

**The Effects of the Adoption of the Four-Day Instructional Week
on Teacher Retention in Oklahoma**

Full Report

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Jeffrey Maiden, Ph.D.

Senior Researcher and Director
Institute for the Study of Education Finance
Professor of Educational Administration, Curriculum and Supervision
University of Oklahoma
maiden@ou.edu

H. Michael Crowson, Ph.D.

Researcher
Institute for the Study of Education Finance
Associate Professor of Educational Psychology
University of Oklahoma
mcrowson@ou.edu

Channa Byerly, Ph.D.

Research Associate
Institute for the Study of Education Finance
Chief Financial Officer
Duncan Public Schools Duncan, Oklahoma
channa.byerly@duncanps.org

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Teacher, Norman High School

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Introduction

A primary purpose of common education is to ensure high quality learning for all children, and this high quality is predicated on high quality teachers in classrooms. An important goal of local districts, therefore, is to both recruit promising teachers and to retain outstanding teachers. One of the most critical policy issues in education today is the attraction and retention of good teachers (Hanushek & Rivkin, 2006). An international study that included twenty-five countries listed several concerns about retaining effective teachers:

- Some countries experience high rates of teacher attrition, especially among new teachers;
- Teachers express concerns about the effects of high workloads, stress, and poor working environments on job satisfaction and teaching effectiveness;
- There are only limited means in most countries to recognize and reward teachers work;
- Processes for responding to ineffective teaching are often cumbersome and slow

Many countries face the same issues of higher expectations and demands but resources not able to keep up. Declining teacher's salaries remains one issue that that is consistent across numerous countries (OECD, p. 4, 2005).

In 2017, more than 100,000 classrooms across the United States were staffed by teachers who were unqualified to teach (Carver-Thomas & Darling-Hammond, 2017). This number does not include the thousands of districts who cannot find teachers to fill the other vacant positions. This costly problem continues to drain school districts' public tax dollars, compounding overall funding issues. Additionally, the lack of adequate educational funding is a significant problem across the United States (Leachman, Albares, Masterson, & Wallace, 2016). Low per- pupil

spending often translates into larger class sizes, fewer available resources, and less money for professional development. Teachers in these districts often feel unable to perform with the lack of adequate resources (Pogodzinski, 2014). Many districts that are strapped for available funding also have fewer human resources to provide sufficient support for teachers in the profession.

The teacher retention concern may be particularly acute in rural school districts. Over 26,000 schools exist in rural areas in the United States, and these schools educate almost ten million students (Rural schools, 2007). The reality for most of these rural districts is not only the struggle to find teachers, but also having to function with teachers who are less than qualified (Amazake & Reschovsky, 2003; Monk, 2007). One reason rural school districts struggle with teacher recruitment is lower teacher salaries, which generally lag behind those for teachers in most urban and suburban school districts (Bundt & Leland, 2001). Often these districts are faced with many challenges, including limited budgets due to modest tax bases. The deficits related to these budgets include limited revenue from business and retail sources; higher transportation cost; a lack of taxable property base; limited support for schools (bonds) through local tax increases; and limited employment opportunities within the community (Dayton 2003; Mathis, 2003). This creates even more acute recruitment and retention problem for rural school districts.

Teacher turnover is a national ongoing concern and creates multiple problems for school districts (Darling-Hammond, 2003). High teacher turnover rates in schools have been shown to impact student achievement negatively for all students in a school, disrupt the quality and stability of the school community, and cause significant financial deficit (Adnot, Dee, Katz, & Wyckoff, 2017; Darling-Hammond, 2018; Hanusheck, 2010; Ingersoll, 2001; National

Commission on Teaching and America's Future, 2016; Monk, 2007; Ronfeldt, Loeb, & Wyckoff, 2012;).

The state of Oklahoma is facing numerous funding challenges in education, and these challenges extend to retaining qualified teachers. The state currently has 525 school districts, with over 70 percent of these districts considered rural. Since 2008, state aid funding has fallen by \$213 million, while public school enrollment has increased by nearly 40,000 students (Oklahoma State Department of Education, 2018). Growing enrollment topped with decreased funding has caused the state per-pupil expenditure to drop to \$8,075 in 2018, ranking Oklahoma 49th in the nation and last in the region. With increasing enrollment, the state has experienced growth in different student populations. Since 2009, economically disadvantaged student numbers have increased by 88,665, bilingual students by 31,948 and special education students by 14,208. Studies have shown that teaching positions required to meet the needs of these students are the most difficult positions to staff, and they require additional funding to provide adequate support for learning (Oklahoma State Department of Education, 2018).

The State Department of Education released a few alarming statistics: (1) 11 out of 100 teachers leave the state or the profession every year; (2) 17 percent of new teachers leave the state or the profession every year; and (3) 10 percent of Oklahoma teachers with a decade of experience leave the state or the profession every year (Oklahoma State Department of Education, 2018). In 2019, the State Department of Education has approved 2,852 emergency certifications for individuals who do not have a degree in teaching or any experience in a classroom (Oklahoma State Department of Education, 2018). In the midst of a teacher shortage, schools are turning to teacher's assistants and paraprofessionals to help fill the gap, with

Oklahoma witnessing a 13 percent increase in the number of these positions since the fiscal year 2011 (Oklahoma Budget Hearing Presentation, 2018).

Due to the poor educational fiscal climate in Oklahoma, many schools cannot offer monetary incentives to their teachers, and therefore are compelled to be more fiscally creative. Some school districts in the state of Oklahoma are shifting to a four-day work week as a recruitment tool for teachers. Historically, small, rural schools switch to a four-day work schedule for the purpose of saving money (Plucker, Cierniak, & Chamberlin, 2012). Rural schools are particularly attracted to a four-day schedule because, during times of financial crisis, their budgets are typically reduced significantly. Rural districts usually offer lower salaries than urban districts, creating difficulty in recruiting high-quality teachers (Jimerson, 2005). “The real reason why so many school districts are resorting to a shortened calendar is that it is the only true perk they can offer to poorly paid teachers” (Reuters, 2017).

One Oklahoma Superintendent summarized the belief among many other district leaders by claiming that implementing a four-day week is “really an experiment in recruiting and retaining teachers.” She mentioned when teacher pay is substandard, “being able to give someone an increase for the work that they do, you have to find other ways to make the job worthwhile” (Wender, 2015). In Oklahoma, 47 counties have a district with a four-day school week, with approximately 20% of all school districts having adopted the format by 2018 (Oklahoma State Department of Education, 2018). A four-day work week in districts means one day of the week the school is closed. There is some argument the use of a four-day week may be harmful to the education of children; yet there is minimum research that has been conducted on the relationship between the use of four-day school weeks and student achievement (Donis-Keller & Silvernail, 2009). One study suggests there is little evidence a four-day week

compromises student academic achievement compared to a traditional five-day week (Anderson & Walker, 2015). There is even less research to determine if utilizing a four-day work week affects recruitment and retention of teachers in that district.

Teacher turnover has been shown to be higher in rural school districts, and these districts have additional difficulty in hiring highly qualified teachers (Rees, 1991; Monk, 2007). This creates a bigger problem for the state of Oklahoma, given 70 percent of Oklahoma school districts are considered rural. Over forty-five percent of all teachers in the state of Oklahoma are classified as unqualified, new teachers, or inexperienced (i.e., with three or fewer years of classroom experience, Oklahoma Equity Plan, 2018). In a state where budgets have been cut and student enrollment is continuing to increase, the concern with losing teachers is even more magnified. Districts in Oklahoma are continuously looking at ways to retain teachers when they are limited with their resources.

Study purpose

An increasing number of Oklahoma school districts are adopting four-day instructional weeks. Anecdotally and intuitively, the use of the four-day instructional week is attractive to some educators, and therefore may lead to higher levels of teacher retention. Yet the link between the use of the four-day week and retention has not been examined empirically.

Given this context, the purpose of the current study was to examine the relationship between local Oklahoma district characteristics and fiscal decisions and rates of teacher retention, with a focus of the effects of adoption of a four-day instructional week on district retention. Examining teacher retention is particularly important in Oklahoma given the increasing severity of the teacher shortage (Oklahoma Policy Institute, 2017).

Design and Results

We performed our analyses using the R packages “lme4” (Bates, Maechler, Boker, & Walker, 2015; <https://cran.r-project.org/web/packages/lme4/lme4.pdf>) and “lmerTest” (Kuznetsova, Brockhoff, Christensen, 2017; <https://cran.r-project.org/web/packages/lmerTest/lmerTest.pdf>) to test several multilevel regression models incorporating various within- and between-district predictors of teacher retention rate (i.e., percentage) spanning a five-year period (i.e., from the 2013/14 school year to the 2017/18 school year). Teacher retention rate was our level 1 outcome, which was measured yearly over the observation period. These measurements were nested within school districts (i.e., the level 2 units) – with those districts representing the population of districts within the state of Oklahoma. Level 1 predictors included (a) average teacher salary (bachelor level), (b) average extra duty pay, (c) instructional expenditures per student, (d) administrative expenditures per student, (e) average class size, (f) percentage of students within a district on free and reduced lunch and (g) a variable indicating whether a district was on a four-day week (coded 0=no, 1=yes) during a given school year. All Level 1 predictors were centered at their cluster means for inclusion in our analyses. We re-introduced the means of those variables at Level 2, thereby allowing us to assess whether any relationships between these predictors and retention rate are occurring within district (over time), between-district, or both. Additionally, this strategy allowed us to avoid potential bias in the regression slopes at Level 1 due to failure to properly account for between-district differences on those variables (see Enders & Tofighi, 2007; see also the within-between random effects model described by Bell, Fairbrother, & Jones, 2018). Finally, we included three additional district-level indicator variables at Level 2 that may account for between-district variation in retention rate: Rural (coded 0=no, 1=yes); Charter (coded 0=no, 1=yes); Proximity

(1 for a district in a county bordering another state, 0 for other districts). Degrees of freedom for the model were adjusted using the Satterthwaite method.

We modeled our data using several steps. First, we tested a null model where the district-level intercepts were specified as randomly varying to determine whether teacher retention rate varied significantly between districts. Second, we tested a basic growth curve model incorporating both linear and quadratic components as predictors to evaluate whether retention rate had changed in a linear or curvilinear fashion over the five-year observation period. Our third model included our level 1 predictors in the model. For this model, we also re-introduced the cluster (district-level) means for these predictors at Level 2. Our final model incorporated the additional Level 2 (district-level) predictors. All models were analyzed using maximum likelihood estimation. Model coefficients and fit statistics are presented in Table 1.

Model 1: Random-intercept model

Our initial model was a null model that simply allowed district-level intercepts to randomly vary. This allowed us to address the question, “Did the average retention rate for teachers vary significantly across districts over the five-year observation period?”

Based on our analysis, there was evidence of between-district variation in retention rates. The variance of the district level intercepts was statistically significant ($\sigma_I^2 = .00271$, LR $\chi^2(1) = 256.46$, $p < .001$). Moreover, the computed ICC for the model was .26 indicating substantial clustering of retention rates within districts.

Model 2: Testing for trending in retention rates across time

For the second model, we tested for evidence of trending concerning teacher retention rate over the five-year observation period. This step was taken to address the question: “Is there evidence of decreasing teacher retention over time in the state?” We regressed retention rate onto time and time in order to estimate both linear and quadratic growth parameters. The fixed effects for these parameters were non-significant, indicating no significant linear or curvilinear changes over the five-year observation period. As in Model 1, the variation in district-level intercepts was statistically significant ($\sigma_I^2 = .00270$, LR $\chi^2(1) = 257.26$, $p < .001$). Given the linear time predictor was coded zero for the initial measurement occasion, this result indicates that retention rates for the 2013/14 school year exhibited significant variation across districts. The ICC for the model was again .26, indicating substantial within-district dependence in retention rates over the years. Because the fixed effects for this model were not significant, the linear and quadratic growth parameters were not considered in subsequent models.

Model 3: Adding Level 1 predictors

For our next model, we incorporated our proposed Level 1 predictors as a set to test whether they (singularly or in combination) would account for significant variation in retention rate. Since these predictors were centered at their district-level means, we reintroduced those means for the predictors Level 2 to aid us in disentangling variation in teacher retention as a function of within-district and between-district variation on the predictors. We tested whether this model represented a significant improvement in fit relative to Model 1 (our initial baseline model, with no growth parameters included) using a likelihood ratio chi-square test. We found that, indeed, this model represented a significant improvement in fit relative to the null model, $\chi^2(14) = 91.662$, $p < .001$. Notably, none of the Level 1 predictors were significant in the model. On

Table 1

Unstandardized regression coefficients

	Model 1: Random-intercept	Model 2: Growth-curve parameters	Model 3: Level 1 predictors with means reintroduced at Level 2	Model 4: Remaining Level 2 predictors added
Intercept	0.85695*** (0.00285)	0.85795*** (0.00397)	0.70155*** (0.07027)	0.66406*** (0.07078)
L1 growth parameters				
Linear		-0.00182 (0.00188)		
Quadratic		0.00005 (0.00003)		
L1 predictors:				
Salary			1.470e-06 (1.424e-06)	
Class size			0.00342 (0.00221)	
Instructional exp.			3.307e-06 (4.858e-06)	
Administrative exp.			-0.00008 (0.00001)	
Extra duty pay			-2.232e-07 (2.159e-06)	
Free and reduced lunch			0.00926 (0.03400)	
Four day			0.01004 (0.01007)	
L2 predictors:				
Salary _ mean			4.718e-06** (1.449e-06)	4.205e-06** (1.410e-06)
Class size _ mean			-0.00080 (0.00197)	0.00190 (0.00209)
Instructional exp. _ mean			0.00001* (4.520e-06)	.00001** (4.638e-06)
Administrative exp. _ mean			-0.00008*** (.00001)	-0.00008*** (.00001)
Extra duty pay _ mean			2.829e-06 (1.717e-06)	2.237e-06 (1.704e-06)
Free and reduced lunch _ mean			-0.04459** (0.01726)	-0.04769** (0.01718)
Four day _ mean			-0.01824 (0.01163)	-0.01853 (0.01153)
Charter				-0.03849 (0.03377)
Rural				0.00813 (0.00619)
Proximity				0.01635** (0.00557)
Level 1 residual variance	0.007678	0.007666	0.007343	0.007447
Level 2 intercept variance	0.002699	0.002701	0.001872	0.001782
ICC	.260	.260	.203	.193
Num Par	3	5	17	13
Deviance (-2*LL)	-4763.273	-4766.5	-4854.935	-4875.715

Notes: * $p < .05$, ** $p < .01$, *** $p \leq .00$. The -2LL is presented in "smaller-as-better" form, meaning that models with the most negative values on these indices are preferred. Values in parentheses are standard errors. All values are rounded off to 5 decimal places. With smaller values, scientific notation is used. Level 1 predictors have been centered within clusters (districts). Level 2 "means" reflect the reintroduction of group means for level 1 predictors into the model.

the other hand, at Level 2, we found that teacher salary and instructional expenditures were significant positive predictors of retention rate. Conversely, the proportion of students on free and reduced lunch and administrative expenditures were significant negative predictors of retention rate. In general, the results indicate that variation in retention rate was a function of stable, district-level characteristics and not to time-dependent variations on our predictors. The addition of the predictors in the model accounted for roughly 4% of the variation in retention rate at Level 1 and 31% of the variation at Level 2 (see Heck, Thomas, & Tabata, 2014, for computation of “pseudo-R-square”).

Model 4: Addition of level 2 predictors

In the final model, we included our remaining district-level indicator variables reflecting whether a district is (a) charter, (b) rural, and/or (c) located in a county bordering another state. In the interest of parsimony, we removed the previous Level 1 predictors from consideration in this model. A likelihood ratio test of the omnibus effect of including our remaining predictors (while removing the previous non-significant ones) indicated that the current model represented a significant improvement in fit over Model 1 (null model): LR $\chi^2(10)=112.442$, $p<.001$. A comparison of the AIC's (i.e., Akaike Information Criterion) from Model 3 (AIC = -4820.93549) and Model 4 (AIC = -4849.80628) revealed that Model 4 fit the data better than Model 3.

As in our previous model, district-level salary and instructional expenditures were both positive and significant predictors of teacher retention rate. Similarly, district-level administrative expenditures and proportion of students on free and reduced lunch were significant negative predictors of retention rate. Of the three additional predictors proximity was a positive and significant predictor of retention rate. Apparently, teacher retention rate was

greatest in school districts that are closer to bordering states. An examination of standardized regression coefficients using the 'jtools' package (Long, 2019) in R revealed that administrative expenditures ($\beta = -.028$), proximity ($\beta = .016$), and instructional expenditures ($\beta = .015$) were the strongest predictors in the model followed by salary ($\beta = .008$).

Ancillary analyses

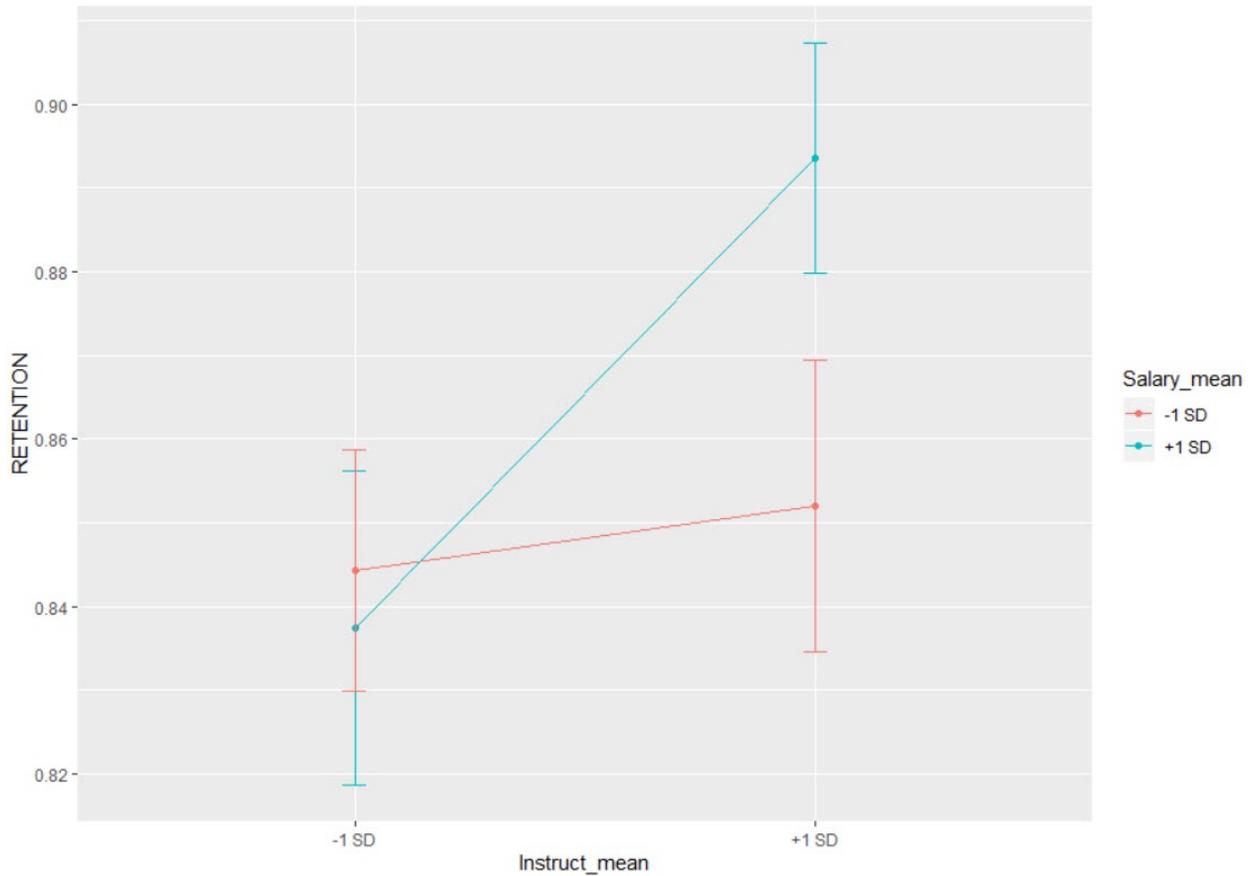
We tested a two ancillary models to explore whether district-level four-day week or teacher salary might moderate the effects of any of the remaining district-level characteristics (from Model 4) on teacher retention. When four-day week was treated as a moderator of the remaining predictors, no statistically significant interaction terms appeared. On the other hand, when salary was treated as a moderating variable, one statistically significant interaction was found. Specifically, district-level salary significantly moderated ($p=.0143$) the effect of instructional expenditures on teacher retention rate. In Figure 1 (interaction plot), we see that in districts where the amount of instructional expenditures is lower, there is no difference in retention rate for teachers who are paid more versus less. On the other hand, in districts with greater instructional expenditures, the retention rate is significantly higher for those teachers who are paid more than those who are paid less.

Discussion

The initial primary focus of the study was to determine whether the existence of the four-day instructional week was related to teacher retention in the state. There is scant research exploring whether a four-day workweek influences teacher retention, though a few studies have related a positive relationship between the two. Plucker and associates (2012) identified a few

Figure 1

Plot of simple slopes and 95% error bars for Salary_mean*Instructional_mean interaction



benefits to a four-day instructional week, linking these benefits to teachers staying within the district. Marion (2018) explored the perceptions of school personnel about the extent to which the four-day instructional week impacted retention, finding that teachers perceived the four-day workweek had a positive impact on the retention of teachers, especially in rural schools. The current study sought to determine if there were empirical linkages to the four-day week and retention.

Basically, the results indicate that the existence of the four-day instructional week had no significant predictive relationship to retention rate over time or between districts. The study

provides no evidence that implementation of the four-day week will improve teacher retention over time, controlling for other relevant predictive factors. It might be noted that a substantial number of districts did not adopt the four-day instructional week until 2017, which may affect the overall finding. Given this, additional study with a more robust number of districts operating under a four-day instructional week is needed.

Several of the findings of the current study were consistent with what one might expect given the current theoretical and empirical literature about factors affecting rates of teacher retention. Salaries of teachers with bachelor's degrees was also positively related to rates of district retention significant at the .01 level), arguably the most important single finding of the study.

Higher levels of instructional and support expenditures are related to increased teacher retention, significant at the .05 level. This finding is consistent with the literature indicating that teachers who believe they have adequate resources, mentoring, and training to be successful in the classroom are more likely to stay than leave a district (Cancio, Albrecht, & Johns, 2013; Hill, 2015; Ian, 2015; Ingersoll 2001; Kersaint, Lewis, Potter, & Meisels, 2005; Kelly, 2004). This finding is critically important in Oklahoma given the extreme cuts in per pupil funding over recent years especially, as investment choices are even more acutely important during lean years. Investment of scarce resources into the classroom may have a positive impact on quality factors such as teacher retention as well as academic achievement (Ballard and Maiden, 2017).

Conversely, administrative expenditures were inversely related to rates of retention across districts. The literature reflects that lack of administrative support is one of the main reasons teachers leave a district or the profession altogether (Boyd, Grossman, Ing, Lankford, Loeb, & Wyckoff, 2011; Cancio, Albrecht, & Johns, 2013; Marshall, 2015; Ingersoll, 2001;

Kersaint, Lewis, potter, & Meisels, 2005; Liu & Meyer, 2005; Madsen & Hancock, 2002). Of course, the current study evaluates actual dollar amounts districts spend, not the leadership quality of administrators. The amount of money expended does not necessarily equate to administrative support for teachers.

The results of this study indicate that districts with higher percentage of students who qualify for free and reduced meals experienced lower teacher retention rates across the years of the study. Increased percent of economically disadvantaged students predicted lower levels of teacher retention across districts (statistically significant at .05 in model 3 and at .01 in model 4). These results were consistent with literature indicating that districts with higher numbers of economically disadvantaged students encounter more difficulty not only recruiting teachers, but also retaining them (Allensworth, Ponisciak, & Mazzeo, 2009; Hanushek, Kain & Rivkin, 2004; Ingersoll, 2001; Ingersoll, 2004). Oklahoma includes a higher rate of students qualifying for free or reduced lunch compared to the national average (Oklahoma Policy Institute, 2018). Accordingly, this finding is critically important to educators and policy makers in the state.

There were a couple of variables demonstrating no statistical connection to teacher retention in Oklahoma that warrant commentary. Teacher retention rates in rural districts (which were examined at level 2 in model 4 of the analysis) were not significantly different from rates in non-rural districts. There is considerable academic literature indicating rural schools face greater hiring and retention challenges than their urban and suburban peers (Behrstock-Sherratt, 2016; Burton, Brown, & Johnson, 2013; Ingersoll, 2001; Monk, 2007). The nonsignificant finding in Oklahoma may be related to the imbalance of rural (about 70%) to nonrural (about 30%) of districts in the state. Clearly, more research into the rural effect is needed.

District additional extra duty pay did not yield a statistically significant contribution to predicting teacher retention. This finding held constant when both Level 1 and Level 2 variables were added to the analysis. However, extra duty pay does not affect every teacher in a school district. Therefore, the results imply that extracurricular duty pay has no relationship to teacher retention rates within the five years analyzed, irrespective of the amount paid.

Some of the findings of the current study were a bit puzzling given the academic literature. Class size did not significantly predict teacher retention in models 3 and 4. In previous research, class size has been an indicator that led to increased teacher turnover (Gallo & Beckman, 2016; Harrell, Leavell, VanTassel & McKee, 2004; Ingersoll, 2003; Loeb, Darling-Hammond & Luczak, 2005; Larrivee, 2012). In Oklahoma, statutorily defined class size limits have not been enforced due to decreased funding. Therefore, throughout years of downwardly spiraling budgets districts have dealt with larger class sizes across districts throughout the state, perhaps partially explaining the counterintuitive result. Given this finding, more intensive examination of the class size effect on teacher retention is needed to shed light on this finding.

Perhaps the most exacerbating finding of the study is that districts proximal to state borders enjoyed significantly *higher* rates of retention compared to non-proximal districts. The result is especially inscrutable given the fact that during the years of the study all neighboring states included higher rates of teacher pay. Perhaps the result is tied to the recruitment of teachers, and that proximal districts necessarily must recruit teachers that are more naturally inclined to remain in the district. Certainly, a great deal of additional research is needed to fully understand this result.

Recommendations

We offer three recommendations to policy makers and practitioners based on the results of the current study;

1. There is an anecdotal perception that the existence of a four-day instructional week may be a tool for both teacher recruitment and teacher retention. However, our study offers no empirical evidence to support the use of the four-day instructional week as a district policy intended to improve teacher retention.
2. The current study clearly indicates teacher salaries are positively related to teacher retention across Oklahoma school districts over the five years of the study. Teacher retention (and recruitment) is a critical issue in Oklahoma, as evidenced by the exponentially increasing rates of emergency certified teachers. Therefore, we strongly recommend that the Legislature, state policy makers and practitioners continue the trend (emerging from the teacher walk out of 2018) of implementing and financially supporting teacher pay raises.
3. There is evidence to suggest that resources devoted to the classroom is positively impacting teacher retention rates across Oklahoma school districts. We repeat the recommendation made by Ballard and Maiden (2017) that districts invest as many resources into classroom instruction as possible. Ballard and Maiden (2017) recommended increasing classroom resources because of its relationship to student achievement. The current study buttresses this recommendation based on the positive effects on teacher retention.

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