.7	17.1	17.7	18.2	18.9	17.5
Quintile 2	12.2	12.7	13.2	13.3	13.8	14.8	13.3
Quintile 3	11.7	12.1	12.7	12.7	13.0	13.6	12.7
Quintile 4	10.7	11.2	11.4	12.0	12.3	12.7	11.7
Poorest	50.5	51.0	52.0	51.8	52.5	53.1	51.8
Wealthiest-Poorest	**-34.3**	**-34.2**	**-34.9**	**-34.1**	**-34.4**	**-34.2**	**-34.4**

Data Source: PDE data files on student enrollment and district characteristics

As shown in Table 46, the poorest quintile of districts had greater percentages of ELL students than districts in the wealthiest quintile, especially at the middle school level. At the elementary school level, 7% of students in the poorest districts were ELL students as compared to only about 3% in the wealthiest districts. At the middle school level, about 8% of students were ELL students while only about 1% of students in the wealthiest districts were ELL students. Finally, at the high school level, the percentage of students in the poorest districts who were ELL students was 5% while the percentage for the wealthiest districts was about 1%.

[10] Students of color refers to students whose racial/ethnic identification includes one of the following: American Indian, Alaskan Native, Black/African American, Hispanic/Latinx, or mixed race.

Table 46: Percentage of English Language Learner Students by District Wealth and Year

District Wealth	Spring of Academic Year						Average Percentage
	2014	2015	2016	2017	2018	2019	
Elementary Schools							
Wealthiest	2.6	2.7	2.9	3.0	3.5	3.8	3.1
Quintile 2	2.5	2.6	2.7	2.7	3.1	3.5	2.9
Quintile 3	1.5	1.6	1.6	1.6	1.9	2.1	1.7
Quintile 4	1.5	1.6	1.7	1.8	2.1	2.4	1.8
Poorest	6.2	6.3	6.3	6.9	7.7	8.8	7.0
Wealthiest-Poorest	**-3.6**	**-3.6**	**-3.4**	**-3.9**	**-4.2**	**-5.1**	**-4.0**
Middle Schools							
Wealthiest	1.3	1.5	1.5	1.7	1.9	2.1	1.7
Quintile 2	1.6	1.7	1.8	1.8	1.8	2.0	1.8
Quintile 3	0.9	1.0	1.0	1.1	1.3	1.6	1.2
Quintile 4	2.1	2.2	2.2	2.5	2.7	2.9	2.4
Poorest	7.2	7.9	7.8	8.2	8.6	9.3	8.2
Wealthiest-Poorest	**-5.9**	**-6.5**	**-6.3**	**-6.5**	**-6.7**	**-7.2**	**-6.5**
High Schools							
Wealthiest	0.9	1.0	1.1	1.5	1.4	1.5	1.2
Quintile 2	1.1	1.2	1.3	1.4	1.6	1.6	1.4
Quintile 3	0.7	0.7	0.7	0.9	1.0	1.1	0.8
Quintile 4	0.9	0.9	1.0	1.0	1.1	1.1	1.0
Poorest	4.4	4.8	4.8	5.3	5.3	5.5	5.0
Wealthiest-Poorest	**-3.5**	**-3.8**	**-3.8**	**-3.8**	**-3.9**	**-4.0**	**-3.8**

Data Source: PDE data files on student enrollment and district characteristics

If we assume that student characteristics serve as an imperfect proxy for teacher working conditions, the above data suggests the districts in the poorest quintile likely have less favorable working conditions than districts in the wealthiest quintile. Since research suggests employees generally require higher pay to endure worse working conditions, this would suggest that teachers in the poorest quintile of districts should be paid higher salaries than those in the wealthiest quintile of districts. I turn to this issue next.

Salary

There is widespread consensus among the research community that salaries have a significant and substantial effect on teacher retention in a school, district, and the profession (Borman & Dowling, 2008; Clotfelter, Ladd, & Vigdor, 2011; Clotfelter, Ladd, Glennie, & Vigdor, 2008; Murnane, Singer, & Willett, 1989), which, as shown above, is associated with increased teacher effectiveness. Teacher salaries also influence prospective teachers' perceptions of the attractiveness of particular positions—even above and beyond the influence of other important factors like leadership quality and working conditions (Clotfelter, et al., 2011; Ladd, 2011).

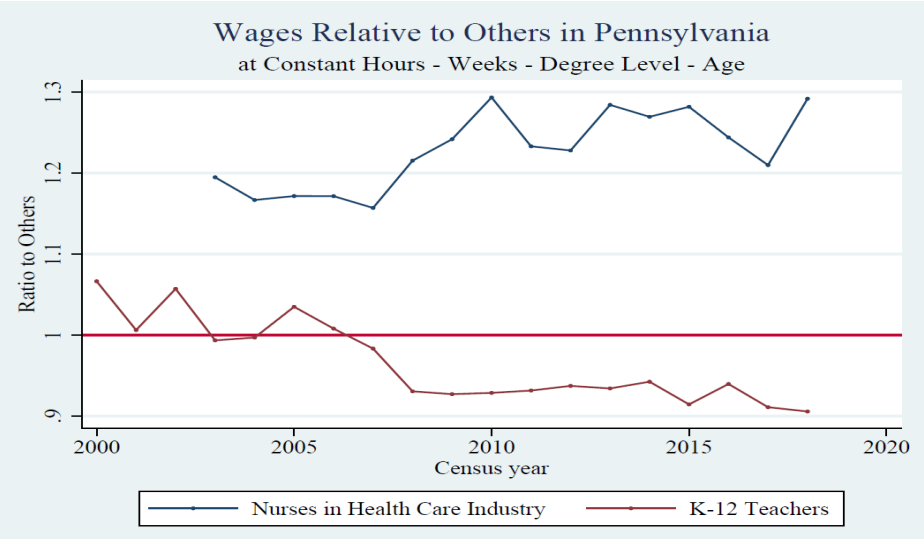
In addition, one of the basic tenets of labor economics is that employers must offer greater compensation to entice workers to take less desirable jobs (Baugh, & Stone, 1982; Murnane, et al, 1989). In other words, districts must offer greater salaries to compensate for perceived worse

working conditions. Simply offering salaries equal to other districts with perceived better working conditions will not create an equitable distribution of teachers across such districts within the same labor market. Indeed, if all districts offered equal salaries, districts with more difficult circumstances, less stable leadership, and lower quality leadership will still have greater difficulty in recruiting and retaining well-qualified and effective teachers. Moreover, in a state as large and diverse as Pennsylvania, there is uncontrollable variation in the costs of labor that advantages some districts while disadvantaging other districts. To truly equalize educational opportunity, education funding must be distributed in a way that favors the disadvantaged schools and districts.

Commonwealth

In Pennsylvania, teacher salaries remain relatively high compared to alternative occupations (Allegretto & Mishel, 2018)—especially in rural areas of the state. However, the gap between teacher salaries and salaries for alternative occupations in competition with teaching for college-educated workers has grown over time and is now almost 14% (Allegretto & Mishel, 2018). In other words, by choosing to enter teaching rather than another profession that requires a college-degree, an individual in Pennsylvania would expect to make nearly 14% less in salary than would otherwise be the case. In addition, until recently, the health and retirement benefits offered to teachers helped make the teaching profession relatively more attractive than would otherwise be the case (Keefe, 2018). Recent changes in such benefits enacted by the Legislature, however, have reduced such benefits (Fuller & Pendola, 2020; Keefe, 2018). Further, in an analysis of US of salary data from the American Community Survey shown in Figure 6 below, Baker (2020) found the salaries for nurses in Pennsylvania have increased over the last 15 years relative to competing professions—professions that require a college degree for entrance into the field--while the salaries for teachers in Pennsylvania have declined. This was true even after adjusting for differences in age, degree level, hours worked, and weeks worked. In fact, since 2005, the difference in pay between nurses and teachers has roughly doubled—thus providing a strong fiscal incentive for individuals to forego teaching as a career and choose nursing instead.

Figure 6: Comparison of Wages of Nurses and Teachers in Pennsylvania



Data Source: Analysis of American Community Service Data; Analysis by Dr. Bruce Baker

School Districts

While the lack of adequate compensation for teachers likely negatively impacts the overall supply of teachers in Pennsylvania, the salaries offered by specific school districts and their surrounding districts within the same labor market determine the "winners" and "losers" in the competition to hire the most qualified teachers.

Assessing the differences in salaries across districts is complicated by a number of factors, including cost of living differences across districts in geographically larger states such as Pennsylvania as well as differences in the salaries for occupations in competition with education for employees (in particular nursing since it is also a female-dominated profession and also involves an ethic of care). One strategy to address this issue is to compare teacher salaries within the same labor market. This is the approach I employ in the analysis below. Restricting comparisons to the same labor market ensure that a number of factors that affect teacher supply, demand, hiring, and attrition are held constant.

As in Taylor's 2010 (Taylor, 2010) study of teacher salary and the competition between school districts for teachers, I use the CBSA to define teacher labor markets. There are 37 CBSAs in Pennsylvania. In addition, there were five areas of the state not included in a CBSA. Districts in these areas were placed into one of the five geographic areas: Northwest Rural, Northeast Rural, South Central Rural, Southwest Rural, and Central Rural. In total, the 37 CBSAs and five geographic areas include all public school districts in Pennsylvania. Many of the CBSAs and regions, however, do not include districts in any more than three wealth quintiles. In the analysis below as displayed in Table 47, I restrict the analysis to only those CBSAs and regions that had districts in at least four wealth quintiles and included districts in either the wealthiest quintile and/or the poorest quintile. This resulted in the inclusion of 13 CBSAs and three geographic regions. For each CBSA/region, I compared the median salaries for all beginning teachers in each wealth quintile for five years-2014 through 2018. With sufficient data for all wealth quintiles, CBSAs/regions, and years, there would have 75 observations. However, in a few instances, there was not sufficient information to make a comparison. Thus, my final number of observations was 73.

When data was missing from either the highest or lowest wealth quintile in the CBSA/region, the next highest or lowest quintile was used. Such comparisons are shaded in gray in the tables included in Appendix A.

The vast majority of the comparisons revealed that the median salaries of beginning teachers were lower in the lowest wealth quintile in a CBSA/region than in the highest wealth quintile in a region. In fact, 77.5% of the comparisons found this to be true. Moreover, nearly 44% of all the comparisons showed that the difference between the median salary for beginning teachers in the highest and lowest wealth quintiles in the CBSA/region was at least 10% of the median salary for beginning teachers in the lowest wealth quintile in the CBSA/region.

In other words, lower wealth districts have great difficulty offering wages that are competitive with higher wealth districts within the same CBSA/region. This is consistent with the findings from myriad studies that have examined this issue across many districts, states and the US.

Table 47: Comparison of Median Salaries of Beginning Teachers in Major Pennsylvania CBSAs between Highest and Lowest Wealth Districts within the CBSA (2014-2018)

Percentage Interval	CBSAs	
	Number	Percent
The median salary for the highest wealth quintile in the CBSA is ____ greater than the median salary for the lowest quintile in the CBSA		
50%+ or more	1	1.4%
40% to 49.9%	1	1.4%
30% to 39.9%	3	4.2%
20% to 29.9%	9	12.7%
10% to 19.9%	17	23.9%
5% to 9.9%	8	11.3%
3% to 4.9%	9	12.7%
> 0% to 2.9%	7	9.9%
Difference is essentially 0%	3	4.2%
The median salary for the highest wealth quintile in the CBSA is ____ less than the median salary for the lowest quintile in the CBSA		
> 0% to 2.9%	10	14.1%
3% to 4.9%	1	1.4%
5% to 9.9%	1	1.4%
10% to 19.9%	1	1.4%
20% to 29.9%	0	0.0%
30% to 39.9%	0	0.0%
40% to 49.9%	0	0.0%
50%+	0	0.0%
Total Year Count	71	100.0%

Data Source: Teacher employment files provided by PDE; Analysis by author

Summary

As shown above, the poorest districts and the districts serving the greatest percentages of economically disadvantaged students have greater principal turnover, arguably more difficult teacher working conditions, and provide lower salaries than districts with which they must compete for teachers. These and other factors create a situation in which the districts enrolling children most in need of a stable groups of experienced and well-qualified teachers are the least likely to be able to provide this vital resource. In particular, the inability of the poorest districts to offer competitive wages to attract teachers puts the children in such districts at a distinct disadvantage through no faut of their own. It is the responsibility of the state to create a system in which all students have—at the very least—equal access to similar levels of teacher quality.

Teacher Mobility Across Districts

One consequence of the differences in working conditions and salary between poor and wealthy districts is the preference of teachers transferring from one district to another. Indeed, research has consistently found that higher teacher salaries enhance the ability of a district to recruit and retain teachers (Baugh & Stone, 1982; Hanushek,, Kain, & Rivkin, 2004; Imazeki, 2005; Murnane, et al., 1989). In addition, teachers respond most strongly to increased salaries within the same labor market as their current place of employment (Hanushek,, Kain, & Rivkin, 2004; Imazeki, 2005)

In the analysis below, I examine the inter-district teacher mobility patterns for all teachers transferring from one district to another district between 2013 and 2018. As shown in Table 48, teacher tend to migrate from poorer districts to wealthier districts. Indeed, in looking at the rows for the wealthiest districts, we see in the first row that only 5% of the teachers (n=30) leaving a district from the Wealthiest Quintile found employment in a district in in the Poorest Quintile. Alternatively, nearly 45% of teachers (n=264) simply moved to another district in the Wealthiest Quintile.

At the other end of the spectrum, we see in the Poorest Quintile row in Table 48 as well as in Figure that 19.1% of teachers (n=206) who were employed in a district in the Poorest Quintile moved to a district in the Wealthiest quintile while another 26.9% of teachers (n=294) moved to a district in Quintile 2. Thus, as shown in Figure 7, 46% of teachers originally employed in a district in the Poorest Quintile moved to a district in one of the wealthiest two quintiles.

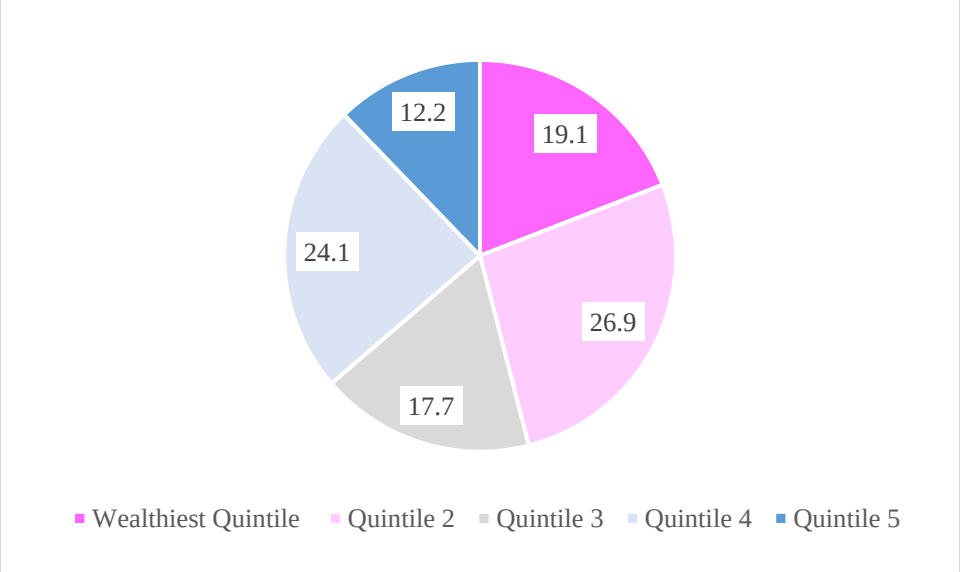
Thus, consistent with prior research, teachers In Pennsylvania migrate from poorer districts to wealthier districts. This pattern disadvantages the many students living in poverty enrolled in the poorest districts in the state.

Table 48: Teacher District Mobility Rates by District Wealth

District Wealth for Sending District	Measure	District Wealth for Receiving District					All Districts
		Wealthiest Quintile	Quintile 2	Quintile 3	Quintile 4	Poorest Quintile	
Wealthiest Districts	%	44.7	27.4	15.2	7.6	5.1	100.0
	N	264	162	90	45	30	591
Quintile 2	%	29.1	35.0	18.9	10.9	6.1	100.0
	N	250	301	162	94	52	859
Quintile 3	%	20.2	31.7	27.2	16.2	4.8	100.0
	N	203	319	274	163	48	1,007
Quintile 4	%	19.1	23.8	19.7	28.2	9.2	100.0
	N	206	257	213	305	99	1,080
Poorest Districts	%	19.1	26.9	17.7	24.1	12.2	100.0
	N	209	294	193	263	133	1,092
All Districts	%	24.5	28.8	20.1	18.8	7.8	100.0
	N	1,132	1,333	932	870	362	4,629

Data Source: PDE data files on teacher employment and district characteristics

Figure 7: Percentage of Teachers Transferring from One of the Poorest Districts by Wealth Quintile of Destination District



Data Source: PDE data files on teacher employment and district characteristics

Access to Other Human Resources

The benefits of greater fiscal revenues include more than just an increased ability to recruit and retain better qualified and more effective teachers. Greater fiscal revenue can also allow districts to provide greater access to important educators other than teachers such as counselors and librarians. Research suggests both school counselors and librarians have a positive influence on student outcomes. In fact, recent research has found a causal link between access to student counselors and student outcomes. As delineated below, students enrolled in the poorest districts in Pennsylvania once again suffer—this time from a lack of access to school counselors and librarians.

School Counselors

School Counselors are certified and/or licensed individuals who assist students in many areas, including academics, personal development, mental health, and post high school plans (Gilfillan, 2017; Mandel & Fuller, 2020). Recent research confirms prior studies about the influence of counselors—specifically, counselors are associated with improvements in student achievement, graduation rates, college readiness, and college attendance (Mandel & Fuller, 2020; Mulhern, 2019) This is particularly true for students living in poverty and students of color (Henfield, Washington, & Byrd, 2014). Most recently, Mulhern (2019) found that counselors have a *causal effect* on these outcomes, meaning counselors positively influence these outcomes apart from the influence of other factors that influence such outcomes.

The following analyses are conducted at the school level because there are substantial differences in the odds that schools employ a counselor by school level (elementary schools,

middle schools, and high school). Moreover, one of the important metrics related to school counselors is the student-counselor ratio. This metric is most appropriately calculated at the school level.

Research establishes a causal connection between school counselor case load and counselor effectiveness in high schools (Mulhurn, 2019). This research substantiates the recommendations of the American School Counselor Association has long recommended a ratio of 250 students to every one full-tie counselor. Such a ratio would, in theory, maximize the effectiveness of the school counselor.

As shown in Table 49, the vast majority of elementary schools and middle schools in Pennsylvania, regardless of district wealth or the percentage of economically disadvantaged students enrolled in the district, meet the recommended 250 to 1 student-counselor ratio. Even at the high school level—where recent research shows a causal connection between access to lower student-counselor ratios and improved student outcomes (Mulhern, 2019)—students in less than 26% of all high schools in the commonwealth had access to a student-counselor ratio of 250 to 1. Thus, most students in the Commonwealth do not have the recommended access to school counselors.

Table 49: Percentage of Schools Meeting the 250 to 1 Student-Counselor Ratio by School Level and Year

School Level	Spring of Academic Year						Average
	2014	2015	2016	2017	2018	2019	
Elementary Schools	2.5	2.7	3.0	3.8	4.4	5.7	3.7
Middle Schools	9.5	11.0	9.7	11.5	10.8	10.5	10.5
High Schools	22.2	24.0	22.9	23.5	26.3	25.7	24.1
All Schools	8.8	9.8	9.4	10.4	11.3	11.9	10.3

Data Source: Educator employment and district student characteristic files from PDE

In the following section, I examine the percentage of schools that meet a standard of 500 students to each counselor which is double the size of the recommended standard.

Student-Counselor Ratio of 500 to 1 by District Wealth

Elementary Schools

As shown in Table 50, a substantially greater percentage of elementary schools in the wealthiest districts met the 500:1 student-counselor ratio standard than elementary schools in the poorest districts. On average, about 59% of elementary schools in the wealthiest districts met a 500:1 standard as compared to only about 34% of schools in the poorest districts. Thus, the difference was 25 percentage points. The percentages of schools in both groups have increased over time, but the disparity between the types of districts has remained quite large over time. Indeed, for the 2019 rolling average, the difference was a substantial 20 percentage points—with only 40% of schools in the poorest districts meeting the standard.

Table 50: Three Year Rolling Average of the Percentage of Elementary Schools with a Student-Counselor Ratio of 500 or Less by District Wealth and Year

District Wealth	Spring of Academic Year				Change: 15 to 18	
	2016	2017	2018	2019	N	%
Wealthiest	56.0	58.8	60.5	61.7	5.7	10.2
Quintile 2	47.2	48.7	50.1	52.7	5.5	11.6
Quintile 3	43.8	45.6	48.4	52.1	8.3	18.9
Quintile 4	41.4	43.8	44.9	44.7	3.3	8.0
Poorest	27.3	32.2	35.4	40.5	13.2	48.2
Diff: W-P	**28.7**	**26.6**	**25.1**	**21.2**	**-7.5**	**-26.0**

Data Source: Educator employment and district student characteristic files from PDE

Middle Schools

As shown in Table 51, a substantially greater percentage of middle schools in the wealthiest districts met the 500:1 student-counselor ratio standard than middle schools in the poorest districts. On average, about 84% of middle schools in the wealthiest districts met a 500:1 standard as compared to just slightly more than 44% of schools in the poorest districts. Thus, the difference was almost 40 percentage points. While the disparity has declined over time, the difference between the two groups of school remained relatively substantial at 28 percentage points for the 2019 rolling average. In fact, barely more than one-half of middle schools in the poorest districts met the 500 to 1 standard.

Table 51: Three Year Rolling Average of the Percentage of Middle Schools with a Student-Counselor Ratio of 500 or Less by District Wealth and Year

District Wealth	Spring of Academic Year				Change: 15 to 18	
	2016	2017	2018	2019	N	%
Wealthiest	83.8	84.7	84.1	84.1	0.3	0.4
Quintile 2	86.6	86.3	86.3	85.9	-0.7	-0.8
Quintile 3	79.6	78.2	78.1	76.4	-3.2	-4.1
Quintile 4	75.0	74.2	73.4	72.8	-2.3	-3.0
Poorest	32.2	40.9	44.5	56.0	23.9	74.2
Diff: W-P	**51.6**	**43.8**	**39.6**	**28.0**	**-23.6**	**-45.7**

Data Source: Educator employment and district student characteristic files from PDE

High Schools

As shown in Table 52, a substantially greater percentage of high schools in the wealthiest districts met the 500:1 student-counselor ratio standard than high schools in the poorest districts. On average, about 96% of high schools in the wealthiest districts met a 500:1 standard as compared to just slightly more than 72% of high schools in the poorest districts. Thus, the difference was almost 24 percentage points. While the disparity has declined over time, the

difference between the two groups of school remained substantial at 15 percentage points for the 2019 rolling average.

Table 52: Three Year Rolling Average of the Percentage of High Schools with a Student-Counselor Ratio of 500 or Less by District Wealth and Year

District Wealth	Spring of Academic Year				Change: 15 to 18	
	2016	2017	2018	2019	N	%
Wealthiest	95.5	96.6	96.6	96.2	0.7	0.7
Quintile 2	96.7	97.0	96.7	96.3	-0.4	-0.4
Quintile 3	95.7	95.9	95.7	95.2	-0.5	-0.5
Quintile 4	94.1	93.7	93.9	93.7	-0.4	-0.5
Poorest	63.6	73.2	76.7	81.0	17.4	27.4
Diff: W-P	**31.9**	**23.4**	**19.9**	**15.2**	**-16.7**	**-52.5**

Data Source: Educator employment and district student characteristic files from PDE

Student-Counselor Ratio of 500 to 1 by Percentage of Economically Disadvantaged Students

Elementary Schools

As shown in Table 53, a substantially greater percentage of elementary schools in districts with the lowest percentages of economically disadvantaged students met the 500:1 student-counselor ratio standard than elementary schools in districts with the greatest percentages of economically disadvantaged students. On average, 53% of elementary schools in the districts with the lowest percentages of economically disadvantaged students met a 500:1 standard as compared to only about 32% of schools in the districts with the greatest percentages of economically disadvantaged students. While the disparity between Quintile 1 and Quintile 5 districts has declined over time, the difference for the 2019 rolling average was still 16 percentage points. Moreover, less than 40% of the schools in the districts with the greatest percentages of economically disadvantaged students met the standard.

Table 53: Three Year Rolling Average of the Percentage of Elementary Schools with a Student-Counselor Ratio of 500 or Less by the Percentage of Economically Disadvantaged Students Enrolled in the District and Year

% of Eco Dis Students in District	Spring of Academic Year				Change: 15 to 18	
	2016	2017	2018	2019	N	%
Quintile 1	51.0	52.7	53.7	55.2	4.2	8.2
Quintile 2	46.4	48.8	52.2	55.3	8.9	19.2
Quintile 3	44.4	46.8	48.0	49.5	5.0	11.3
Quintile 4	47.1	48.5	49.2	50.2	3.1	6.5
Quintile 5	24.0	29.7	33.8	38.9	14.9	61.9
Q1 - Q5	**27.0**	**23.0**	**19.9**	**16.3**	**-10.7**	**-39.6**

Data Source: Educator employment and district student characteristic files from PDE

Middle Schools

As shown in Table 54, a substantially greater percentage of middle schools in districts with the lowest percentages of economically disadvantaged students met the 500:1 student-counselor ratio standard than elementary schools in districts with the greatest percentages of economically disadvantaged students. On average, nearly 87% of middle schools in the districts with the lowest percentages of percentages of economically disadvantaged students met a 500:1 standard as compared to only about 44% of schools in the districts with the greatest percentages of economically disadvantaged students. Thus, the difference was greater than 42 percentage points. The percentage for middle schools in districts with the lowest percentages of economically disadvantaged students was nearly twice the percentage of middle schools in districts with the greatest percentages of economically disadvantaged students. In short, students most in need of access to a counselor were the least likely to have such access.

Table 54: Three Year Rolling Average of the Percentage of Middle Schools with a Student-Counselor Ratio of 500 or Less by the Percentage of Economically Disadvantaged Students Enrolled in the District and Year

% of Eco Dis	Spring of Academic Year				Change: 15 to 18	
Students in District	2016	2017	2018	2019	N	%
Quintile 1	87.4	86.3	86.2	85.7	-1.7	-1.9
Quintile 2	84.0	84.4	84.6	85.0	1.0	1.2
Quintile 3	83.7	83.1	81.9	81.6	-2.1	-2.5
Quintile 4	72.5	71.4	71.3	69.4	-3.1	-4.2
Quintile 5	33.9	42.1	44.7	54.2	20.3	59.8
Q1 - Q5	**53.4**	**44.2**	**41.5**	**31.5**	**-22.0**	**-41.1**

Data Source: Educator employment and district student characteristic files from PDE

High Schools

As shown in Table 55, a substantially greater percentage of high schools in districts with the lowest percentages of economically disadvantaged students met the 500:1 student-counselor ratio standard than elementary schools in districts with the greatest percentages of economically disadvantaged students. On average, nearly 97% of high schools in the districts with the lowest percentages of percentages of economically disadvantaged students met a 500:1 standard as compared to only about 70% of schools in the districts with the greatest percentages of economically disadvantaged students. Thus, the average disparity was nearly 30 percentage points. In short, nearly all high schools in districts with the lowest percentages of economically disadvantaged students met the 500:1 standard while nearly one-third of schools with the greatest percentages of economically disadvantaged students did not meet the standard. Again, students most in need of access to a counselor were the least likely to have such access.

Table 55: Three Year Rolling Average of the Percentage of High Schools with a Student-Counselor Ratio of 500 or Less by the Percentage of Economically Disadvantaged Students Enrolled in the District and Year

% of Eco Dis	Spring of Academic Year				Change: 15 to 18	
Students in District	2016	2017	2018	2019	N	%
Quintile 1	96.5	97.2	97.0	96.7	0.2	0.2
Quintile 2	96.4	96.4	95.8	94.5	-1.8	-1.9
Quintile 3	93.9	94.7	96.2	96.4	2.5	2.7
Quintile 4	96.8	96.4	95.4	95.7	-1.0	-1.1
Quintile 5	59.2	68.9	72.3	76.7	17.5	29.6
Q1 - Q5	**37.4**	**28.4**	**24.7**	**20.1**	**-17.3**	**-46.3**

Data Source: Educator employment and district student characteristic files from PDE

Summary

Research has shown that counselors play a vital role in improving the educational outcomes of students—particularly economically disadvantaged students and high school students. As shown above, children enrolled in the poorest districts and the districts serving the greatest percentages of economically disadvantaged students are the less likely to have access to a counselor than their peers in the wealthiest districts and districts serving the lowest percentages of economically disadvantaged students. In short, the Pennsylvania children most in need of access to school counselors are the least likely to have access to them. This creates an unequal playing field that impedes the realization of the potential of all children in the Commonwealth.

School Librarians

There are no causal studies relating investments in *school libraries* to student achievement. Multiple studies have, however, associated greater library staffing and usage with higher test scores, even after controlling for district wealth and other factors that might explain test scores (Lance & Hofschire, 2012). Regardless of the research base, simple common sense suggests that training students to make effective use of media is critical in the information economy and restricting access to media at school impairs such training. Librarians are particularly important for students living in poverty. For example, students living in poverty typically have access to less books at home and in local libraries compared to their peers in more affluent households (Neuman & Moland, 2019). Thus, school libraries and librarians serve a critical role in addressing opportunity gaps related to reading achievement (Neuman & Moland, 2019).

In this section, I examine access to a school librarian for each of the three school levels. Access is defined as employing at least one FTE of a librarian. This standard could be met by employing one person or multiple people. As long as the sum of librarian FTEs equaled one or greater, the school was considered to be providing access to a librarian.

<u>Access to Librarians by District Wealth</u>

In this section, I compare access to a librarian by district wealth. Because there are relatively stark differences by school level, I disaggregate the analysis by school level.

Elementary Schools

As shown in Table 56, a substantially greater percentage of elementary schools in the wealthiest districts employed at least 1.0 FTEs of librarians than elementary schools in the poorest districts. On average, greater than 65% of elementary schools in the wealthiest districts employed at least 1.0 FTEs of librarians while slightly more than 23% of elementary schools in the poorest districts employed at least 1.0 FTEs of a librarian. In other words, only one-third of schools in districts in the wealthiest districts did *not* employ at least 1.0 FTEs of a librarian while almost 80% of schools in the poorest districts did *not* employ at least 1.0 FTEs of librarians. The percentage point difference of nearly 42% was about twice the percentage of schools in poor districts that actually met the standard.

Table 56: Three Year Rolling Average of the Percentage of Elementary Schools with at Least 1.0 Librarian FTEs by District Wealth and Year

District	Spring of Academic Year				Change: 15 to 18	
Wealth	2016	2017	2018	2019	N	%
Wealthiest	63.4	64.2	66.1	66.8	3.3	5.3
Quintile 2	39.8	38.1	37.1	36.8	-3.0	-7.5
Quintile 3	26.3	26.9	28.2	28.6	2.2	8.5
Quintile 4	24.5	25.1	25.5	25.8	1.3	5.4
Poorest	23.2	24.4	24.6	23.7	0.5	2.0
Diff: W-P	**40.2**	**39.8**	**41.5**	**43.1**	**2.9**	**7.1**

Data Source: Educator employment and district student characteristic files from PDE

Middle Schools

As shown in Table 57, on average, slightly more than 70% of middle schools in the wealthiest districts employed at least 1.0 FTEs of librarians while almost 13% of middle schools in the poorest districts employed at least 1.0 FTEs of a librarian. In other words, about 3 out of every 10 middle schools in districts in the wealthiest districts did *not* employ at least 1.0 FTEs of a librarian while nearly 9 out of 10 middle schools in the poorest districts did not employ at least 1.0 FTEs of librarians. The percentage point difference was a staggering 65 percentage points. At no time has the rolling average of percentage of schools in the poorest districts exceeded 15% and declined to just under 11% in 2019.

Table 57: Three Year Rolling Average of the Percentage of Middle Schools with at Least 1.0 Librarian FTEs By District Wealth and Year

District	Spring of Academic Year				Change: 15 to 18	
Wealth	2016	2017	2018	2019	N	%
Wealthiest	69.4	69.6	69.6	70.7	1.3	1.9
Quintile 2	61.6	60.2	58.8	58.3	-3.4	-5.5
Quintile 3	52.4	51.1	52.3	50.6	-1.7	-3.3
Quintile 4	37.6	37.1	38.3	35.9	-1.7	-4.4
Poorest	14.8	13.7	13.1	10.9	-4.0	-26.7
Diff: W-P	**54.6**	**55.9**	**56.5**	**59.8**	**5.3**	**9.7**

Data Source: Educator employment and district student characteristic files from PDE

High Schools

On average, as shown in Table 58, slightly more than 78% of high schools in the wealthiest districts employed at least 1.0 FTEs of librarians while slightly more than 21% of high schools in the poorest districts employed at least 1.0 FTEs of a librarian. Thus, about 2 out of every 10 high schools in districts in the wealthiest districts did *not* employ at least 1.0 FTEs of a librarian while only 8 out of every 10 high schools in the poorest districts did *not* employ at least 1.0 FTEs of librarians. The average percentage point difference was a substantial 57.2 percentage points. The percentage point difference was nearly three times the percentage of high schools in the poorest districts that employed at least 1.0 FTEs of a librarian.

Table 58: Three Year Rolling Average of the Percentage of High Schools with at Least 1.0 Librarian FTEs By District Wealth and Year

District	Spring of Academic Year				Change: 15 to 18	
Wealth	2016	2017	2018	2019	N	%
Wealthiest	78.1	78.2	77.8	78.5	0.4	0.5
Quintile 2	63.2	60.8	59.1	58.5	-4.7	-7.4
Quintile 3	56.6	55.6	53.7	51.2	-5.4	-9.5
Quintile 4	43.5	39.8	36.9	35.1	-8.3	-19.2
Poorest	25.1	21.0	18.4	17.0	-8.1	-32.1
Diff: W-P	**53.0**	**57.2**	**59.4**	**61.4**	**8.5**	**16.0**

Data Source: Educator employment and district student characteristic files from PDE

Access to Librarians by District Percentage of Economically Disadvantaged Students

In this section, I compare access to a librarian by the percentage of economically disadvantaged students in the district. Remember that this analysis includes not only school districts, but charter schools and Career and Technical Centers.

Elementary Schools

As shown in Table 59, a greater percentage of elementary schools in districts with the lowest percentages of economically disadvantaged students (Quintile 1) employed at least 1.0 FTEs of a librarian than elementary schools in districts with the lowest percentages of economically disadvantaged students (Quintile 5). Specifically, nearly 55% of schools in districts in Quintile 1 employed at least 1.0 FTEs of a librarian while about 19% of schools in Quintile 5 districts employed at least 1.0 FTEs of a librarian. The difference of nearly 36 percentage points was substantially greater than the percentage of schools in Quintile 5 districts who actually met the criteria.

Table 59: Three Year Rolling Average of the Percentage of Elementary Schools with at Least 1.0 Librarian FTEs by Economically Disadvantaged Student Quintiles and Year

District % of Econ	Spring of Academic Year				Change: 15 to 18	
Disadv Students	2016	2017	2018	2019	N	%
Quintile 1	54.7	54.3	54.7	55.1	0.4	0.7
Quintile 2	31.6	31.3	32.1	31.8	0.2	0.6
Quintile 3	33.8	34.2	33.5	33.1	-0.7	-2.1
Quintile 4	21.4	21.6	22.3	23.9	2.4	11.4
Quintile 5	17.7	19.6	21.0	20.5	2.8	15.8
Diff: Q1 - Q5	**37.0**	**34.7**	**33.7**	**34.6**	**-2.4**	**-6.6**

Data Source: Educator employment and district student characteristic files from PDE

Middle Schools

As shown in Table 60, a greater percentage of middle schools in districts with the lowest percentages of economically disadvantaged students (Quintile 1) employed at least 1.0 FTEs of a librarian than middle schools in districts with the lowest percentages of economically disadvantaged students (Quintile 5). Specifically, greater than 68% of schools in Quintile I districts employed at least 1.0 FTEs of a librarian while only about 14% of schools in Quintile 5 districts employed at least 1.0 FTEs of a librarian. Thus, almost 7 of every 10middle schools in Quintile I districts employed at least 1.0 FTEs of a librarian while less than 2 of every 10 middle schools in Quintile 5 districts did so. The difference between Quintile I and Quintile 5 schools was slightly greater than 54%.

Table 60: Three Year Rolling Average of the Percentage of Middle Schools with at Least 1.0 Librarian FTEs by Economically Disadvantaged Student Quintiles and Year

District % of Econ	Spring of Academic Year				Change: 15 to 18	
Disadv Students	2016	2017	2018	2019	N	%
Quintile 1	68.7	67.2	67.5	68.2	-0.5	-0.7
Quintile 2	49.5	48.9	49.9	49.7	0.2	0.3
Quintile 3	40.4	40.5	39.9	36.3	-4.1	-10.1
Quintile 4	43.3	42.2	43.1	41.4	-1.9	-4.3
Quintile 5	15.9	15.3	14.6	12.5	-3.4	-21.2
Diff: Q1 - Q5	**52.8**	**52.0**	**52.9**	**55.7**	**2.9**	**5.4**

Data Source: Educator employment and district student characteristic files from PDE

High Schools

As shown in Table 61, a greater percentage of high schools in districts with the lowest percentages of economically disadvantaged students (Quintile 1) employed at least 1.0 FTEs of a librarian than high schools in districts with the lowest percentages of economically disadvantaged students (Quintile 5). Specifically, about 67% of schools in Quintile I districts employed at least 1.0 FTEs of a librarian while only about 20% of schools in Quintile 5 districts employed at least 1.0 FTEs of a librarian. Thus, almost 7 of every 10 high schools in Quintile I districts employed at least 1.0 FTEs of a librarian while only about 2 of every 10 middle schools in Quintile 5 districts did so. The difference between Quintile I and Quintile 5 schools was almost 47%.

Table 61: Three Year Rolling Average of the Percentage of High Schools with at Least 1.0 Librarian FTEs by Economically Disadvantaged Student Quintiles and Year

District % of Econ	Spring of Academic Year				Change: 15 to 18	
Disadv Students	2016	2017	2018	2019	N	%
Quintile 1	67.3	66.7	66.2	66.7	-0.7	-1.0
Quintile 2	50.0	48.1	45.4	42.6	-7.4	-14.7
Quintile 3	38.1	35.3	33.6	32.2	-5.9	-15.5
Quintile 4	38.7	35.5	34.0	33.2	-5.5	-14.2
Quintile 5	23.3	20.9	18.4	17.2	-6.1	-26.2
Diff: Q1 - Q5	**44.1**	**45.8**	**47.8**	**49.5**	**5.4**	**12.3**

Data Source: Educator employment and district student characteristic files from PDE

Summary

Librarians serve an important purpose in all schools, from helping students learn how to read in elementary schools to teaching older students how to navigate the vast amounts of information available to individuals. Research, in fact, suggests librarians improve student outcomes. As shown above, children enrolled in the poorest districts and the districts serving the most economically disadvantaged students are less likely to have access to a full-time librarian. This disadvantages the very children most in need of access to a librarian.

Conclusion

As I have shown in this study, the Commonwealth of Pennsylvania has created a system of education that inequitably distributes access to teachers, principals, counselors, and librarians. Specifically, students enrolled in the poorest districts and districts serving the highest percentages of economically disadvantaged students have less access to well-qualified teachers, teachers and principals who remain for extended times at the same school, counselors with an appropriate case load of students, and full-time librarians. This inequitable access to educators ensures that not all children in Pennsylvania have an equal opportunity to learn. In fact, the education system in Pennsylvania as currently constructed, ensures that the most disadvantaged students are further disadvantaged by having less access to the types of human resources necessary to flourish academically. To create a truly equitable system of education, the Commonwealth would need to adopt strategies to increase the production of teachers and provide additional revenue to districts serving the neediest students such that each district in Pennsylvania had an equal chance at recruiting and retaining effective teachers, principals, counselors, librarians, and other educators. Without such efforts, the Commonwealth will continue to support and foster a system of "haves" and "have nots" that depends largely on the zip code in which a student lives.

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Appendix A: Identification of Beginning teachers

To identify teachers as beginning teachers, the researchers relied on PDE employment data from 2012-13 through 2017-18. The data identified the years of education experience for each individual. As defined by PDE, a beginning teacher should be in their first year of being employed as an educator which is denoted as a "1" in the educator experience data submitted by districts to the state through the Teacher Information Management System (TIMS).

Unfortunately, there were two issues that made this information inaccurate in the PDE data. Actual examples from the PDE data are shown below in Table A-1 to reveal these issues. The first column includes a teacher identifier, the next six columns contain the original experience data for each of six academic years, and the final six columns contain the modified experience data for the same six academic years.

The first of the two major errors with the experience data was that there was data entry error. For example, the years of experience entry for teacher 32 in Table A-1 was incorrect for the 2017-18 academic year. The data for the four prior years suggested the years of experience for the 2017-18 academic year should be "5". This change is reflected in the "revised experience data" column for 2017-18 where a "4" was replaced with a "5".

The second type of error stemmed from the discretion districts have in recognizing a teacher's years of experience. In Pennsylvania and other states, districts can choose to recognize or ignore an individual's teaching experience in districts outside of the Commonwealth. Further, a district has discretion about whether to grant prior work experience to teachers transferring from private schools into public schools. In short, districts have some discretion in recognizing an individual's years of experience as an educator.

This discretion can be problematic in identifying a beginning teacher. For example, a district could choose to not recognize an individual's experience in another district. Thus, the individual's historic record of years of experience over a five-year time span could be 1, 2, 3, 9, 10 (see teacher 21 below in Table A-1) where the individual changed districts after year three and the second district recognized the individual's prior experience as an educator while the first district did not. What is unclear from the data are the errors for teachers 200 through 205 below. One could make the argument that the teachers may have changed districts from 2013-14 to 2014-15 and the second district did not recognize the person's prior education experience. On the other hand, one could argue that because each of the individuals had three or four consecutive years of employment, the prior entries were simply data error. Such errors are not easily resolved.

To remove errors, I took a number of steps. When three or more consecutive years of teacher experience were correct and represented the end years of the data, such as for Teacher 32 in Table 2, I assumed the consecutive years were correct and the other entries were data error. If, on the other hand, there were two sets of consecutive data that were correct (e.g., Teacher 21), then the most recent set of data was used.

Unfortunately, because there is only had six years of data, I was forced to make many assumptions in rectifying erroneous teacher experience data. However, I have over 20 years of experience in working with individual teacher experience files in Texas, New Mexico, and Ohio. Based on my expertise—which has been reviewed by other academics and accepted in other court cases—I contend the revised data is far more accurate than the original data.

Table A-1: Examples of Problematic Teacher Experience Data in the PDE Employment Files

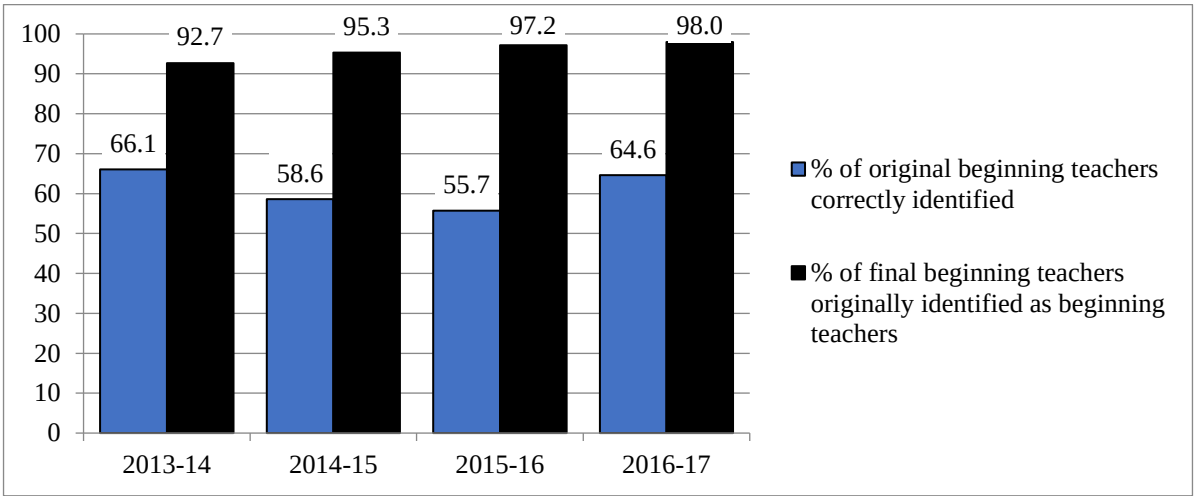
Educator Identifier	Original Experience Data						Revised Experience Data					
	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
21		1	2	3	9	10		6	7	8	9	10
32		1	2	3	4	4		1	2	3	4	5
44		1	1	3	4	6		2	3	4	5	6
67		1		8	8	8		6		7	8	9
10		1	8	9	10	11		7	8	9	10	11
104	19	1	2	2	21	22	17	18	19	20	21	22
845	1	1		2	14	15	11	12		13	14	15
200		7	1	2	4	5		1	2	3	4	5
201		8	2	3	4	5		1	2	3	4	5
202		9	8	3	4	5		1	2	3	4	5
203		9	11	3	4	5		1	2	3	4	5
204		12	2	3	4	5		1	2	3	4	5

Source: PDE Educator Employment Data

Figure A-1 below documents the changes the researchers made to the teacher experience data. The researchers found between 55.7 percent (in the 2015-16 academic year) and 66.1 percent (in the 2013-14 academic year) of the teachers originally identified as beginning teachers using PDE data did, in fact, meet the criteria for being identified as a beginning teacher. For the approximately 35 to 45 percent of the teachers incorrectly identified as beginning teachers using PDE data, an individual had more than one academic year in which s/he was listed as having one year of education experience. For example, teacher 44 in Table 2 above is identified as a beginning teacher twice—both in the 2013-14 and 2014-15 academic years. Clearly this could not be the case, thus the researchers changed the data to reflect that the teacher was very likely a beginning teacher in the 2013-14 academic year and then was in their second year in 2014-15.

The number of teachers incorrectly identified as beginning teachers in each year, starting with 2013-14, were; 9,353; 11,755; 12,025; and 7,303.

Figure A-1: Accuracy of Identification of Beginning Teachers



Data Source: PDE teacher employment data; Calculations by researchers

Appendix B: Median Beginning Teacher Salaries for 2014 through 2018 by CBSA and District Wealth (pg 1)

CBSA Name	District Wealth Quintile	Spring of Academic Year				
		2014	2015	2016	2017	2018
Allentown-Bethlehem-Easton PA-NJ	Wealthiest Quintile	$52,009	$53,616	$52,461	$54,804	$56,521
	Quintile 2	$46,781	$46,050	$48,257	$49,327	$50,330
	Quintile 3	$43,598	$43,466	$45,275	$46,914	$51,028
	Quintile 4	$38,535	$38,731		$40,850	$43,000
	Poorest Quintile	$40,905	$44,537	$48,768	$47,800	$48,660
	Total	**$11,104**	**$9,079**	**$3,693**	**$7,004**	**$7,861**
Altoona PA	Quintile 2	$39,010	$39,310	$39,010	$39,935	$41,193
	Quintile 4	$39,899	$42,520	$42,590	$42,705	$43,780
	Poorest Quintile			$40,000	$38,311	
	Total	**-$889**	**-$3,210**	**-$990**	**-$2,770**	**-$2,587**
Bloomsburg-Berwick PA	Quintile 2	$40,239	$40,048	$41,813	$41,776	$43,367
	Quintile 3	$37,422	$39,457	$40,164	$40,817	$42,639
	Total	**$2,817**	**$591**	**$1,649**	**$959**	**$728**
Bradford PA	Quintile 4	$42,131	$42,390	$44,748	$42,748	
	Poorest Quintile	$39,607	$40,378	$39,978	$39,978	$41,763
	Total	**$2,524**	**$2,012**	**$4,770**	**$2,770**	
C Rural PA	Quintile 3	$38,882	$39,837	$41,248	$42,819	$41,459
	Total					
Chambersburg-Waynesboro PA	Quintile 3	$46,843	$45,563	$49,104	$47,457	$48,985
	Quintile 4	$43,653	$46,044	$44,814	$49,862	$46,860
	Total	**$3,190**	**-$481**	**$4,290**	**-$2,405**	**$2,125**
DuBois PA	Quintile 4	$40,694	$40,951	$42,043	$41,301	$45,792
	Poorest Quintile	$36,102	$31,142	$40,000	$39,006	$39,750
	Total	**$4,592**	**$9,810**	**$2,043**	**$2,295**	**$6,041**
East Stroudsburg PA	Quintile 3	$45,649	$48,894	$47,359	$47,153	$52,485
	Quintile 4	$41,221	$43,520	$45,747	$43,500	$43,185
	Total	**$4,428**	**$5,374**	**$1,612**	**$3,653**	**$9,300**
Erie PA	Quintile 2	$45,298	$45,515	$47,074	$47,783	$47,675
	Quintile 3	$44,387	$44,924	$36,348	$45,800	$40,333
	Quintile 4	$42,870	$42,783	$43,441	$43,020	$43,850
	Poorest Quintile	$44,078	$43,628	$44,927	$43,031	$42,796
	Total	**$1,220**	**$1,886**	**$2,147**	**$4,752**	**$4,878**
Gettysburg PA	Wealthiest Quintile	$43,867	$44,685	$45,542	$45,397	$47,171
	Quintile 2	$44,044	$44,900	$46,441		$46,691
	Quintile 3	$43,539	$44,788	$46,225	$51,077	$48,277
	Quintile 4	$44,790	$46,040	$44,411	$44,626	$44,996
	Total	**-$923**	**-$1,355**	**$1,131**	**$771**	**$2,175**
Harrisburg-Carlisle PA	Wealthiest Quintile	$46,321	$44,893	$45,370	$45,595	$48,013
	Quintile 2	$44,296	$45,043	$45,734	$46,745	$47,670
	Quintile 3	$43,239	$43,576	$43,308	$45,000	$47,300
	Quintile 4	$40,513	$39,512	$41,918	$40,499	$42,882
	Poorest Quintile	$45,549	$41,799	$43,532	$45,963	$51,916
	Total	**$773**	**$3,094**	**$1,838**	**-$369**	**-$3,904**
Huntingdon PA	Quintile 3	$35,694	$36,783	$39,822	$41,680	$41,807
	Quintile 4	$33,179	$36,841	$34,693	$36,475	$36,399
	Poorest Quintile	$33,667	$36,180	$35,000	$37,225	$37,375
	Total	**$2,027**	**$603**	**$4,822**	**$4,455**	**$4,432**
Indiana PA	Quintile 2	$59,705	$51,018			$50,603
	Quintile 4	$52,352	$45,000	$47,499	$46,730	$48,740
	Poorest Quintile	$52,022	$51,053		$42,871	
	Total	**$7,683**	**-$36**			**$1,863**

Appendix B: Median Beginning Teacher Salaries for 2014 through 2018 by CBSA and District Wealth (pg 2)

CBSA Name	District Wealth Quintile	Spring of Academic Year				
		2014	2015	2016	2017	2018
Johnstown PA	Quintile 2	$41,265	$41,769		$43,055	
	Quintile 3	$37,738	$37,658	$39,439	$40,218	$41,557
	Quintile 4	$33,804	$35,088	$35,193	$35,760	$37,061
	Poorest Quintile	$31,000	$33,634	$27,899	$32,898	$27,500
	Total	**$6,738**	**$4,024**	**$11,541**	**$7,320**	**$14,057**
Lancaster PA	Wealthiest Quintile	$45,194	$46,433	$45,858	$38,839	$49,353
	Quintile 2	$44,984	$47,000	$47,623	$49,814	$49,219
	Quintile 3	$47,724	$46,875		$53,001	$52,756
	Quintile 4	$47,832	$47,614	$49,051	$50,812	$52,800
	Poorest Quintile		$36,620	$39,337	$36,215	$44,542
	Total	**-$2,638**	**$9,813**	**$6,522**	**$2,624**	**$4,811**
Lebanon PA	Quintile 2	$43,695	$44,068	$45,581	$45,554	$44,669
	Quintile 3	$43,509	$42,398	$44,101	$46,053	$45,032
	Poorest Quintile	$45,041	$45,675	$46,924	$46,420	$49,028
	Total	**-$1,346**	**-$1,607**	**-$1,343**	**-$866**	**-$4,359**
Lewisburg PA	Quintile 2	$46,179	$47,529	$47,429	$48,979	
	Quintile 3	$38,166	$36,782	$40,755	$43,250	$43,513
	Total	**$8,013**	**$10,747**	**$6,674**	**$5,729**	
Lewistown PA	Quintile 4	$34,754	$38,588	$38,998	$40,630	$41,000
	Total					
Lock Haven PA	Quintile 4	$43,689	$44,523	$45,270	$44,884	$48,220
	Total					
Meadville PA	Quintile 4	$47,915	$49,735	$49,732	$50,485	$52,856
	Poorest Quintile	$42,662	$44,609	$42,882	$43,687	$45,052
	Total	**$5,253**	**$5,126**	**$6,850**	**$6,798**	**$7,804**
N Rural PA	Wealthiest Quintile			$49,536	$60,477	
	Quintile 3	$40,427	$42,009	$41,215	$44,127	$47,566
	Quintile 4	$40,997	$41,414	$41,414	$43,293	$42,653
	Total	**-$570**	**$595**	**$8,122**	**$17,184**	**$4,914**
NE Rural PA	Wealthiest Quintile	$41,746	$42,840	$49,127	$48,422	$50,879
	Quintile 2	$44,946	$43,507	$46,497	$47,471	
	Quintile 3	$43,163		$47,138	$42,342	$41,454
	Quintile 4		$38,966	$40,000	$50,677	$47,124
	Total	**-$1,417**	**$3,874**	**$9,127**	**-$2,255**	**$3,755**
New Castle PA	Quintile 3	$42,322	$42,768	$44,142		
	Quintile 4	$43,019	$42,644	$45,324	$42,644	$41,769
	Poorest Quintile		$39,400			
	Total	**-$697**	**$3,368**	**-$1,182**		
New York-Newark-Jersey City NY-NJ-PA	Wealthiest Quintile	$47,474	$48,346	$46,939	$50,356	$49,151
	Quintile 3	$52,350	$53,276	$51,663	$52,150	$53,500
	Total	**-$4,876**	**-$4,931**	**-$4,724**	**-$1,794**	**-$4,349**
NW Rural PA	Wealthiest Quintile	$32,500			$35,259	
	Quintile 3	$32,000	$46,427	$39,214	$39,326	$35,000
	Quintile 4	$36,214	$37,757	$38,973	$34,525	$40,500
	Poorest Quintile	$33,200	$34,017	$34,667		$35,921
	Total	**-$700**	**$12,410**	**$4,547**	$734	**-$921**
Oil City PA	Quintile 4	$42,561	$45,380	$45,527	$45,630	$44,710
	Poorest Quintile	$43,842	$44,147		$43,774	$44,562
	Total	**-$1,281**	**$1,233**		**$1,856**	**$148**

Appendix B: Median Beginning Teacher Salaries for 2014 through 2018 by CBSA and District Wealth (pg 3)

CBSA Name	District Wealth Quintile	Spring of Academic Year				
		2014	2015	2016	2017	2018
Philadelphia	Wealthiest Quintile	$48,816	$49,073	$49,218	$49,600	$48,408
	Quintile 2	$48,624	$49,331	$48,543	$50,598	$50,761
	Quintile 3	$47,465	$46,482	$44,683	$48,709	$45,967
	Quintile 4	$46,493	$46,868	$46,631	$46,916	$47,514
	Poorest Quintile	$49,476	$48,287	$47,985	$50,079	$49,402
	Total	**-$660**	**$785**	**$1,233**	**-$479**	**-$994**
Pittsburgh PA	Wealthiest Quintile	$43,309	$42,691	$46,066	$47,452	$46,332
	Quintile 2	$46,809	$46,944	$46,878	$46,850	$48,240
	Quintile 3	$44,099	$43,350	$41,439	$46,562	$45,982
	Quintile 4	$41,904	$42,612	$43,805	$45,053	$42,233
	Poorest Quintile	$38,300	$38,917	$40,613	$40,500	$40,950
	Total	**$5,009**	**$3,774**	**$5,453**	**$6,952**	**$5,382**
Pottsville PA	Quintile 3	$38,500	$38,500	$38,500	$42,301	$42,665
	Quintile 4	$37,801	$38,499	$38,499	$39,808	$38,000
	Poorest Quintile	$37,769	$36,991	$35,780	$40,786	$39,617
	Total	**$731**	**$1,510**	**$2,720**	**$1,515**	**$3,049**
Reading PA	Wealthiest Quintile	$51,652			$56,786	
	Quintile 2	$45,929	$45,760	$43,533	$46,082	$46,591
	Quintile 3	$42,520	$45,096	$44,503	$44,832	$47,863
	Quintile 4	$54,600	$40,500	$41,633	$41,840	$43,982
	Poorest Quintile	$43,380	$41,547	$42,095	$41,337	$43,341
	Total	**$8,272**	**$4,213**	**$1,438**	**$15,449**	**$3,250**
Sayre PA	Quintile 3		$49,369	$50,443	$52,332	$57,182
	Quintile 4	$49,839	$50,165	$48,729	$49,345	$55,846
	Total		**-$796**	**$1,714**	**$2,987**	**$1,336**
SC Rural PA	Quintile 3	$41,164	$42,426	$35,250	$45,459	$46,227
	Quintile 4	$42,191	$36,516	$38,545	$44,599	$39,475
	Total	**-$1,027**	**$5,910**	**-$3,295**	**$860**	**$6,752**
Scranton--Wilkes-Barre--Hazleton PA	Quintile 2	$42,282	$43,017	$48,664	$46,332	$50,460
	Quintile 3	$41,812	$42,752	$42,830	$44,555	$45,595
	Quintile 4	$41,501	$41,127	$42,356	$41,518	$42,228
	Poorest Quintile	$40,355	$40,649	$38,716	$38,716	$38,377
	Total	**$1,927**	**$2,368**	**$9,948**	**$7,616**	**$12,083**
Selinsgrove PA	Quintile 4	$42,041	$47,401	$44,021		
	Total					
Somerset PA	Wealthiest Quintile	$37,949	$36,916			$37,377
	Quintile 2	$37,123	$33,911	$37,264	$34,497	
	Quintile 3	$26,000	$26,000	$26,000	$26,000	
	Quintile 4	$36,200	$35,850	$35,999	$36,000	$33,100
	Total	**$1,749**	**$1,066**			**$4,277**
St. Marys PA	Quintile 3	$41,950	$41,557	$44,362	$45,796	
	Quintile 4	$40,398	$48,841	$40,398	$42,458	$45,590
	Total	**$1,552**	**-$7,284**	**$3,964**	**$3,338**	
State College PA	Wealthiest Quintile	$44,263	$45,248	$45,964	$46,031	$49,097
	Quintile 2	$41,764	$41,070	$47,223	$45,031	$46,065
	Quintile 3	$36,830	$36,773	$38,073	$38,874	$39,106
	Total	**$7,433**	**$8,476**	**$7,891**	**$7,157**	**$9,990**
Sunbury PA	Quintile 3	$37,462	$38,792	$41,596	$42,609	
	Quintile 4	$41,566	$43,358	$43,777	$41,679	$44,765
	Poorest Quintile	$30,326	$29,282	$29,667	$35,500	$38,346
	Total	**$7,136**	**$9,510**	**$11,930**	**$7,109**	**$6,419**

Appendix B: Median Beginning Teacher Salaries for 2014 through 2018 by CBSA and District Wealth (pg 4)

CBSA Name	District Wealth Quintile	Spring of Academic Year				
		2014	2015	2016	2017	2018
SW PA	Wealthiest Quintile	$37,481	$45,563			$41,650
	Quintile 3	$33,461	$36,350	$30,675	$36,183	
	Quintile 4	$32,750	$33,738	$34,500	$33,167	$32,750
	Poorest Quintile	$35,733	$35,503	$35,770		$36,570
	Total	**$1,748**	**$10,059**			**$5,080**
Warren PA	Quintile 4	$42,525	$44,390	$44,267	$45,621	$46,335
	Total					
Williamsport PA	Quintile 2	$42,410	$43,125	$45,237	$42,375	$42,525
	Quintile 3	$42,980	$43,754	$44,750	$44,500	$44,810
	Quintile 4	$44,917	$44,293	$46,186	$46,663	$47,395
	Total	**-$2,507**	**-$1,168**	**-$949**	**-$4,288**	**-$4,870**
York-Hanover PA	Quintile 2	$50,514	$50,600	$51,528	$53,004	$53,822
	Quintile 3	$44,671	$44,622	$44,893	$47,249	$50,387
	Quintile 4	$48,468	$45,675	$49,347	$48,010	$52,444
	Poorest Quintile	$50,745	$49,544	$52,701		$59,777
	Total	**-$231**	**$1,056**	**-$1,174**	**$4,994**	**-$5,955**
Warren PA	Quintile 3	$42,419	$42,920	$43,976	$43,369	$47,007
	Quintile 4	$40,888	$40,389	$42,109	$43,240	$49,353
	Poorest Quintile	$42,286	$43,386	$47,931	$44,819	$49,048
	Total	**$133**	**-$466**	**-$3,955**	**-$1,450**	**-$2,040**