Individual and Organizational Moderators of Induction Program Effects in Texas With an Additional Focus on Induction Effect Duration

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Introduction

This study analyzes a dataset of Texas novice teachers to examine how the effects of induction programs are moderated by teacher and school characteristics. The *raison d'être* for induction programs is often to soften the stark contrast between the demands and working conditions of teaching and neophytes' preconceptions and motivations surrounding teaching (Lortie, 1975). By providing a variety of supports to novice teachers, these programs are intended to assist novice teachers' transition into the workplace and reduce teacher turnover rates. Teacher induction programs have received widespread validation from teachers, policymakers and educational researchers; however, our understanding of their effects on teachers is limited, particularly our knowledge of whether their impact is contingent upon contextual and individual variables (Feiman-Nemser, Schwille, Carver & Yusko, 1998).

Only recently have large datasets on teacher induction made possible quasi-experimental analysis of individual and context effects. While very recent studies using national datasets to study induction effects have emerged (e.g. Fuller 2003; Smith and Ingersol, 2004; Cohen, 2005a), studies that examine how organizational and teacher characteristics moderate (or adjust) induction program effects remain rare. Specifically, this study will examine how teachers' initial preparedness and other school characteristics might relate to induction program effects, after examining the overall rates at which the programs increase retention. The analyses presented here follow Fuller's (2003) descriptive analyses TxBESS data, offer new research questions, and utilize different analytic methods.

The problems new teachers experience in public schools, and the purposes of induction programs (i.e. their mission to reduce attrition), frame this analysis as a policy study that seeks to improve knowledge of how induction programs function for different demographic and professional groups of teachers in various organizational contexts. As a policy study, the analysis explores the possible effects of one induction program in policy-relevant contexts. Policymakers may find these results useful in designing induction programs and in considering factors that have some relationship to induction program effects on teacher turnover.

The TxBESS Initiative

Texas Beginning Educator Support System (TxBESS), an initiative of the Texas State Board for Educator Certification (SBEC), is designed to provide systematic support for beginning teachers in their first and second years of teaching. In 1999, a committee of educators from Texas public schools and educator preparation programs developed the TxBESS, which consists of performance standards and a developmental continuum that show beginning teachers how to build knowledge and skills sets necessary for teaching. The standards also define what beginning teachers in Texas should know and be able to accomplish. Additionally, the framework reflects the research-based standards of teaching described in *Enhancing Professional Practice: A Framework for Teaching* by Charlotte Danielson (1996).

The TxBESS Performance Standards are grouped into four clusters. The purpose of these clusters is to promote reflective and professional practice that results in high levels of student learning. Each cluster is both individually important and intertwined with the others. As a beginning teacher moves through the clusters and standards he/she is expected to grow in and out of the classroom. The following is a brief synopsis of each cluster and the standards provided within them:

Cluster 1: Planning for Learner-Centered Instruction

Cluster 1 focuses on how the teacher organizes the curriculum and designs the instruction. Cluster 1 concerns all aspects of instructional planning, such as the teacher's knowledge of content and pedagogy, as well as the teacher's understanding and appreciation for students and what they contribute to the learning experience.

Cluster 2: Classroom Environment that Promotes Equity, Excellence, and Learning

Cluster 2 focuses on classroom interactions. This cluster elaborates on the teacher's responsibilities with respect to the elements of a classroom environment. The teacher who excels in Cluster 2 respects students' interests, concerns, and intellectual abilities. In turn, students regard their teacher as a knowledgeable and caring adult with whom they can build a strong and trusting relationship.

Cluster 3: Instruction and Communication

Cluster 3 contains the standards that are at the heart of teaching. In this cluster, teachers learn to be compelling communicators and help students gain a better understanding of specific knowledge and skills. Further, Cluster 3 provides for the teacher to use his or her knowledge of content, content-specific pedagogy, and personal relationships skills to create a respectful and safe learning environment in that promotes students learning.

Cluster 4: Professionalism

The standards in Cluster 4 are generally those associated with a true professional educator. These standards encompass teacher roles outside the classroom. Cluster 4 includes teachers' reflections on skills outlined in Clusters 1, 2, and 3. These reflections are critical for making improvements to future planning, instruction, and assessment.

The Correlates of the Induction Solution

This study examines school size and teacher qualifications as important controls on the effect of TxBESS. In general, larger school sizes are associated with lower levels of teacher collaboration and commitment. For instance, Bryk and Driscoll (1988) discovered that smaller schools had more cohesive professional cultures than larger schools. Similarly, higher levels of teachers' commitment have been associated with smaller district size (Reyes, 1989). Since Roseholtz (1989) makes clear that such normative conditions are essential to quality workplaces, it follows that larger schools might have environments that counteract the positive impact of induction programs and make it more difficult to connect novice teachers positively to the workplace.

Research also has found that teacher education and certification status impact teachers' instructional outcomes, particularly in terms of student achievement. Although the research base on out-of-field teaching is generally limited to descriptions of its occurrence (Ringstaff & Sandholtz, 2002), there is some evidence that out-of-field teachers are more likely than other teachers to find it challenging to improve their teaching. Little (1999) clarified the great importance of matching new teachers to teaching assignments that promote their professional development; such assignments

carefully consider a novice's knowledge and experience, such as their area of certification. In the same vein, Hawk, Coble and Swanson (1985) found that out-of-field teachers were more likely to have poorer instructional skills than infield teachers. In terms of their subject matter preparation, teachers who hold a master's degree in their teaching assignment are more able to select and structure the content and pedagogy of their lessons (Shulman, 1986). In short, the knowledge teachers acquire in certification programs, and through acquiring advanced degrees, prepares teachers to better gear their instruction to curriculum standards and improve student achievement. Based on this research that suggests a link between teacher education certification status and positive teacher outcomes, it seems possible that induction program goals may have some ties to the type of certification and content preparation that novices bring to their first teaching experiences.

Data and Method

Data

The study utilizes several data sets available from the Texas Education Agency. The data sets were merged together at the teacher level such that TxBESS participation information, teacher demographics, school information and attrition rates could be calculated across a three-year period for all teachers. The primary independent variable we use in the analyses is a dichotomous measure of participation in TxBESS (see Table 1). Detailed data on components of the TxBESS induction (e.g. mentor assignments and training, professional development frequency for novices) program are not available.

Our analytic file represents teachers with zero years of experience in the 1999-2000 school year, and whose retention status was tracked over a three-year period (2001, 2002 and 2003). All teachers who participated in TxBESS during Spring 2000 were included in the analytic file (n=595).[1] An equal number of non-participants was randomly selected from among more than 16,000 remaining Texas teachers with zero years of experience in the 1999-2000 school year. The final analytic file includes 1,190 beginning teachers who participated in TxBESS in Spring 2000 and who were included in analysis

[1] Twenty-two TxBESS teachers were removed from the analytic file because they had re-entered a TX school after exiting. However, only seven of these teachers would have been included in analysis of 2002 and 2003 retention because 15 of the 22 left school in 2001. These teachers are not expected to have any substantial effect on results.

of 2001 retention. Analysis of 2002 and 2003 retention focuses on teachers who did *not* leave in a prior year. Table 1 presents definitions and coding protocols for each of the variables in this file for the Spring 2000 TxBESS cohort. Tables 2 and 3 provide descriptive statistics for these variables.

Research Questions

Based on the results of earlier induction program research (e.g. Cheng & Brown, 1992; Eberhard, et al, 2000) and generally accepted views that improving employees' working conditions enhances their retention in the workplace (Weiss, 1999), we assume that the provision of induction programs increases the likelihood of retention. In this vein, we pursue three research questions in this study:

RQ1: What are the effects of participation in TxBESS on subsequent retention in 2001, 2002 and 2003?

RQ2: How do the effects determined in [RQ1] differ when controlled by certain teacher and school characteristics?

RQ3: To what extent are the effects in [RQ1] *adjusted* by teacher and school characteristics?

Analytic Method

The multivariate analyses track to the research questions and examine the relationship between TxBESS and teacher retention using descriptive statistics and a quasi-experimental design. In addition to t-tests, we use logistic regression to make predictions about the probability of turnover in terms of participation in TxBESS. Logistic regression analysis is the most appropriate method to measure the likelihood that TxBESS and other variables explain differences in the probability of retention because the dependent variable is dichotomous (that is, two possible outcomes typically coded zero (0) and one (1)). Logistic regression contrasts with ordinary least squares (OLS) regression because, in part, it bounds probabilities to be between 1 and 0, whereas predicted scores from OLS may be less than 0 or greater than 1. Logistic regression also assumes an asymptotic, non-linear relationship between the dependent and independent variables, and provides more reliable estimates of error and test statistics for dichotomous outcomes than are possible with OLS regression (Menard, 1995).

We include interaction terms in some regression models. Interaction terms, which are created by multiplying two or more independent variables, inform us whether the effect of one independent variable on a dependent variable is moderated by a third variable. Vogt explains this relationship similarly, stating that, "…interaction effects occur when the relation between two variables differs depending on the value of a third variable." (1999, p. 140).

The methods utilized here contrast with Fuller's (2003) analysis in that measures of retention exclude TxBESS teachers who left their schools in a previous year. Our methods here also utilize a logistic, quasi-experimental design, whereas Fuller had used only t-tests in his earlier work.

Results

The study's results are presented in order of the research questions. However, our analyses are more approachable when they follow a description of the teachers they are focused on.

Who Are TxBESS Participants?

This study focuses on a sub-sample of Texas teachers with zero years of experience in the 1999-2000 school year. Table 2 presents descriptive statistics for these teachers according to several variables. On average, these teachers were about 32 years of age. About 76 percent were female[2] and 63 percent were white. About one third of these teachers were "in-field." These distributions are very similar to the full sample of teachers (n~16,000) with zero years of experience. As a result of the analytic design, exactly 50 percent of these teachers participated in TxBESS during 2000. Table 3 shows that these teachers attended schools with an average enrollment of 856 students, 56 percent of whom were in poverty. About 46 percent of the schools were secondary level.

RQ1: Effects of TxBESS Participation.

Figure 1 illustrates the average retention rates for TxBESS participants (diagonal fill bars) and non-participants (solid fill bars). Comparative retention rates are presented for each year of data – 2001, 2002, and 2003. TxBESS retention rates are higher in each

[2] Several variables are dummy coded in this study. The mean of any dummy coded variable is equal to the percentage of cases that match the value coded "1" – in this case, female.

year than non-TxBESS rates, with the greatest difference in 2001. These differences are significantly different for 2001 and 2002, but not 2003. The results for 2001 and 2002 evidence the benefits of TxBESS participation, and provide an initial view of the duration of induction program effects.

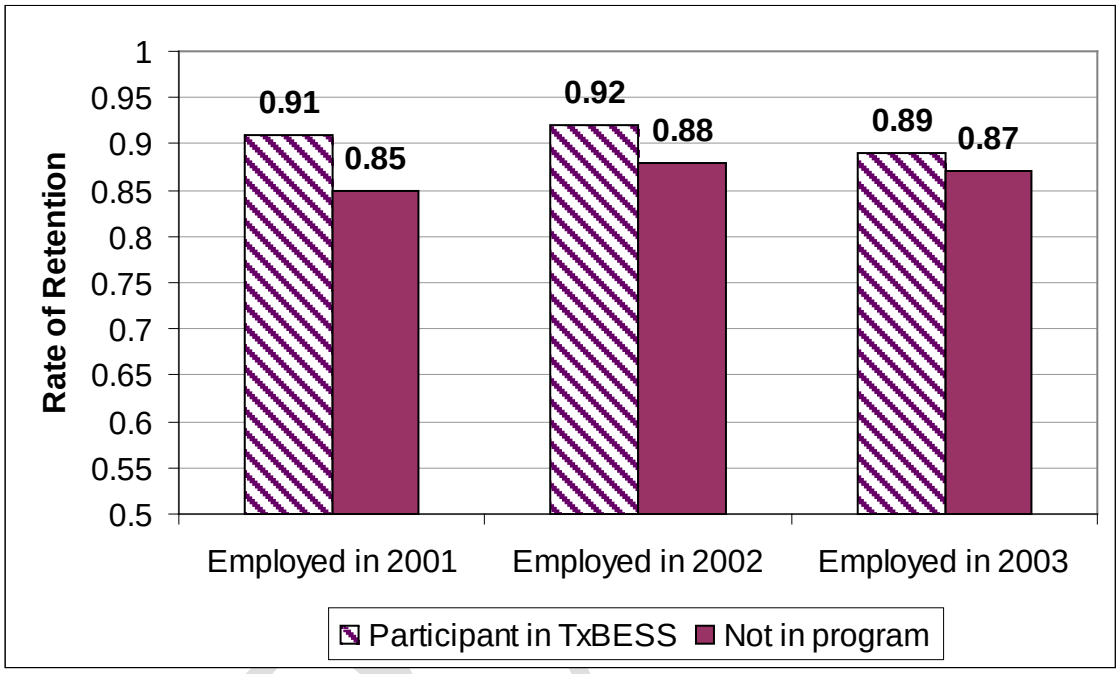

Figure 1: Average Retention Rates For TxBESS and non-TxBESS, by Year

RQ 2: Main effects variability for teacher and school characteristics

The significant impact of TxBESS on mean retention rates in 2001 and 2002 warrants further examination. In particular, it is useful to understand whether the program retains its effects after controlling for different teacher and school characteristics. We used two sets of logistic regression models — which examine retention rates holding several control variables constant — in this vein.

Table 4a presents the log-odds of retention in 2001, in terms of TxBESS effects and controlling for other teacher and school characteristics. Certain demographic variables are not included in these models because preliminary analyses indicated that teachers' sex, race (excluding ethnicity) and age were not significant predictors of retention in models for 2001, 2002 or 2003.

Model A1 shows a significant effect for TxBESS, indicating that participation in the program is associated with a 0.55 log odds – or a 73 percent increase in the odds of retention. This variable makes a significant contribution to predicting retention (χ^2=8.75). In Model A2 participation in TxBESS is associated with a 57 percent increase in the odds of retention. A teacher's infield status and Hispanic ethnicity are also added at this stage; the former with a stronger relationship to retention than TxBESS. Infield teachers are 3.9 times more likely to remain in their teaching positions in 2001, while the effect of TxBESS decreases slightly. The variables added in Model A2 make a significant contribution to predicting retention as well (χ^2=43.64), and also make a marked increase in the total variance explained (Nagelkerke R^2=.09).[3]

Model A3 adds three school characteristics to the 2001 retention model: enrollment, poverty rate and school level (a dummy variable indicating secondary school status). None of the school variables have a significant relationship to retention, and as a group make no contribution to predicting retention (χ^2=2.40). Interactions between TxBESS and infield status and Hispanic ethnicity were not found be significant in Model A4.

Table 4b repeats the same logistic regression analysis for 2002 retention. Model B1 tests the relationship between TxBESS and 2002 retention without controls. We find that the TxBESS is smaller than Model A1 – from .55 in 2001, to .45 in 2002. The 2002 effect is associated with a 57 increase in the odds of retention. This trend is examined further in the Discussion, below. In Model B2, the TxBESS effect represents Hispanic, TxBESS participants who work infield – participation in the program is associated with a 42 percent increase in the odds of retention.

Model B3 shows that teachers who work in larger schools (those schools whose enrollment is one standard deviation above mean enrollment) are more likely to be retained. Supplemental descriptive analyses of the retention rates in larger schools

[3] Use of a pseudo-R^2 measure with logistic regression is problematic, and not a fully useful indication of variance explained. Garson explains, "For a dichotomous dependent variable, for instance, variance is at a maximum for a 50-50 split and the more lopsided the split, the lower the variance. This means that R-squared measures for logistic regressions with differing marginal distributions of their respective dependent variables cannot be compared directly, and comparison of logistic R-squared measures with R^2 from OLS regression is also problematic. Nonetheless, a number of logistic R-squared measures have been proposed, all of which should be reported as approximations to OLS R^2, not as actual percent of variance explained." http://www2.chass.ncsu.edu/garson/pa765/logistic.htm%20

verified this relationship, although more analysis of the magnitude of this effect is needed. We maintain our focus on TxBESS.

RQ 3: Adjustments on TxBESS Effects

No interactions with TxBESS are statistically significant for the models shown in Tables 4a and 4b. However, the absence of interactions may relate to the large role of infield status, which might eclipse variance due to interactions. In alternate regression models that remove the Infield variable, certain interaction terms (such as TxBESS interactions with school size and poverty level) are nearly statistically significant at the p=.10 level.

Another explanation for the absence of interaction effects is the limited measurement of TxBESS itself – that is, because we have only one dichotomous variable to represent the entire TxBESS program it is more difficult to observe moderators of program effects. Interactions with induction effects *were* observed in 1999-2000 SASS data when more nuanced (interval) measures of mentoring were available. In contrast, interactions *were not* evident in 1999-2000 SASS teacher induction data if only the dichotomous measure for induction program participation was to indicate of induction effects. Such interactions occurred even when a measure of INFIELD was excluded from the SASS model. Put another way, results from SASS analyses do not indicate interactions unless *interval* measures of induction programs are utilized in regression models.

Discussion

This study found that participation in TxBESS is effective in increasing retention rates among new teachers for up to a two-year period. Two sets of logistic regression models illustrated that TxBESS participation was an important factor in enhancing retention rates for teachers who entered teaching with zero years of experience in 1999-2000. Specifically, TxBESS increased the likelihood of retention in 2001 and 2002 by 73 percent and 57 percent, respectively. These effects varied slightly when other controls were added to the models, particularly infield status.

School level controls, however, were not significant factors in predicting retention for either 2001 or 2002 retention, with the exception of school size in 2002 (Table 4b). In

alternate analyses, however, the indicator for secondary school level *was* significant when the infield status measure was removed from the models.

This study did not find that interactions with induction program effects to be statistically significant. Such interactions were evident in earlier analyses (Cohen, 2005a, b) of the 1999-2000 Schools and Staffing Survey (SASS), and were among the empirical justifications for examining interactions in this study. For instance, in SASS regression models predicting attrition, high quality mentors' effect[4] on novices' attrition was moderated by infield status and school size. Figure 2 shows these two interactions. The two leftmost bars show the probability of turnover for out-of-field and infield novices. The three rightmost bars show the probability of turnover for novices working in low, average and high enrollment schools. These results demonstrate how individual teacher and school level characteristics play an important role in moderating induction program effects.

Interactions may not be apparent in this study for several reasons, however, evidence from both TxBESS and SASS data suggests that understanding the role of teacher characteristics and school context on induction requires detailed measurement of the supports novices receive. The case for "detailed measurement" has two plausible premises: first, dichotomous measures mask variance. TxBESS has broad goals and multiple modes of implementation that remain unobserved with the primary independent variable used in this study. Second, important sociological relationships between TxBESS participants and their mentors are represented in these data, yet also are unobserved. Interactions found in SASS data took account of mentors' main assignment, and mentees' certification and level of affiliation with their mentors and in doing so made a small inroad to understanding these sociological phenomena with statistical models.

[4] Cohen(2005) defined high quality mentors as those working in the same subject area as a novice and who were rated by their novices as being "very helpful."

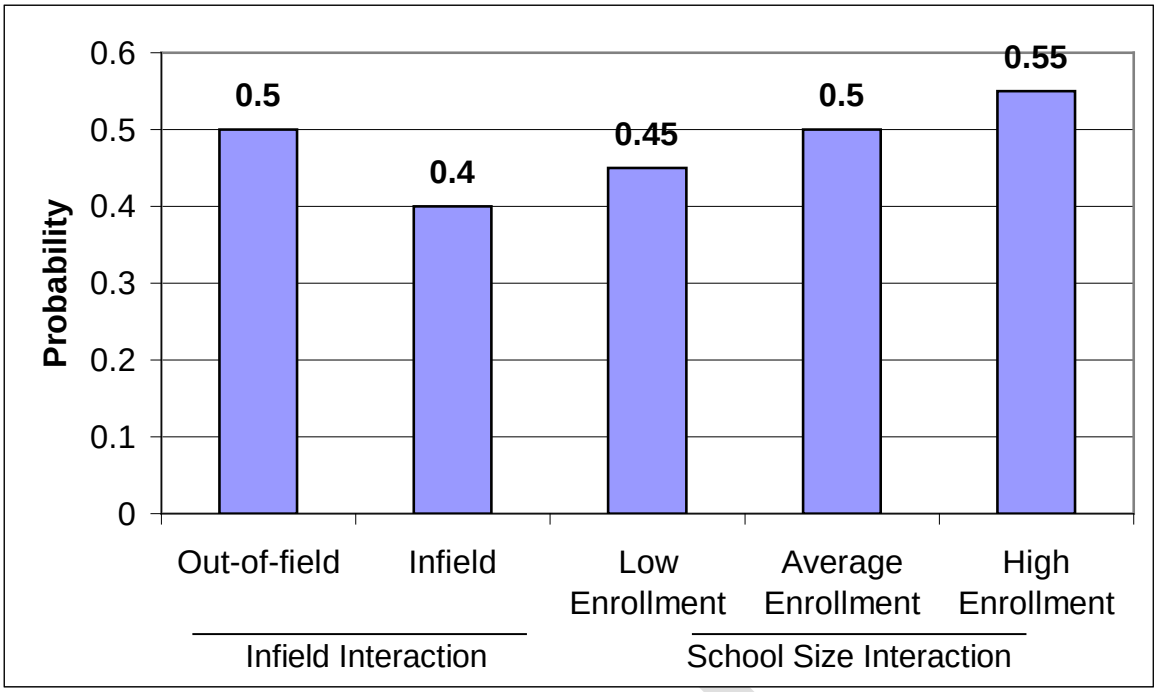

Figure 2: High Quality Mentoring Effects Vary by Teacher and School Moderators (Source: 1999-2000 Schools and Staffing Survey)

Perhaps this study's most important contribution is its measure of the duration of an induction program effect over time. Earlier quantitative studies have not examined program effect duration (Ingersol & Kralik, 2004). The logistic regression models for 2001 and 2002 provided estimates of TxBESS effects over a two-year time period for a single cohort of teachers. Based on these results, Figure 3 illustrates that the *percentage increase in the likelihood* to remain in teaching *decreases* with each year following exposure to the induction program. The two leftmost points in Figure 4 are predicted using data from TxBESS, while the two rightmost points (indicated by vertical arrows) are extrapolated from the declining trend using a logarithmic function. This trend indicates that teachers in this analytic sample would continue to see *some increase* in the likelihood of their retention through 2004. Such a reduction implies a long-lasting benefit for the program. The results further justify induction programs, particularly in this case because TxBESS participants received the intervention only during Spring 2000 – that is, the results show an enduring effect for a short-lived intervention. Following 2004, other factors might certainly become the predominant retention factors over TxBESS, such as

changes in family structure (Bielby& Bielby, 1992), although future research might investigate whether more substantial induction programs have effects of greater duration.

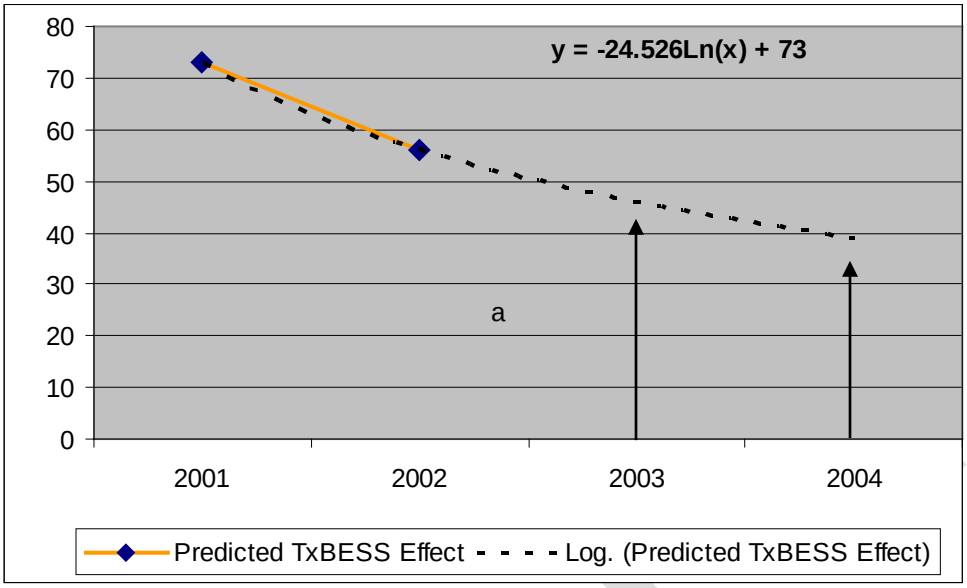

Figure 3: Predicted and Extrapolated Likelihood [Exp(B)] of Retention

Note: Extrapolated values are shown as dashed line and are computed with the logarithmic function shown based on observations in 2001 and 2002.

Limitations

This study's limitations constrain the implications of the results. First, the TxBESS program remains essentially a black box. As described in our introduction, TxBESS has several inter-workings and components that are not measured – the quality and frequency, for instance, of program components associated with each TxBESS Cluster. Second, important aspects of teachers' normative climate should be taken into account when examining induction program effects. That teaching quality is inherently tied to the entire community of teachers within a school is the premise behind the latest approaches to new teacher induction (National Commission on Teaching and America's Future [NCTAF], 2005). Finally, more robust analytic methods, such as multilevel repeated measures, may improve our understanding of these data.

Despite these limitations important findings remain. In particular, this study confirms other research that finds induction programs to be beneficial. It also makes a

first examination of program effect duration, and helps to clarify data needs in quantitative research in teacher induction.

Table 1: Key Variables

Variable	Description
TxBESS	Indicator of TxBESS participation, where 0=no participation and 1=participation.
TCH01, TCH02, TCH03	Indicators of retention in 2001, 2002 and 2003, respectively, where 1=retained and 0=not retained.
IFALL	Indicator of in-field teaching status. Infield teachers must be fully certified in the main assignment (coded 1), while teachers not infield have emergency, alternative, out-of-state, or out-of-field certification (coded 0).
HISPANIC	Indicator of whether a teacher has Hispanic ethnicity (coded 1) or not (coded 0).
BIGSCHOOL	Indicator of whether a teacher's school has an enrollment one standard deviation above the mean enrollment (coded 1) or not (coded 0).
Poverty Rate	The percent of students coded as eligible for free or reduced-price lunch or other public assistance.
Secondary	Indicator of whether a teacher's school is a secondary level institution (coded 1) or not (coded 0).

Table 2: Teacher Characteristics for Analytic Sample

	N	Minimum	Maximum	Mean	Std. Deviation
Participated in TxBESS	1190	.00	1.00	.5000	-
Age in 2000	1185	22	63	31.64	8.565
Female	1190	.00	1.00	.7580	-
Hispanic	1190	.00	1.00	.2866	-
White	1190	.00	1.00	.6252	-
In-field	1146	.00	1.00	.3159	-
Employed in 2001	1190	0	1	.88	.324
Employed in 2002†	1048	0	1	.90	-
Employed in 2003†	945	0	1	.88	-

Note: Cell n's may vary due to missing data.
† Reflects a subset of teachers who did not leave teaching in the previous year.
Source: TxBESS Dataset.

Table 3: School Characteristics

	N	Minimum	Maximum	Mean	Std. Deviation
School size	856	1	5,030	786	598.81
Secondary	863	0	1	.46	-
Poverty Rate	857	0	100	56.13	27.85

Note: Cell n's may vary due to missing data. Total 863 schools in file.
Source: TxBESS Dataset.

Table 4a: Multivariate Log-Odds Relationships to 2000-01 Retention

	Model A1		Model A2		Model A3		Model A4	
Basic model	B	p	β	p	β	p	β	P
- Txbess	.55	.004	.45	.019	.50	.011		
- Infield			1.36	.000	1.30	.000		
- Hispanic			.84	.001	.94	.000		
- Big School					-.03	.930		
- Poverty Rate[a]					-.01	.172		
- Secondary					-.23	.280		
➢ txbesss_inf							NS	
➢ txbess_hisp							NS	
Intercept	1.76	.000	1.31	.000				
Chi square [block]	8.75	.003	43.64	.000	2.40	.493		
Nagelkerle R-square	.02		.09		.09			

Source: TxBESS Dataset.

Table 4b: Multivariate Log-Odds Relationships to 2001-02 Retention

	Model B1		Model B2		Model B3		Model B4	
Basic model	B	p	B	P	B	p	β	p
- Txbess	.45	.034	.35	.10	.34	.121		
- Infield			.33	.16	.44	.066		
- Hispanic			.69	.01	.70	.015		
- Big School					1.59	.010		
- Poverty Rate[a]					.00	.477		
- Secondary					.135	.561		
➢ txbesss_inf							NS	
➢ txbess_HISP							NS	
Intercept	1.96	.000	1.73	.000	1.36	.000		
Chi square [block]	4.55	.033	8.93	.011	12.10	.007		
Nagelkerle R-square	.01		.03		.05			

Source: TxBESS Dataset.

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