

## RESEARCH ARTICLE

---

# Exploring the Moderated Mediation of Student Demographics and Teacher Turnover or Teacher Working Conditions Effect on Student Achievement in North Carolina

Theodore Kaniuka

*Fayetteville State University*

Andrea R. Kaniuka

*Duke Center for Autism and Brain Development*

Teacher working conditions, teacher turnover, and student achievement are examined from North Carolina. For over 10 years, teacher working conditions have been used as a policy tool to better understand how these conditions are linked to school performance and teacher retention. Previous studies have examined working conditions and achievement; however, this study used a moderated mediation model to examine the when and how causal relationships of these measures. The purpose of the paper is to provide policymakers and educational leaders relevant information about the power of teacher working conditions to influence teacher turnover and student achievement, controlling for student characteristics. The results of the study show (a) current year teacher working conditions have direct effects on teacher turnover and on student performance, (b) current or previous year teacher turnover have no direct effects on student performance, and (c) teacher turnover mediates teacher working conditions on student achievement.

*Keywords:* teacher working conditions, student performance, teacher turnover

Continuing to study teachers and their relationship to student achievement is supported by the strong agreement from researchers across many disciplines that teachers account for a significant portion of the variation in student achievement (e.g., Clotfelter, Ladd, & Vigdor, 2007; Darling-Hammond & Youngs, 2002; Hanushek, Kain, & Rivkin, 1998; Ladd, 2011; Murnane & Phillips, 1981; Sanders & Rivers, 1996). Associated with this body of research is the work on teacher working conditions (TWC) and teacher turnover (TT) that have been linked such that improvement in teachers' perceptions of working conditions may affect (a) student achievement (i.e., Hirsch & Emerick, Church & Fuller 2007) and (b) the decision to leave, move, or stay (Ladd, 2011). Teacher working conditions have been defined broadly as teachers' perceptions of factors that define the working climate of the school. These conditions are defined by constructs such as teacher leadership, administrative support, and professional development (see Table 1), and turnover.

Turnover refers to the percentage of teachers who leave a school within a given year, have been linked to student achievement in ways that indicate that improvement in either or both could result in increased student performance. However, these linkages are not clear, and opinions differ regarding importance and magnitude of these relationships (Adnot, Dee, Katz, & Wyckoff, 2017; Guin, 2004, Ronfeldt, Loeb, & Wyckoff, 2013). Yet, the growing body of research does tend to suggest that as working conditions are more positive, student performance also tends to increase (Allensworth, Ponisciak & Mazzeo, 2009; Boyd et al., 2011; Johnson, Kraft, & Papay, 2012; Ladd, 2011; Loeb, Hammond, & Luczak, 2005; Marinell & Coca, 2013).

The majority of the research linking either teacher working conditions or teacher attrition to student achievement is cross-sectional in design; albeit, in some cases the data sets are quite complex and rich (Ladd, 2011). As a result, there is a paucity of research that examines these relationships over time, such that often only immediate and shorter-term effects have been investigated. Supporting this position, Berry, Smylie, and Fuller (2008) stated “survey research and others have suggested strongly that there are relationships between working conditions and certain teacher and student outcomes, little is known about the causal nexus associating independent, mediating, and dependent variables” (p. 6). While teacher success is a complex construct and has both deep personal and professional interpretations, being consistent with previous research for the purpose of this study, we define success in terms of student achievement (Fullan & Hargreaves, 1996). We will explore these relationships using a multi-stage model that depicts a current year model and then adds current and previous year variables in subsequent models to explore how and when teacher working conditions, teacher turnover, and student socioeconomic status (defined by a student’s race and income) are associated with student performance.

This study utilizes data from the 2014 administration of the North Carolina Teacher Working Conditions Survey (North Carolina Teacher Working Conditions, n.d.), two years of teacher turnover data as reported in the North Carolina School Report Cards (NC Report Cards, n.d.), and one year of student and school performance data from the North Carolina Department of Public Instruction website (NCDPI, n.d.). North Carolina has administered the TWC every two years since 2002 (Hirsch & Emerick, Church, & Fuller 2007). Given this, and the temporal effects of teacher perceptions, a two-year time frame appeared to be a consistent time span. This study will add to the body of literature on schools by providing a) a model of how and when teacher perceptions of TWC are mediated by teacher turnover and the direct and indirect effects they have on current and future student performance, and b) to what degree student characteristics moderate this relationship. It is intended that this knowledge will assist policymakers and educational leaders as they plan to allocate resources in schools by providing a model of the immediate short-term effects of manipulation of resources and policy that are designed to yield improvements in student outcomes.

## WHAT WE KNOW ABOUT TEACHER WORKING CONDITIONS

Since 2002, North Carolina has administered a bi-annual Teacher Working Conditions survey that was originally designed to assist state policymakers in addressing the predicted teacher shortage and help them better understand how working conditions are related to student performance. This body of research shows how critical it is to understand such conditions (Hanushek & Rivkin, 2007; Steele, Hamilton, & Stecher, 2010). Considering such working conditions from a practical perspective, recent reports point to a need to focus on working conditions to ameliorate teacher

turnover and the difficulty (particularly in North Carolina) in the hiring of either replacement or new teachers (Hincliff, 2019; Learning Policy Institute, 2017; North Carolina Department of Public Instruction, 2019). Recent studies have shown that assessing teacher working conditions in areas such as school leadership is significantly relevant, where the role of school principals is shown to influence teacher turnover (Kraft, Marinell, & Shen-Wei Yee, 2016; Learning Policy Institute, 2017). Furthermore, as in the case of North Carolina, where high poverty and low wealth school districts have difficulty in recruiting and retaining teachers, researchers have found that the role of the school principal is key in addressing such critical issues (Brown, & Wynn, 2009; Grissom, 2011; Simon, & Johnson, 2015). Taking the above from a policy and practitioner perspective, while these relationships have been established, little is known about the causal connections among these variables.

## Student Achievement

Consistently, since the release of the first report in 2002, research on the TWC survey results indicates that TWC are correlated with student achievement, such that in schools where teachers report higher levels of satisfaction, student test scores tend to be higher (Hirsch, 2005; Hirsch & Emerick, 2007; Hirsch & Church, 2009). In North Carolina related studies, Hirsch and others found that teachers' perceptions about teacher empowerment, instructional leadership, time, professional development, and facilities all influenced student achievement to some degree when looking at the data in aggregated fashion. For example, the results reported from the 2004 North Carolina survey analysis prompted the phrase "Teacher Working Conditions are Student Learning Conditions" (Hirsch, 2005) as a correlation between reported teacher satisfaction and school achievement was positive. Ladd (2009) supported this finding when she reported that the North Carolina teacher working conditions accounted for up to 15 percent of the variability on student performance. This relationship is not exclusive to North Carolina, as using data from other states and nationally still consistently demonstrates relationships among these variables.

Results reported by Johnson, Kraft, and Papay (2012) using data from Massachusetts showed that as teachers' perceptions for their working conditions were higher, these increased perceptions were associated with higher levels of student's achievement. Of keen interest is that this relationship existed in high-poverty, high-minority schools, suggesting that teacher perceptions are valid indicators of performance in diverse school environments. More recently, Kraft and Papay (2014) found that teachers who work in more supportive environments tend to develop skills and attributes that enable them to become more effective in increasing student achievement over time compared to teachers who report working in less supportive schools. In South Carolina, the results were similar to what was discovered in North Carolina, where teacher working conditions were found to be critical predictors of meeting federal Adequate Yearly Progress (AYP) targets and state performance measures, including on grade level and annual growth measures (Hirsch, 2005b). Results from Arizona (Berry & Fuller, 2007) paint a somewhat different and more uncertain picture. When 53 percent of the teachers participated in the survey, the relationship between working conditions and student performance gains was mixed. This seems to be in contrast with what Kraft and Papay (2014) found in Massachusetts and Hirsch in North and South Carolina (Hirsch, 2005; Hirsch, 2005b), thereby adding uncertainty on how to interpret these findings.

## Turnover and Achievement

The importance of understanding teacher turnover has both economic and student performance consequences (see Adnot, Dee, Katz, & Wyckoff, 2017). It is suggested that the financial and educational impact of teacher turnover is substantial, in terms of economic costs and negative impact on student performance (Darling-Hammond, 2011; Haynes, Maddock, & Goldrick, 2014). The state of teacher turnover in the United States was recently summarized by Golding, Taie, and Riddles (2014) who reported that during school year 2011-12, 16 percent of teachers either moved (8.3 percent) or left the profession (7.7 percent). Historically, this represents a 2.2 percent increase in the percentage of teachers leaving the profession since 1988-89, with the greatest change being from 5.6 to 7.3 percent. Compared to North Carolina, for the 2013-2014 school year, approximately 14.12 percent of the teachers either moved or left the profession. Of these, about 30 percent left the district but remained in education. In the most recent report (NCDPI, 2019), beginning teachers account for over 25% of all attrition; coupled with the documented difficulty in recruiting new teachers (see Hincliff, February 8, 2019), it is argued that understanding how working conditions affect attrition is of critical importance in North Carolina. However, not all turnover is bad and some organizational scholars posit that low turnover is associated with organization health and is necessary (Abelson & Baysinger, 1984; Meier & Hicklin, 2007). Of interest is the latter study of Texas school districts over a nine-year period, where the authors found that moderate levels of turnover were associated with slight gains in ACT and SAT scores. While others have found that any level of turnover is negatively associated with organizational performance (Park & Shaw, 2013), this finding supports continued efforts to better understand how turnover affects educational organizations.

While established as an important indicator of teacher workplace satisfaction, not all teacher turnover is attributable to working conditions alone. In several studies, researchers found that certain school characteristics, such as poverty, racial composition, low salaries, and student performance have been associated with teacher turnover (Allensworth, Ponisciak & Mazzeo, 2009; Imazeki, 2005; Loeb, Hammond, & Luczak, 2005). The phenomenon of teacher turnover has recently been framed by studying school contexts which include teacher working conditions (similar to those in the NC survey), salaries, discipline, community support, district leadership, and achievement. Taken as a whole, this body of research points to the fact that school contexts are a stronger predictor of teacher retention than individual teacher characteristics (Kraft & Papay, 2015). Related studies seem to bolster this position, as Borman and Dolwing (2008) completed a meta-analysis of 34 studies and concluded that teaching and learning conditions are more related to teachers' professional career choices, such that, teachers determine the most appealing school based on a number of factors, with working conditions being among them. In recent international studies, the association of teacher turnover and student achievement are consistent with what has been suggested in the United States. A study conducted in Norway found that, regardless of the type of separation, the impact on performance was negative (Falch & Rønning, 2007). The researchers classified teacher departure into four categories: (a) move between public schools within school districts, (b) to another school district in the same labor market region, (c) across labor market regions, and (d) whether to leave public schools. Regardless of the type of decision, in the school from which teachers left, student performance was negatively influenced. It appears, while not universally agreed upon, in many studies teachers leaving a school is, on average, an unwelcome event for students, regardless of its root causes.

## Working Conditions and Turnover

The association between teacher working conditions and teacher attrition (turnover) appear to have been well established, such that there is a clear understanding that as working conditions in general decline or at least are perceived not to be supportive, teachers tend to leave those schools for schools where they can be more successful, believe that they will receive greater administrative support, and have improved relations and collaboration with peers, school safety, and empowerment (Borman & Dowling, 2008; Boyd et al., 2011; Hirsch & Church, 2009; Johnson, Kraft, & Papay, 2012; Kraft, Marinell, & Yee, 2015; Kraft, & Papay, 2014; Ladd, 2009, 2011; Loeb, Hammond, & Luczak, 2005; New Teacher Center, 2014). These studies address several areas of interest in the broader context of teacher working conditions by presenting arguments of the potential causal relationships that may exist. Borman and Dowling (2008) in their study mention this; however, they state that discovering the nature of this relationship between these more salient school contextual characteristics does not appear to be as straightforward as establishing the more general relationships between the construct of teacher working conditions and attrition. Horng (2009) did attempt to address this proposed causal relationship but could only report that teachers are problematic in that they consciously make tradeoffs relative to school contextual factors. These tradeoffs are unique to each teacher, however, and the variability and individual nature of teacher decision-making makes establishing generalized patterns problematic, limiting actions policymakers and educational leadership can take as to what supports matter most to teachers.

A critical perspective was raised by Johnson, Kraft, and Papay (2012) when they posited that teachers leave schools where they fail to experience success in terms of student achievement. The unfortunate correlate is that many high minority, high poverty schools experience low student achievement. This association can be stated in terms of school demographics, and teachers may leave these schools not for the lack of success linked with school characteristics. It also brings to the forefront the idea of what occurs first or what has a greater influence on teacher attrition decisions – success or school demographics. A possible correlate to this is the question: in higher performing high poverty, high minority schools do teachers leave at the same rate as schools with similar wealth and racial characteristics? Johnson, Kraft, and Papay (2012) seem to offer that teachers will stay in these types of schools if certain supports are present, such as administrator leadership, collaboration with peers, and school culture. Kraft, Marinell, and Yee (2016) found that as schools improve their organizational contexts (working conditions are part of that context), teacher attrition declines and associated improvements in student performance occur at faster rates. It also has been suggested that teacher attrition not only has present effects for the year in which the leavings occur, but as Ronfeldt, Loeb, and Wyckoff (2013) provide, there are associated consequences that impinge upon the school's staff ability to generate a sustainable culture due to turnover. That is, as teachers leave, gaps occur in skills, knowledge, and teaming such that student learning is negatively affected by the loss of cultural capital and the constant rebuilding of school cultures.

The usefulness of such teacher satisfaction data has been explored, and Ladd (2011) found that as a policy tool, survey data collected in North Carolina was highly predictive of teacher planned departures, but more weakly associated with actual departures, indicating that some unaccounted for variables may be at play when actual decisions are made to leave than are captured on the survey. Alternatively, teachers actually choosing to leave a school may be dependent on a number of factors such as what they really intend to do – just leave this school or leave the profession. This seems to be supported, as Ladd (2011) found that taken as a whole, working

conditions accounted for approximately 15, 13, and 10 percent of the actual leavers at the elementary, middle and high school levels respectively, giving credence to the argument that the opportunities for employment outside of education, or in a different building, may impact how and when teachers make decisions to leave.

Both teacher working conditions and student achievement have been shown to have strong associations with student characteristics (race and wealth), such that recent working conditions results and student performance show consistent and negative associations (see NCDPI, 2019, 2018). Given these strong historical relations, it was deemed highly likely that including these data as a moderator on both TWC and turnover would yield a strong model to provide a deeper understanding of how these variables associate.

## METHODS

In an attempt to provide insight on the developmental nature of the relationships among the aforementioned variables, this study used a moderated mediation design (Hayes, 2018; Selig & Little, 2012) including an investigation of the direct and indirect effects from mediating variables (Selig & Preacher, 2009). The mediation component allowed the researcher to probe the direct and indirect relationship of teacher working conditions when mediated by teacher turnover on student achievement. While some researchers have argued that such models may imply causality, causality is more of an overall design issue (Sidman, 1960) than being attributed to a statistical approach.

### Research Questions

The following research questions were used to guide the development of the model used to analyze the data:

RQ 1. What were the current year direct and indirect effects of teacher turnover, teacher working conditions, and student performance?

RQ 2. What were the unconditional and conditional effects of teacher turnover, teacher working conditions, and school level student socio-economic data on student achievement when previous year turnover and school level student socio-economic data were considered?

### Data and Variables

The data used in this study were retrieved from two sources: a) various pages of the North Carolina Department of Public Instruction website (<http://www.dpi.state.nc.us/>) and b) the North Carolina Teacher Working Conditions staff (<http://www.ncteachingconditions.org/>). Data from the NCDPI website included a) school level performance data (performance composites), b) school level student demographics (race and wealth), and c) school report card information (annual teacher turnover).

*School Performance, Demographic and Report Card Data.* The data used to represent school-level characteristics were accessed via the NCDPI website from various locations, depending upon how the department classified the data. School performance data was defined as the composite score a school generated as part of the state testing program. The performance composite (PC) score is the percentage of student test scores in a school that are deemed as passing. In North Carolina, that is scoring high enough to be at least at Achievement Level III (proficient) (NCDPI, 2019). Percentages of minority students were calculated as the number of minority students in a school, with Asian students being considered a majority student along with Whites, as these two groups consistently score higher on tests as compared to other racial groups (see Hsin, & Xie, 2014; Reeves, & Halikias, 2017). Wealth data was derived from Title 1 reports that denote the schools served and the number of students who receive free, reduced, or full pay lunch. The preceding school-level variables were included in the model to account for the variation in test scores associated with these student-level characteristics. Teacher turnover is the percentage of teachers who left the school for that year, regardless of reason. This was considered since previously cited research (see Henry & Redding, 2018) indicated that attrition in its many forms negatively affects student performance.

*Survey Data.* The North Carolina Teacher Working Conditions (NCTWC) staff provided raw teacher working conditions bi-annual survey data for the 2014 year. According to The New Teacher Center (2014), the organization that administers and coordinates research and design activities for the Teacher Working Conditions Survey, the purpose of the survey is “to report educators’ perceptions about the presence of teaching and learning conditions organized into constructs” (p. 1). The Teacher Working Conditions survey has gone through several revisions since 2002 including the addition of new questions and constructs. It was decided that the seven constructs would be used for the basis of this study as they have been cited in the research as areas that effect teacher attrition both in North Carolina and nationally (Learning Policy Institute, 2018). The constructs used to define teacher working conditions in this study are shown in Table 1.

The technical aspects of the instruments are readily available from the NCTWC website (<http://www.ncteachingconditions.org/>). The data were aggregated at the school level, meaning any individual teacher differences were not modeled. The aggregated data represents the means for each school of the percentage of responses that were either agree or strongly agree. While aggregating the data in this manner does limit the precision of the analysis, this was necessary since the teachers complete the survey with anonymity, eliminating any possibility of linking individual teacher responses to test scores for the students they teach.

TABLE 1  
Teacher Working Conditions Constructs and Focus

Constructs	
Use of Time	Available time to plan, collaborate, provide instruction, and eliminate barriers in order to maximize instructional time during the school day
Facilities and Resources	Availability of instructional, technology, office, communication, and school resources to teachers
Community Support & Involvement	Community and parent/guardian communication and influence in the school
Managing Student Conduct	Policies and practices to address student conduct issues and ensure a safe school environment
Teacher Leadership	Teacher involvement in decisions that impact classroom and school practices
School Leadership	The ability of school leadership to create trusting, supportive environments and address teacher concerns
Professional Development	Availability and quality of learning opportunities for educators to enhance their teaching

In Table 2, the variables used in the study are summarized along with the coding/measurement of each.

### Theory of Change

The design of this model is based on the theory of change (Collins, 2006) which posits that teacher perceptions of their working conditions influence their decision to leave and that these conditions have direct effects on same-year student performance (Research Question 1). Because teacher turnover data is reported for the same year in which teachers leave, it captures two potential sources of influence on student performance. First, it captures those teachers who left during the school year. Secondly, it captures teachers who are leaving who may very well have "left" before the year is over. That is, as teachers make the decision to leave a school, they very well may become less engaged, thereby affecting student performance. In North Carolina, the majority of testing is conducted in the last 2-3 weeks of the school year, and if teachers are planning to leave, their degree of dedication may be compromised. A key weakness in this data, however, is that the timing of a teacher leaving is not modeled, and regardless of when a teacher left, it is coded the same. In addition to this immediate year effect, there may be lagged effects of teacher turnover that take several forms and a complete model should include these in its design (Research Question 2). First is the loss in investment in the teachers that leave, causing future dollars to be spent on replacing these teachers, thus reducing the funds available to schools for other activities. Second is a school contextual concern, in that there is a loss of skill, collaboration, and knowledge that impacts the year immediately following the attrition. It has been shown that new teachers are usually less experienced and capable, and it takes several years for teachers to amass the skills needed to be



successful. As Sanders and Rivers (1996) demonstrated, the effects of poor or below standard teaching can be cumulative and do have a lagged effect on students.

TABLE 2  
Summary Table of the Dependent and Independent Variables

Variable	Description	Scale
Performance Composite (PC)	The composite score of the percentage of test scores for a school at or above proficiency, school years 2013 and 2014	Continuous, 0-100
Teacher Working Conditions (TWC)	The school mean score of the percentage of responses that were either agree or strongly agree	Continuous, 0-100
Mediator		
Teacher Turnover (TT)	The percentage of teachers who left a school for 2014	Continuous, 0-100
Moderator	School demographic and wealth variables	
SES_14	Product of the percent of minority and poverty students in a school for 2014	Continuous 0-2
Covariates		
SES_13	Product of the percent of minority and poverty students in a school for 2013	Continuous 0-2
Teacher Turnover (TT)	The percentage of teachers who left a school for 2013	Continuous, 0-100

*Note.* Performance Composite was used to measure student achievement to remain consistent with how the North Carolina Department of Public Instruction reports annual school performance; School level race and poverty data (SES) has been shown to reliably predict student achievement (see Domina et al., 2018; Perry & McConney, 2010).

*Model.* A moderated mediation model, consistent with Hayes (2018) was developed to allow the researcher to examine the total TWC → TT → PC and TWC → PC, direct TWC → PC and indirect TWC → TT → PC effects of the variables of interest. The model provided for using the same moderator (school demographic) for both paths: TWC → TT and TT → PC. The first moderation path examined the potential moderating effect of socioeconomic characteristics of the school on the relation between current year TWC onto teacher turnover. The second moderation path provided a test to determine the potential moderating effect of socioeconomic characteristics on the relation between turnover and student performance.

Analyses were conducted using model 58 of “PROCESS (Version 3.1)” (Hayes, 2018) with bootstrap resampling (5,000 samples), to yield 95 percent confidence intervals of the indirect effect. Teacher turnover and student socioeconomic status from 2013 were covaried for all models,

given their impact on teacher working conditions, teacher turnover, and student performance for 2014

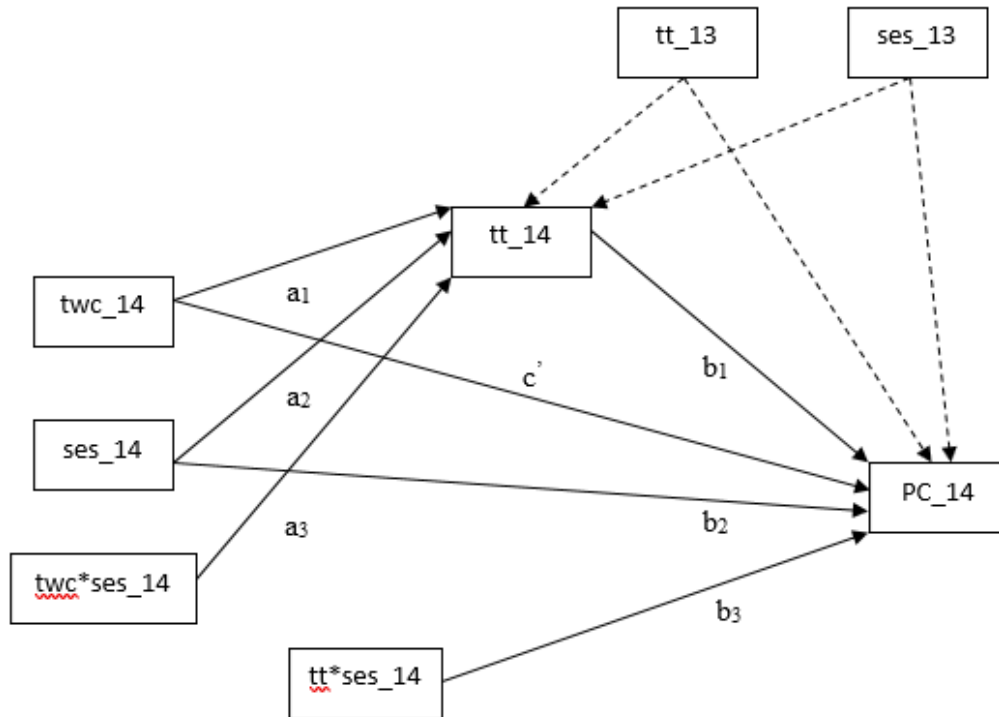


Figure 1. Regression model

Note. TT = Teacher Turnover, TWC = Teacher Working Conditions, SES = Student Socio-economic Status, and PC = School Performance Composite

## RESULTS

The results of the study are presented in this section, beginning with summary statistics on the sample and the data from the main analysis. Table 3 summarizes the descriptive statistics for the variables used in the model. As seen in the data, official teacher turnover averaged 14.09 percent, implying that over the two-year period, over 28 percent of school teachers were no longer employed as a teacher in the original school. This high rate of turnover suggests that a time period that included two TWC administrations would represent over a 50 percent turnover in staff, seriously limiting any meaningful interpretation of the results. Even the 28 percent observed rate needs to be considered in any discussion of the results.

TABLE 3  
Summary Statistics for Model Variables

Variable	Year	
	2013	2014
Teacher Turnover (TT)		
Mean	14.25	13.92
SD	0.08	0.08
Teacher Working Conditions (TWC)		
Mean		79.51
SD		0.09
Performance Composite (PC)		
Mean		57.69
SD		15.49
Socio-Economic Status (SES)		
Mean	1.07	1.12
SD	0.01	0.01

The TWC reported turnover is in parentheses and clearly shows that teachers communicated a much greater intent to leave than was actualized. The mean of 79.51 shows that nearly 80 percent of the teachers in the sample reported that they agree or strongly agree that the working conditions in their schools were supportive.

### Moderated Mediation Results

Prior to running the moderated mediation model above, a simple mediation model was run using teacher working conditions, teacher turnover, and student performance for 2014. The results are displayed in Table 4 below. This simple or base model shows how, not considering the moderating effects of race/poverty and the covariates of the full model, teacher turnover does mediate working conditions effects onto performance by about 18.7 percent.

This model demonstrates that at the most simplistic level, improved working conditions positively affect student performance and that this relationship is mediated by turnover; however, the small coefficient of determination values speak to the need for more complex modeling.

TABLE 4  
Base Models of TWC Being Mediated by Turnover

		Outcome			
		tt_14		pc_14	
		B(SE)	95% CI	B(SE)	95% CI
Constant		0.29*** (0.03)	[0.27 , 0.32]	34.41*** (2.7)	[29.03 , 39.65]
twc_14	a <sub>1</sub>   c'	-0.19*** (0.02)	[-0.23 , -0.16]	36.89*** (3.16)	[30.7 , 43.09]
tt_14	b <sub>1</sub>			-43.06*** (3.82)	[-50.56 , -35.56]
	R	0.06		0.13	
Effects		<i>B(SE)</i>		<i>p</i>	
Indirect		8.49(1.05)		<0.001	
Direct		36.9(3.16)		<0.001	

Note. \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$

The results for the regression model with bootstrapped standard errors are reported in Table 5, with both the regression for the mediator and full model being significant with  $F(5, 2216) = 112.31$ ,  $p < .001$  and  $F(6, 2215) = 682.65$ ,  $p < .001$  respectively. Additionally, the models show a strong coefficient of determination, with the final model having a value of 0.65. This is attributed to the inclusion of the socio-economic variables in the model, as student wealth and race have been shown to contribute to overall student performance. For the moderator, the predicted effect of current year teacher working conditions (TWC), both signally and with the interaction term, fail to yield significant values with respect to teacher turnover (TT). However, for the model designed to examine how and when the school performance composite (PC) is affected by these same variables, the results are significant. While the interaction of SES and TWC onto turnover is not significant, SES does interact or moderate turnover onto performance, showing that the combined effect is negative. The direct effect of working conditions onto performance as shown in Table 6 reveals a strong and positive effect, implying that as teacher view their conditions more favorably, student performance is expected to improve. Returning to Table 4, the predicted coefficients for socio-economics and turnover appear to be counter intuitive, where the current year socio-economic predicted coefficient is positive. Caution is suggested to avoid examining these in isolation. The results for the conditional effects as shown in Tables 6 and 7 are of import and central to the study.

TABLE 5  
Moderated Mediation Model Regression Results

		Outcome			
		tt_14		pc_14	
		B(SE)	95% CI	B(SE)	95% CI
Constant		0.11** (0.04)	[0.04 , 0.18]	69.17*** (2.09)	[65.07 , 73.27]
twc_14	a <sub>1</sub>   c'	-0.07(0.05)	[-0.16 , 0.02]	16.09*** (2.07)	[12.04 , 20.15]
tt_14	b <sub>1</sub>			15.92* (7.11)	[1.98 , 29.87]
ses_14	a <sub>2</sub>   b <sup>2</sup>	0.06~(0.04)	[-0.01 , 0.13]	12.29*** (3.15)	[6.11 , 18.47]
ses_14_twc	a <sub>3</sub>	-0.03(0.04)	[-0.1 , 0.03]		
ses_14_tt	b <sub>3</sub>			-17.79*** (5.29)	[-28.17 , -7.43]
Covariates					
ses_13		0.002(0.02)	[-0.04 , 0.05]	-35.88*** (3.06)	[-41.89 , -29.86]
tt_13		0.28*** (0.02)	[0.24 , 0.32]	8.74*** (2.63)	[3.59 , 13.89]
	R	0.45		0.81	
		Test of unconditional interaction		Test of unconditional interaction	
		ses_14_twc		ses_14_tt	
		R <sup>2</sup> change	p	R <sup>2</sup> change	p
		<0.001	0.32	0.002	<0.001

Note. \*\*\*  $p < .001$ , \*\*  $p < 0.01$ , \*  $p < .05$ , ~  $p < .1$

In Table 6, it is seen that current year socioeconomics (SES) controlled for previous year socioeconomics, and that turnover affects how working conditions predict student performance. As shown in Table 5, when the effect of SES is examined +/- a standard deviation about the mean, it is observed that lower levels of the variable yield predicted values that are not significant, but do behave as expected. That is, as SES is lower – meaning fewer minority and economically disadvantaged students – the moderating effects are positive and only become negative at the mean and above. It is clear that as schools have greater percentages of poor and minority students, this moderates the influence of working conditions, such that more positive working conditions fail to negate the moderating effects of race and poverty in schools.

TABLE 6  
Conditional Effects of the Focal Predictor at Values of the Moderator

Value of ses_14	B(SE)	95% CI
0.64 (mean-1 SD)	4.56(4.18)	[-3.62 , 12.75]
1.04 (mean)	-2.57(2.89)	[-8.22 , 3.07]
1.65 (mean + 1 SD)	-13.49*** (3.42)	[-20.19 , -6.79]

Note. \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$

The above outcome is shown in Table 7 where the direct and indirect effects are shown. It is seen that working conditions do have a significant and strong direct effect on student performance and the indirect effects are mediated through turnover and moderated by race and wealth.

TABLE 7  
Direct and Indirect Effects of Teacher Working Conditions on School Performance

	B(SE)	95% CI
Direct Effect	16.09*** (2.07)	[12.04 , 20.15]
Indirect Effect		
0.64 (mean-1 SD)	-0.41(0.41)	[-1.24 , 0.41]
1.04 (mean)	0.27(0.37)	[-0.39 , 1.07]
1.65 (mean + 1 SD)	1.69*** (0.65)	[0.59 , 3.11]

Note. \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$

The proportion of teacher working conditions that are mediated in the moderated mediation model are 11.02 percent, a reduction compared to the base model. This implies that the full model shows working conditions having a smaller direct/total effect on performance as compared to the base model as the ratio of direct to total for the base was 1.23 and for the full 1.1.

## DISCUSSION

Simply, teacher working conditions matter and understanding how teachers perceive the working climate of a school has immediate and subsequent year effects on student performance and longer-term effects on teacher turnover. As the analysis shows, it is no surprise that schools with superior teacher working conditions (TWC) survey results tend to be predicted to have higher achievement, even when accounting for socio-economic differences. Furthermore, the model proposes a causal relationship between teacher perceptions and school performance, and that previous year turnover also contributes to current year performance outcomes and turnover. This supports the idea that the effect of how teachers perceive current year working conditions are important; however, previous year turnover and performance matter as well. Importantly, this study supports previous

studies (Hirsch & Church, 2009; Hirsch, Emerick, with Church, & Fuller, 2007; Hirsch, 2005; Ladd, 2009; Ladd, 2011), as it shows a relationship between TWC and PCs, considering the influence of student race and wealth.

The first regression for the full model showed that student socioeconomic characteristics did not have a significant predicted coefficient onto teacher turnover, either directly or as it moderated the relationship with teacher working conditions. As seen above, this did change when the full model explored how student performance is influenced by the direct and indirect effects of teacher working conditions. Whereas student SES does moderate the effect of how turnover impacts performance as greater percentages of economically disadvantaged and minority students are represented in a school, turnover effects are seen as more negative, all else being equal. The models do tend to show that when SES is considered, this measure does influence the relationship between teacher working conditions and turnover. As seen in the base model, teacher working conditions did significantly influence turnover, but in the more complex models, this was no longer the outcome and working conditions only had an effect when SES became more acute. The effect of the mediator variable teacher turnover shows that, as working conditions are mediated by turnover, a one-unit change in working conditions provides a positive and significant change onto student performance under very restrictive conditions given the effect of the moderator, SES. The model shows that only when SES is above the mean for the sample, and in this case one full standard deviation above, is the indirect effect positive and significant. This finding suggests working conditions may matter more in schools with higher levels of poverty or minority students – that is how teachers perceive their environment and the consequences thereof is sensitive to the context in which these teachers work. More fully, as schools become more diverse and serve greater percentages of either poor or minority students, or both, how teachers perceive their working conditions, as mediated by turnover, is important. Teachers leave schools and this leaving has been argued to be a negative influence on student performance, but this negative effect can be ameliorated in these poorer, more racially diverse schools, if and when working conditions are perceived as favorable.

## Policy Implications

It is clear that the results from the TWC survey can be seen as a meaningful policy tool if policymakers examine the multi-year ramifications of such efforts to improve schools in a more complex manner than illustrated in the base model. Extending this further, the idea of lagged effects may make sense and has been investigated in economics, biology, demography, political science, and business and management (e.g., Benton, Plaistow & Coulson, 2006; Eveland & Thompson, 2006; Hannon & Ruth, 2014; Leeflang, Wittink, Wedel, & Naert, 2013; Sims, 1980). In the current study, these one-year lagged effects are shown as important, as current-year actions have measurable immediate effects, but delayed impacts are also present. This phenomenon may be related to the outcomes Henry and Redding (2018) found, as when teachers leave matters as their work examined same year attrition and the time within the year teachers left. This current study extends this by showing turnover, no matter when it occurs, matters, and more fully previous year turnover has effects in the year that it occurred and the effects persist in the subsequent year. Clearly, as demonstrated in literature examining employee turnover in other organizations (Hom, Lee, Shaw, & Hausknecht, 2017), turnover is inevitable, despite changes in working conditions, and in the case of schools, other factors may influence teachers' decisions to leave which are not

captured in this survey (see Bonhomme, Jolivet, & Leuven, 2016). Previous year turnover is a strong predictor of current year outcomes, especially more so when actual turnover is considered.

Implications for educational leadership include (a) in simple terms, teacher working conditions do matter for teacher turnover and student achievement, (b) when the models become more representative of the complex nature of schools, the value of teacher working conditions as a tool to guide policy with regard to how such conditions affect turnover remain clear, and claiming teacher working conditions are student learning conditions remains valid. Ladd (2011) stated the following "...that policymakers would do well to pay far more attention to working conditions than they have to date and to provide a strong rationale for periodic surveys of teachers" (p. 36). This plea seemed to have been heeded when the evaluation of principals was revised in 2010 to include the analysis of working conditions by school principals as an important school improvement tool (NCDPI, Educator Effectiveness Model, 2018). This study supports this view as perceptions matter, especially those of teachers, in determining school performance and how departure decisions cause changes in student performance.

Recent research into the area of how school administration can and does influence teacher attrition shows that state and local school districts can positively affect school environments and teacher attrition by implementing policies and procedures (see Burkhauser, 2017; Kraft, Marinell, & Shen-Wei Yee, 2016). In North Carolina at least, it is clear that the voice of the teacher has been heard and policymakers have adjusted certain aspects of the system that indicate the importance of teacher opinions. The importance of the voice of the teacher is reflected in the 2010 revision of the school executive annual evaluation instrument used in North Carolina (NCDPI, 2015). The intent is clear, as the revised evaluation manual clearly states that the principal "Utilizes data from the NC Teacher Working Conditions Survey in developing the framework for continual improvement in the School Improvement Plan" (p. 12). It is therefore incumbent on school and district-level administrators to have a strong sense of teacher satisfaction as an important component of school improvement planning. This sentiment is reflected in the work of Podolsky, Kini, Bishop, & Darling-Hammond, (2016) as they discuss ways the teacher shortage and associated attrition can be addressed through the use of federal resources at the state and local levels. Of the recommendations made, improving teacher working conditions was central to their argument as was supporting principal development to improve how school administrators work with teachers and create a positive school climate. While a strong emphasis remains on test scores as a measure of a good school, the evidence found in this study and others advocates that school accountability systems include measures of teacher satisfaction – as working conditions move, so does school performance.

## CONCLUSION AND LIMITATIONS

Given the findings in this study it is argued that additional research into the relationship between school contextual factors and turnover is warranted. Recent efforts have shown that understanding the complex relationship among turnover, working conditions, and performance can provide educational leadership with a more realistic conceptualization of this phenomena. It is suggested that while studying current year relationships is insightful, this tends to ignore that turnover and teacher perceived working conditions have more than one-year consequences for schools. Research needs to evolve to include the models used by Bonhomme, Jolivet, and Leuven (2016)



and Henry and Redding (2018), but also study the manner in which these relationships are casual and temporal.

Although this study did confirm and extend our understanding of how teachers perceive their working conditions by including time as a factor, it is limited by the nature of the data. In that the data is aggregated at the school level and the survey being anonymous, linking individual teacher characteristics does hamper deeper understandings of how individual teacher traits are associated with teacher turnover and student achievement. This did restrict the number and type of other factors that could be considered, which might influence these relationships. It is suggested that while securing additional teacher traits is limited, adding additional time periods may allow for an examination of trends to illustrate the long term impact of policy on the critical issues of teacher attrition and student achievement.

## REFERENCES

- Abelson, M., & Baysinger, B. (1984). Optimal and dysfunctional turnover: Toward an organizational level model. *Academy of Management Review*, 9(2), 331-341.
- Adnot, M., Dee, T., Katz, V., & Wyckoff, J. (2017). Teacher turnover, teacher quality, and student achievement in DCPS. *Educational Evaluation and Policy Analysis*, 39(1), 54-76.
- Allensworth, E., Ponisciak, S., & Mazzeo, C. (2009). The schools teachers leave: Teacher mobility in Chicago Public Schools. Chicago, IL: Consortium on Chicago School Research - University of Chicago.
- Berry, B., & Fuller, E. (2007). Stemming the tide of teacher attrition: How working conditions influence teacher career intentions and other key outcomes in Arizona. Chapel Hill, NC: Center for Teaching Quality. Retrieved from <https://eric.ed.gov/?id=ED514990>
- Berry, B., Smylie, M., & Fuller, E. (2008). Understanding teacher working conditions: A review and look to the future. Report prepared for the Spencer Foundation. Hillsborough, NC: Center for Teaching Quality.
- Benton, T. G., Plaistow, S. J., & Coulson, T. N. (2006). Complex population dynamics and complex causation: devils, details and demography. *Proceedings of the Royal Society of London B: Biological Sciences*, 273(1591), 1173-1181.
- Bonhomme, S., Jolivet, G., & Leuven, E. (2016). School characteristics and teacher turnover: Assessing the role of preferences and opportunities. *The Economic Journal*, 126(594), 1342-1371.
- Borman, G., & Dowling, N. (2008). Teacher attrition and retention: A meta-analytic and narrative review of the research. *Review of educational research*, 78(3), 367-409.
- Boyd, D., Grossman, P., Ing, M., Lankford, H., Loeb, S., & Wyckoff, J. (2011). The influence of school administrators on teacher retention decisions. *American Educational Research Journal*, 48(2), 303-333.
- Brown, K. M., & Wynn, S. R. (2009). Finding, supporting, and keeping: The role of the principal in teacher retention issues. *Leadership and Policy in Schools*, 8, 37-63.
- Burkhauser, S. (2017). How much do school principals matter when it comes to teacher working conditions? *Educational Evaluation and Policy Analysis*, 39(1), 126-145.
- Clotfelter, C., Ladd, S., & Vigdor, J. (2007). Teacher credentials and student achievement in high schools: A cross-subject analysis with student fixed effects. Working Paper 11. Washington, DC: CALDER.
- Collins, L. M. (2006). Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. *Annual Review of Psychology*, 57, 505-528.
- Darling-Hammond, L. (2011). Recruiting and retaining teachers: What matters most and what can government do? The Forum for Education and Democracy. Retrieved from <https://www.help.senate.gov/imo/media/doc/Darling-Hammond.pdf>
- Darling-Hammond, L., & Youngs, P. (2002). Defining highly qualified teachers: What does scientifically-based research actually tell us? *Educational Researcher*, 31(9), 13-25.
- Domina, T., Pharris-Ciurej, N., Penner, A. M., Penner, E. K., Brummet, Q., Porter, S. R., & Sanabria, T. (2018). Is free and reduced price lunch a valid measure of educational disadvantage? *Educational Researcher*, 47(9), 539-555. <https://doi.org/10.3102/0013189X18797609>

- Eveland, W. P., & Thomson, T. (2006). Is it talking, thinking, or both? A lagged dependent variable model of discussion effects on political knowledge. *Journal of Communication*, 56(3), 523-542.
- Falch, T., & Rønning, M. (2007). The influence of student achievement on teacher turnover. *Education Economics*, 15(2), 177-202.
- Fullan, M., & Hargreaves, A. (1996). What's worth fighting for in your school? Revised edition. Teachers College Press, 1234 Amsterdam Avenue, New York, NY 10027.
- Goldring, R., Taie, S., & Riddles, M. (2014). Teacher attrition and mobility: Results from the 2012–13 teacher follow-up survey (NCES 2014-077). U.S. Department of Education. Washington, DC: National Center for Education Statistics. Retrieved from <http://nces.ed.gov/pubsearch>
- Grissom, J. A. (2011). Can good principals keep teachers in disadvantaged schools? Linking principal effectiveness to teacher satisfaction and turnover in hard-to-staff environments. *Teachers College Record*, 113(11), 2552-2585.
- Guin, K. (2004). Chronic teacher turnover in urban elementary schools. *Educational Evaluation and Policy Analysis*, 12(42), 1-25.
- Hannon, B., & Ruth, M. (2014). Modeling dynamic biological systems. New York, NY: Springer International Publishing.
- Hanushek, E. A., & Rivkin, S. G. (2007). Pay, working conditions, and teacher quality. *The Future of Children*, 17(1), 69-86.
- Hanushek, E., Kain, J. & Rivkin, S. (1998). Teachers, schools, and academic achievement. Working Paper 6691. Cambridge, MA: National Bureau of Economic Research.
- Hayes, A. (2018). Partial, conditional, and moderated mediation: Quantification, inference, and interpretation. *Communication Monographs*, 85(1), 4-40.
- Haynes, M., Maddock, A., & Goldrick, L. (2014). On the path to equity: Improving the effectiveness of beginning teachers. Alliance for Excellent Education. Retrieved from <http://all4ed.org/wp-content/uploads/2014/07/PathToEquity.pdf>
- Henry, G. T., & Redding, C. (2018). The consequences of leaving school early: The effects of within-year and end-of-year teacher turnover. *Education Finance and Policy*, 1-52.
- Hincliff, (February 8, 2019). NC public schools 'having real trouble finding elementary teachers'. Retrieved from: <https://www.wral.com/nc-public-schools-having-real-trouble-finding-elementary-teachers/18173967/>
- Hirsch, E., & Church, K. (2009). *North Carolina Teacher Working Conditions Survey Brief: Teacher working conditions are student learning conditions*. Santa Cruz, CA: New Teacher Center.
- Hirsch, E., Emerick, S., Church, K. & Fuller, E. (2007). Teacher working conditions are student learning Conditions: A report on the 2006 North Carolina Teacher Working Conditions Survey. Hillsborough, NC: Center for Teaching Quality. Retrieved from <https://files.eric.ed.gov/fulltext/ED498770.pdf>
- Hirsch, E. (2005). Teacher working conditions are student learning conditions: A report to Governor Mike Easley on the 2004 North Carolina Teacher Working Conditions Survey. Chapel Hill, NC: Southeast Center for Teaching Quality. Retrieved from <https://nepc.colorado.edu/sites/default/files/EPRU-0504-110-OWI.pdf>
- Hirsch, E. (2005b). Listening to the experts: A report on the 2004 South Carolina Working Conditions Survey. Chapel Hill, NC: Southeast Center for Teaching Quality - University of North Carolina. Retrieved from <https://eric.ed.gov/?id=ED485956>
- Hom, P. W., Lee, T. W., Shaw, J. D., & Hausknecht, J. P. (2017). One hundred years of employee turnover theory and research. *Journal of Applied Psychology*, 102(3), 530-545.
- Hornig, E. (2009). Teacher tradeoffs: Disentangling teachers' preferences for working conditions and student demographics. *American Educational Research Journal*, 46, 690-717.
- Hsin, A., & Xie, Y. (2014). Explaining Asian Americans' academic advantage over whites. *Proceedings of the National Academy of Sciences*, 111(23), 8416-8421.
- Imazeki, J. (2005). Teacher salaries and teacher attrition. *Economics of Education Review*, 24(4), 431-449.
- Johnson, S. M., Kraft, M. A., & Papay, J. P. (2012). How context matters in high-need schools: The effects of teachers' working conditions on their professional satisfaction and their students' achievement. *Teachers College Record*, 114(10), 1-39.
- Kraft, M. A., Marinell, W. H., & Shen-Wei Yee, D. (2016). School organizational contexts, teacher turnover, and student achievement: Evidence from panel data. *American Educational Research Journal*, 53(5), 1411-1449.
- Kraft, M. A., & Papay, J. P. (2014, Jan. 30). Can professional environments in schools promote teacher development? Explaining heterogeneity in returns to teaching experience. *Educational Evaluation and Policy Analysis*, 36(4), 476–500.

- Ladd, H. F. (2011). Teachers' perceptions of their working conditions how predictive of planned and actual teacher movement? *Educational Evaluation and Policy Analysis*, 33(2), 235-261.
- Ladd, H. F. (2009). Teachers' Perceptions of Their Working Conditions: How Predictive of Policy-Relevant Outcomes? Working Paper 33. National Center for Analysis of Longitudinal Data in Education Research.
- Learning Policy Institute. (August 24, 2018). Understanding Teacher Shortages: 2018 Update A State-by-State Analysis of the Factors Influencing Teacher Supply, Demand, and Equity. Retrieved from <https://learningpolicyinstitute.org/product/understanding-teacher-shortages-interactive>
- Learning Policy Institute. (2017). The Role of Principals in Addressing Teacher Shortages (research brief). Palo Alto, CA: Learning Policy Institute.
- Leeftang, P. S., Wittink, D. R., Wedel, M., & Naert, P. A. (2013). Building models for marketing decisions (Vol. 9). Springer Science & Business Media.
- Loeb, S., Darling-Hammond, L., & Luczak, J. (2005). How teaching conditions predict teacher turnover in California schools. *Peabody Journal of Education*, 80(3), 44-70.
- Lortie, D. C. (1975). *Schoolteacher: A sociological study*. Chicago: University of Chicago Press.
- Marinell, W. H., & Coca, V. M. (2013). Who stays and who leaves? Findings from a three-part study of teacher turnover in NYC middle schools. A report from the Research Alliance for New York City Schools, New York University
- Meier, K. J., & Hicklin, A. (2007). Employee turnover and organizational performance: Testing a hypothesis from classical public administration. *Journal of Public Administration Research and Theory*, 18, 573-590.
- Murnane, R., & Phillips, B. (1981). What do effective teachers of inner-city children have in common? *Social Science Research*, 10, 83-100.
- New Teacher Center. (2014). Student Achievement and Teacher Attrition Analyses. North Carolina Teacher Working Conditions. Retrieved from: [http://www.ncteachingconditions.org/uploads/File/NC14\\_brief\\_ach\\_retent.pdf](http://www.ncteachingconditions.org/uploads/File/NC14_brief_ach_retent.pdf)
- North Carolina Department of Public Instruction. (February 15, 2019). 2017-2018: The State of the teaching profession in North Carolina. Report to the General Assembly, North Carolina Department of Public Instruction.
- North Carolina Department of Public Instruction (2019). Achievement level Information. Retrieved from: <http://www.dpi.state.nc.us/accountability/testing/shared/achievelevel/>
- North Carolina Department of Public Instruction. (2018). Educator Effectiveness Model. Retrieved from: <http://www.ncpublicschools.org/effectiveness-model/ncees/instruments/>
- North Carolina Department of Instruction. (2015). North Carolina School Executive: Principal and Assistant Principal Evaluation Process. Retrieved from: <http://www.ncpublicschools.org/docs/effectiveness-model/ncees/principals/materials/principal-manual.pdf>
- North Carolina Teacher Working Conditions Initiative. (n.d.) Retrieved from: <https://ncteachingconditions.org/index>.
- Park, T. Y., & Shaw, J. D. (2013). Turnover rates and organizational performance: A meta-analysis. *Journal of Applied Psychology*, 98(2), 268.
- Perry, L. B., & McConney, A. (2010). Does the SES of the school matter? An examination of socioeconomic status and student achievement using PISA 2003. *Teachers College Record*, 112(4), 1137-1162.
- Podolsky, A., Kini, T., Bishop, J., & Darling-Hammond, L. (2016). Solving the teacher shortage: How to attract and retain excellent educators. Palo Alto, CA: Learning Policy Institute. Retrieved October, 29, 2017.
- Reeves, R., & Halikias, D. (2017). *Race gaps in SAT scores highlight inequality and hinder upward mobility*. Washington: Brookings Institution.
- Ronfeldt, M., Loeb, S., & Wyckoff, J. (2013). How teacher turnover harms student achievement. *American Educational Research Journal*, 50(1), 4-36.
- Sanders, W., & Rivers, J. (1996). Cumulative and residual effects of teachers on future student academic achievement. Knoxville: University of Tennessee Value-Added Research and Assessment Center.
- Selig, J. P., & Preacher, K. J. (2009). Mediation models for longitudinal data in developmental research. *Research in Human Development*, 6, 144-164.
- Selig, P., & Little, T. (2012). Autoregressive and cross-lagged panel analysis for longitudinal data. In B. Laursen & P. T. D. Little (Eds.), *Handbook of developmental research methods* (pp. 265-278). New York, NY: Guilford Press.
- Sidman, M. (1960). *Tactics of scientific research: Evaluating experimental data in psychology*. New York, NY: Basic Books.

- Simon, N. S., & Johnson, S. M. (2015). Teacher turnover in high-poverty schools: What we know and can do. *Teachers College Record, 117*(3), 1-36.
- Sims, C. A. (1980). Macroeconomics and reality. *Econometrica: Journal of the Econometric Society, 48*(1), 1-48.
- Steele, J., Hamilton, L., & Stecher, B. (2010). *Incorporating student performance measures into teacher evaluation systems*. Santa Monica, CA: RAND Corporation.