Adult Education Quarterly
2022, Vol. 72(3) 262–283

DOI: 10.1177/07417136211044515
journals.sagepub.com/home/aeq
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Teacher Effectiveness in Adult Education: The Relationship Between Teacher Characteristics and Student Test Gains and Transitions Into Postsecondary Education

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Abstract

The federal adult education program serves over 2 million eligible adults who seek basic literacy and English language skills. Using administrative student-level panel data, this study provides the very first assessment of the relationships between adult education teacher characteristics and student achievement using hierarchical linear modeling design. Results show that students in classes with teachers with a bachelor's or higher degree have higher post-test scores. Having a part-time adult education teacher was associated with lower odds of students transitioning to postsecondary education. Compared to teachers specialized in English as a second language, having an adult secondary education teacher is correlated with an increase in test score gains as well as higher odds of transitioning to postsecondary education. We also identified student characteristics (age, disability status, attendance hours, race, and employment status) and program characteristics (size, quality, and setting) that are statistically significantly correlated with student learning and students' transition to postsecondary education.

Keywords

adult education teacher, teacher effectiveness, adult education student performance, postsecondary education

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Adult education has a long history in the United States and plays a crucial role in helping adults meet their educational and workforce needs (Council for Adult & Experiential Learning, 2011). In the 2017–2018 program year, federally funded adult education providers served over 1.3 million eligible adults who lacked basic literacy and/or English language skills. Among these adults, 26% of unemployed students who enrolled with the goal of finding employment—roughly 269,000 students—were employed shortly after leaving the program (Office of Career, Technical, & Adult Education [OCTAE], n.d.). About one in four with less than a high school education at entry goes on to participate in further education or training, including credit-bearing postsecondary education. Among the learners who indicate that postsecondary enrollment is their goal for participating in adult education, a substantial percentage—56%—later enroll in postsecondary education or training (Strawn, 2007). Programs such as adult education-to-college bridge programs and concurrent enrollment adult education programs also improve the rates at which adult education students transition to higher education (Rutschow, 2019).

Despite the importance of adult education, little is known about the field's approximately 50,000 teachers (OCTAE, n.d.), such as who these teachers are and how their background characteristics, experience, or professional development (PD) correlate with student learning or with students' transition to postsecondary education. This information gap limits our understanding of the qualities that make these teachers effective. For example, some (e.g., Smith & Hofer, 2003; Young et al., 1995) have raised concerns about the fact that 80% of the country's adult education teachers are only part-time employees and have not been trained specifically to teach adults (OCTAE, n.d.). Indeed, the share of adult education teachers who are not employed full time is still the vast majority: In the 2018–2019 program year, 62% of adult education teachers in the United States were part time, and 20% were unpaid volunteers (OCTAE, n.d.); however, many of those part-time teachers may have had other jobs and teaching experiences that made them effective teachers of adults. The adult education workforce reflected various levels of teaching experience, with 31% of programs reporting that their full-time instructors had been teaching between 4 and 10 years. Many programs also require specific credentials, the most common of which is K–12 certification. Twenty-eight percent of full-time instructors in adult education programs held K–12 certification (Coley, 2008).

The role of teacher characteristics—such as demographics, education attainment, years of experience, and full-time/part-time status—has received much more attention in the research literature for K–12 education. In contrast, there are nearly no studies with rigorous designs specific to adult education teachers. The research on teacher effectiveness in K–12 education has been fairly consistent in finding that some teachers are in fact more effective than others, and that effective teachers are associated with improved short- and long-term academic outcomes of their students (Chetty et al., 2011; Hanushek, 2010; Rockoff et al., 2011). However, what makes a K–12 teacher effective may not directly transfer to adult education.

In this study, using administrative data from a Midwestern state and a three-level hierarchical linear modeling regression (HLM) design, we provide the very first look

at the relationships between adult education teacher characteristics and adult student academic performance and transition to postsecondary education. We find that teacher education is positively correlated with student test score gains. Teacher specialization is also statistically significantly correlated with student outcomes, with adult secondary education (ASE) teachers performing better than English as a second language (ESL) teachers in posttest score gains and the odds of the student entering postsecondary education. We also find that part-time status and number of PD hours are uncorrelated with student test gains but correlated with lower odds of entering postsecondary education. Finally, prior adult education teaching experience and most teacher demographic characteristics are not statistically significantly correlated with student outcomes, providing empirical evidence that hiring adult education teachers should not depend on whether they have taught in the field before.

These findings represent important contributions to the literature. First, evidence of adult education teacher effectiveness is exceedingly scarce. Second, this study employs a student-level administrative dataset that allows us to link students with their teachers by program year and to assess the correlation between teacher characteristics and student outcomes while controlling for student and program observable characteristics that otherwise might bias the estimates. Finally, these study findings have important policy implications for recruitment and retention efforts to maintain an effective adult education teacher labor force that meets the needs of millions of adult students who otherwise would be left out of the educational system.

Literature Review and Research Question

According to K–12 research, teachers are the single strongest factor in student achievement, and teacher training is critical (Eaker & Keating, 2012; Stronge, 2010). The most widely studied aspects of teacher effectiveness in K–12 education are teacher background characteristics, especially teacher demographics, cognitive abilities, and education (e.g., degrees, coursework, credentials, and selectiveness of teachers' undergraduate institutions); teacher experience; and the PD teachers receive. However, comprehensive reviews of the research literature have yielded different conclusions about how these teachers' backgrounds are associated with student achievement or learning.

In a meta-analysis exploring the cognitive abilities of teachers, D'Agostino and Powers (2009) found that teacher performance in preparation programs was a significant predictor of teaching skill and student outcomes. Regarding degree attainment, neither holding an undergraduate degree in education nor acquiring a master's degree is correlated with elementary and middle school teaching effectiveness, regardless of the university attended (Chingos & Peterson, 2011). Croninger et al. (2007) found that measures such as advanced degree attainment were not positively associated with elementary student achievement in reading, and that these actually had a negative relationship with student achievement in mathematics. Ehrenberg and Brewer (1994) found that the degree of selectiveness of the college that a teacher attended had a positive relationship with student gain scores for both White and Black high school

students, but not for Hispanic students. Two studies by Goldhaber and Brewer (1997, 2000) found a positive relationship between certification and student gains only for mathematics or science students and only when their mathematics or science teacher's certification was in the subject taught. It did not appear to matter whether that certification was standard or provisional, but standard certification was associated with higher gains than private school certification.

In addition to teacher demographics, a few studies have explored the relationship between teacher experience and PD and student achievement. Gordon et al. (2006) found large gains in teacher effectiveness between the first and second years of teaching, much smaller gains between the second and third years, and no substantial improvement after the third year. Harris and Sass (2010) also found that the largest gains in teacher effectiveness from professional experience occurred in the first few years; however, those gains did continue beyond the first 5 years of a teacher's career. Similarly, Hanushek et al. (2005) concluded that the only important difference was between teachers with no experience and those with at least 1 year of experience. They estimated that having a first-year teacher was roughly equivalent to having a teacher who was half a standard deviation lower in the quality distribution. Positive effects have also been found between student outcomes and over 14 hr of teacher PD (Yoon et al., 2007). An average of 49 hr of PD translated into test score gains of 21 percentile points. The scope of these studies was limited; however, most focused on elementary reading, and most of the PD was workshop based.

Adult education teachers, however, work in significantly different contexts. The unique nature of adult education teaching—which is mostly part time, has higher turnover, and involves teaching in multiple subject areas—affects the type of PD needed and available. As noted earlier, the research examining the relationship between adult education teachers and student performance is limited. Possibly because of this literature gap, teachers and program administrators have relied on experiential knowledge rather than evidence-based practice in adult education programs (Belzer & Darkenwald-DeCola, 2014). In a study where a small sample of instructors and administrators were surveyed, 28% of respondents stated that understanding of instruction practices is one of the most important areas of knowledge that an adult literacy instructor should have (Perin, 1999). Tighe et al. (2013) found that classrooms in two Florida counties that saw success (as defined by stakeholders) demonstrated two important features: multiple instructional approaches and positive, collaborative teacher–student interactions. A few other studies have examined various models of college transition programs in adult education (e.g., Zafft et al., 2006); however, little information is available on the role of teachers in transitioning adult students to postsecondary education. Although these findings most likely do not represent all adult education teachers, they do suggest a distinct need for research studies to better understand the relationships between teacher background characteristics and student learning.

As the very first examination of adult education teacher effectiveness, this study helps to fill the literature gap by answering the research question of whether teacher characteristics—including demographics, education level, PD received, and experience—are correlated with student test score gains and student likelihood of entering

postsecondary education. We used a multilevel theoretical framework with three distinct, nested levels: students, teachers, and programs. This approach enabled us to identify the correlations between teacher characteristics and student outcomes while controlling for potential cofounding factors at both the student and program levels. Controlling for these factors was important because local programs are offered in a variety of settings. Furthermore, participating adults and out-of-school youth come from diverse educational and linguistic backgrounds, and they have a wide range of goals and needs.

Data

Student-level administrative data for the 2008–2009, 2009–2010, and 2010–2011 program years were obtained directly from a Midwestern state's Office of Adult Education and Vocational Services, within the state's community college system.[1] There were three separate data files for students/courses, teachers, and programs within each program year. We first matched teachers with students/courses using unique teacher and course identifiers by year. For students who took more than one course, we selected a primary course/teacher with more than 12 attendance hours. This approach did not pose a threat to the consistency of our estimates because without sufficient contact hours, we cannot credibly attribute student outcome change to teacher characteristics. We used 12 hr as the cutoff point because this is the required average number of attendance hours for a student to be considered a "reportable individual" as defined by the Workforce Innovation and Opportunity Act (WIOA). The resulting student–teacher dataset included unique observations for each course and the teacher from whom the student took the course. Program-level data were merged with the student–teacher dataset to create the analytical sample that included teacher-, student-, and program-level variables.

Student and teacher identifiers were not recorded consistently over time, and adult students may register for a program and then drop out and return the following year with a new student identifier. The lack of balanced, individual-level panel data prohibited us from employing the teacher value-added models that are commonly used in the K–12 literature. Only around 20% of students and 65% of teachers appeared in more than one program year. Instead, we controlled for cohort (year) dummies in our analyses to account for the repeated students and teachers in our regression models. As shown in Table 1, the full sample included 250,993 students and 4,177 teachers from 105 local programs. We further cleaned the data and constructed two analytical subsamples for our two outcome variables and analyses (discussed in detail next).[2] Table 1 presents summary statistics, by sample, for all variables used in our analyses.

Outcome Variables

In the U.S. adult education system, students are assigned to an educational functioning level (EFL) (similar to grade level in K–12 education) based on prior educational attainment or ability, and accordingly, are given different test instruments and

Table 1. Summary Statistics of Teacher, Student, and Program Variables, by Subsample.

	Full sample		Achievement analysis sample		Transition analysis sample	
Variable	Mean	*SD*	Mean	*SD*	Mean	*SD*
Panel A: teacher variables						
Female teacher	0.74	0.44	0.75	0.43	0.74	0.44
Teacher: age	48.43	13.68	48.11	13.88	48.41	13.65
Teacher: White	0.67	0.47	0.70	0.46	0.67	0.47
Teacher: Black	0.12	0.32	0.10	0.30	0.12	0.32
Teacher: Hispanic	0.11	0.31	0.11	0.31	0.11	0.31
Teacher: Asian	0.04	0.19	0.04	0.19	0.04	0.19
Teacher: other race	0.06	0.24	0.06	0.23	0.06	0.24
Highest degree—GED	0.00	0.04	0.00	0.04	0.00	0.04
Highest degree—high school	0.01	0.08	0.01	0.08	0.01	0.09
Highest degree—associate's	0.01	0.10	0.01	0.10	0.01	0.10
Highest degree—bachelor's	0.45	0.50	0.45	0.50	0.45	0.50
Highest degree—master's	0.46	0.50	0.47	0.50	0.46	0.50
Highest degree—doctor's	0.02	0.15	0.02	0.14	0.02	0.15
Highest degree—professional certificate	0.00	0.04	0.00	0.04	0.00	0.04
Highest degree—other	0.05	0.22	0.05	0.21	0.05	0.22
Part-time teacher	0.92	0.28	0.91	0.28	0.92	0.27
Years of adult education experience	11.43	11.27	11.70	11.40	11.43	11.27
Number of professional development hours	8.65	9.94	8.89	10.03	8.56	9.84
Teacher: ABE	0.27	0.44	0.25	0.43	0.27	0.44
Teacher: ASE	0.16	0.37	0.14	0.35	0.16	0.37
Teacher: ESL	0.56	0.50	0.60	0.49	0.56	0.50
Teacher: NA	0.01	0.12	0.01	0.09	0.01	0.12
N	4,177		2,779		4,141	
Panel B: student variables						
Student: age	32.40	12.39	33.11	12.58	32.41	12.38
Student: White	0.23	0.42	0.24	0.42	0.23	0.42
Student: Black	0.19	0.39	0.17	0.37	0.18	0.39
Student: Hispanic	0.50	0.50	0.50	0.50	0.50	0.50
Student: Asian	0.07	0.26	0.08	0.27	0.07	0.26
Student: other race	0.02	0.13	0.02	0.13	0.02	0.13
Student: attendance hours	90.21	90.12	111.46	97.52	90.11	90.04
Student: English as a second language	0.51	0.50	0.54	0.50	0.51	0.50
Student: full time	0.33	0.47	0.33	0.47	0.33	0.47
Student: part time	0.12	0.33	0.12	0.33	0.12	0.33

(continued)

Table 1. (continued)

	Full sample		Achievement analysis sample		Transition analysis sample	
Variable	Mean	*SD*	Mean	*SD*	Mean	*SD*
Student: unemployed	0.43	0.50	0.42	0.49	0.43	0.50
Student: not in labor force	0.12	0.33	0.12	0.33	0.12	0.33
Student: number of other instructors	0.52	0.91	0.65	1.00	0.52	0.91
Student: learning impairment	0.01	0.10	0.01	0.10	0.01	0.10
Student: mentally impairment	0.00	0.06	0.00	0.05	0.00	0.06
Student: multiple impairment	0.00	0.05	0.00	0.05	0.00	0.05
Student: no disability	0.26	0.44	0.27	0.45	0.26	0.44
Student: physically impairment	0.01	0.07	0.01	0.07	0.01	0.07
Student: unknown impairment	0.72	0.45	0.71	0.46	0.72	0.45
Student NRS: ABE beginner basic	0.03	0.17	0.03	0.17	0.03	0.17
Student NRS: ABE beginner	0.01	0.10	0.01	0.09	0.01	0.10
Student NRS: ABE intermediate–high	0.13	0.34	0.12	0.33	0.13	0.34
Student NRS: ABE intermediate–low	0.09	0.29	0.09	0.28	0.09	0.29
Student NRS: ASE high	0.07	0.26	0.06	0.25	0.07	0.26
Student NRS: ASE low	0.08	0.27	0.07	0.25	0.08	0.27
Student NRS: ASE advanced	0.09	0.28	0.10	0.30	0.09	0.28
Student NRS: ESL beginner	0.09	0.28	0.08	0.28	0.08	0.28
Student NRS: ESL high	0.09	0.28	0.09	0.29	0.09	0.28
Student NRS: ESL intermediate–high	0.10	0.30	0.11	0.32	0.10	0.30
Student NRS: ESL intermediate–low	0.06	0.25	0.07	0.26	0.06	0.25
Student NRS: ESL low	0.16	0.37	0.16	0.37	0.16	0.37
N	250,993		162,338		249,325	
Panel C: program variables						
Program size	1,060.13	1,378.47	1,082.64	1,546.09	1,077.52	1,386.06
Program performance	0.44	0.15	0.46	0.15	0.44	0.15
Program type: CBO	0.26	0.44	0.24	0.43	0.25	0.44
Program type: Community college	0.45	0.50	0.41	0.50	0.46	0.50

(continued)

Table 1. (continued)

	Full sample		Achievement analysis sample		Transition analysis sample	
Variable	Mean	*SD*	Mean	*SD*	Mean	*SD*
Program type: CI	0.01	0.10	0.00	0.00	0.01	0.10
Program type: FBO	0.03	0.17	0.04	0.20	0.03	0.17
Program type: PU	0.01	0.10	0.01	0.12	0.01	0.10
Program type: LEA	0.25	0.43	0.29	0.46	0.24	0.43
N	105		70		103	

Note. ABE = adult basic education; ASE = adult secondary education; ESL = English as a second language; NA = not applicable; NRS = National Reporting System for Adult Education; CBO = community-based organization; CI = correctional institution; FBO = faith-based organization; PU = public university; LEA = local education agency.

forms. Because students were at different EFLs and used different test instruments (Table 2), we standardized our main outcome variables—students' pre- and posttest score differences and posttest scores—to allow comparison across years and EFLs.[3] Standardizing the test scores also enabled us to assess the overall relationships between teacher characteristics and student outcomes.

Another unique aspect of adult education data is that students can take multiple posttests at different points in their enrollment. To evaluate student achievement, we used each student's most recent posttest score as our first outcome variable. There was potential for bias with this method if the student had enrolled with a different teacher after the initial posttest, because we would attribute the gains to the student's original teacher. However, fewer than 10% of the students in our dataset had multiple posttest scores. We performed a sensitivity test in which we excluded these students and found consistent results. We further limited our sample to students who had both pre- and posttest test scores using the same test instrument and form, which enabled us to calculate achievement gains and their association with teacher characteristics. This reduced the analytical sample to 211,670 observations for 162,338 students and 2,779 teachers from 70 programs, as shown in Table 1. We compared all variables included in the analysis between the full sample and the achievement analytical sample. We did not identify any significant differences between the two. As shown in Table 2, pre- and posttest scores are nearly identical between the full sample and the achievement subsample, lending further legitimacy to the generalizability of the results.

The second outcome variable is an indicator of whether the student entered postsecondary education. Our analytical sample for this outcome variable included 311,096 observations for 249,325 students and 4,141 teachers from 103 programs, as shown in Table 1. Students may enter postsecondary education immediately or any time after they have exited the adult education system. However, we tracked students only for 3 years after they exited the adult education system. Therefore, we likely

Table 2. Summary Statistics of Outcome Variables, by Subsample.

	Full sample			Achievement analysis sample			Transition analysis sample		
	N	Mean	*SD*	N	Mean	*SD*	N	Mean	*SD*
Z-score post	163,518	0.03	1.01	162,338	0.03	1.01	162,338	0.03	1.01
Z-score pre	250,993	0.01	1.00	162,338	0.01	0.99	249,325	0.01	1.00
Transition to postsecondary	250,993	0.12	0.32	162,338	0.12	0.32	249,325	0.12	0.32
Best literacy pretest	54,019	43.28	42.03	53,789	43.19	41.66	53,789	43.19	41.66
Best literacy posttest	54,019	51.98	14.85	53,789	51.98	14.85	53,789	51.98	14.85
Best plus pretest	8,635	328.26	134.92	8,396	326.45	135.25	8,396	326.45	135.25
Best plus posttest	8,635	426.47	91.17	8,396	425.56	91.40	8,396	425.56	91.40
CASAS pretest	237	71.34	108.51	237	71.34	108.51	237	71.34	108.51
CASAS posttest	237	221.32	11.14	237	221.32	11.14	237	221.32	11.14
CELSA pretest	38,771	52.63	70.29	38,730	52.56	70.13	38,730	52.56	70.13
CELSA posttest	38,771	42.44	13.97	38,730	42.43	13.97	38,730	42.43	13.97
TABE-R pretest	61,856	538.88	76.72	61,186	539.00	76.68	61,186	539.00	76.68
TABE-R posttest	61,856	560.90	72.96	61,186	561.03	72.88	61,186	561.03	72.88

Note. CASAS = Core Academic Skills Assessment; CELSA = Combined English Language Skills Assessment; TABE®-R = Test of Basic Adult Education–Reading.

underestimate the correlations between teacher characteristics and postsecondary education transition. Overall, around 12% of students who received adult education in the participating state entered postsecondary education, as shown in Table 2. The minor difference in sample size between the full sample and the transition analytical subsample is due to missing values in the control variables. These missing values did not pose any concerns for the analysis given that the means of all variables were nearly identical for the two samples.

Teacher Variables

Following prior literature on teacher effectiveness, we included four sets of teacher variables: demographics, education, experience, and PD hours. Demographics included age (continuous), gender (binary), and race/ethnicity (categorical). Education was measured as highest degree attained and collapsed into three levels for inferential analyses: less than bachelor's degree, bachelor's degree, and graduate degree. Employment status was captured with a part-time indicator (1 if part time, 0 if full time). Teacher experience was assessed through number of years of adult education experience and number of PD hours, both of which were measured as continuous variables. Finally, instructional category type was also used—ESL, ASE, or adult basic education (ABE). Panel A in Table 1 presents summary statistics for these variables in the full sample as well as in the two regression models. The summary statistics did not change much across the three samples. Nearly 75% of adult teachers in our state were female. Over 65% of teachers were White, about 12% were Black, and about 11% were Hispanic. Most teachers held either a bachelor's (45%) or a master's (46%) degree as their highest level of education, and 2% had a doctoral degree. Over 90% of teachers were part time, and the average amount of adult education experience was 11 years. The total number of PD hours varied widely across programs within the state; the average was 9 h.

Other Control Variables

In our regression models, we also included a set of student variables shown to be correlated with student performance, including student demographics, attendance hours, employment status, special needs, and student EFL. Panel B in Table 1 presents summary statistics on those variables for the full sample as well as for the two analytical subsamples. Students in this cohort were, on average, about 32 years old. Around 50% of students were Hispanic, and nearly 20% were Black.[4] Average attendance hours, at around 111 hr, were slightly higher in the achievement subsample, whereas the average was about 99 hr for the other two samples. This is consistent with our expectation, given that students who are more engaged are less likely to drop out of the program and therefore more likely to complete a posttest. About 43% of students were unemployed, 33% were employed full time, and 12% were employed part time. Half of the adult students were in ESL, around 24% were in ASE, and the remainder were in ABE.

Research in K–12 education has shown that the characteristics of the educational setting are associated with student performance. Because adult education settings vary significantly by location, we included three program-level variables in our model to control for potential program effects: program size, program setting, and estimated program performance. Program size refers to the average number of students enrolled, which was around 1,000 students. In the state in which we conducted our study, adult education programs were offered in six main settings: community-based organizations, community colleges, correctional institutions, faith-based organizations, public universities, and local education agencies. Over 40% of the programs were in a community college setting (Table 1, panel C). To assess the performance of programs, we considered the percentage of students who completed an EFL in each program. On average, across all programs in the state, 38% of students completed an educational level.

Method

Student Academic Achievement

To take the nesting of students within teachers within programs into account, we used a three-level HLM design.[5] The estimated model took the following form:

Level 1 (student) model:

$$Y_{ijk} = \beta_{0jk} + \rho Y_{ijkpre} + \sum_{s=1}^{S} \beta_s X_{ijk} + \sum_{c=1}^{C} \gamma_c Cohort_{ijk} + \varepsilon_{ijk}$$

Level 2 (teacher) model:

$$\beta_{0jk} = \alpha_{0k} + \sum_{p=1}^{P} \alpha_p T_{jk} + \nu_{jk}$$

Level 3 (program) model:

$$\alpha_{0k} = \gamma_0 + \sum_{q=1}^{Q} \pi_q P_k + \varphi_k$$

where Y_{ijk} represents the posttest performance of student i, $Y_{ijk\text{pre}}$ represents the same student's pretest performance, $\boldsymbol{X}$ is a vector of student characteristics, Cohort represents dummy variables for program year, $\boldsymbol{T}$ is a vector of teacher characteristics, and $\boldsymbol{P}$ is a vector of program site characteristics. The terms ε_{ijk}, ν_{jk}, and φ_k represent residuals at the student, teacher, and program levels. The results from this model revealed whether teacher characteristics were related to student performance when controlling for student and program characteristics and when taking into account the nesting of the students within teachers within programs.

Postsecondary Education Transition

Similar to the achievement analyses, we employed a three-level HLM model to estimate the relationship between teacher characteristics and transition to postsecondary education using a model of the following form:

Level 1 (student) model:

$$logit(p_{ijk}) = \beta_{0jk} + \sum_{s=1}^{n} \beta_s X_{ijk} + \sum_{c=1}^{C} \gamma_c Cohort_{ijk} + \varepsilon_{ijk}$$

Level 2 (teacher) model:

$$\beta_{0jk} = \alpha_{0k} + \sum_{p=1}^{n} \alpha_p T_{jk} + \nu_{jk}$$

Level 3 (program) model:

$$\alpha_{0k} = \gamma_0 + \sum_{q=1}^{n} \pi_q P_k + \varphi_k$$

where, as before, $\boldsymbol{X}$, $\boldsymbol{T}$, and $\boldsymbol{P}$ are vectors of student, teacher, and program site characteristics and ε_{ijk}, ν_{jk}, and φ_k represent residuals at the student, teacher, and program levels. Because the outcome is binary, we estimated the probability of transition to postsecondary education, $P(Y_{ijk} = 1|X_{ijk}, T_{jk}, P_k)$, using multilevel logistic regression. The results from this model were used to determine whether teacher characteristics were related to student transitions to postsecondary education while controlling for student and program characteristics and while taking the nesting of the students within teachers into account.

Results

The second and third columns in Table 3 show results from the HLM model with standardized posttest score as the outcome variable. The intracorrelation coefficients (ICCs[6]) from the unconditional models for program and teacher levels were 0.045 and 0.301, respectively. These results show that about 30% of the variation in student achievement outcomes is explained by differences between teachers, whereas about 4% of the variation is due to program-level differences. The model had an average variance inflation factor of 2.06, with a range of 1.02 and 7.80, suggesting no major multicollinearity issues. The teacher, student, and program controls accounted for all characteristics observable and available for the analysis. As shown, several teacher characteristics were statistically significantly correlated with student achievement. Students whose teachers had a bachelor's or graduate degree had higher posttest scores compared to those whose teachers had a high school or lower degree—having an adult education teacher with a bachelor's or graduate degree is correlated with a nearly 8% point increase in test score gains.

Table 3. Results From HLM Models on Student Achievement and Transition to Postsecondary Education.

	Achievement		Postsecondary transition	
Variable	Unconditional	Conditional	Unconditional	Conditional
Pretest score (standardized)		0.4501***		1.078***
		(0.0027)		(0.0138)
Female teacher		−0.0123		0.950
		(0.0104)		(0.0286)
Teacher: age		0.0003		0.999
		(0.0004)		(0.00126)
Teacher: Black		0.0182		1.005
		(0.0163)		(0.0474)
Teacher: Hispanic		−0.0833***		0.749***
		(0.0157)		(0.0414)
Teacher: Asian		−0.0792**		0.933
		(0.0269)		(0.0842)
Teacher: other race		−0.0480		0.880
		(0.0290)		(0.0720)
Highest degree—bachelor's		0.0759**		0.867
		(0.0258)		(0.0658)
Highest degree—graduate		0.0789**		0.874
		(0.0263)		(0.0683)
Part-time teacher		−0.0239		0.812**
		(0.0221)		(0.0532)
Years of adult education experience		0.0004		1.000
		(0.0005)		(0.00138)
Number of professional development hours		0.0003		0.997***
		(0.0002)		(0.000839)
Teacher: ASE		0.1782***		7.521***
		(0.0123)		(0.343)
Teacher: ABE		−0.3494***		3.219***
		(0.0134)		(0.160)
Teacher: NA		−0.2585***		3.764***
		(0.0347)		(0.253)
Student: age		−0.0057***		0.993***
		(0.0001)		(0.000616)
Student: Black		−0.1655***		1.263***
		(0.0066)		(0.0257)
Student: Hispanic		−0.1355***		0.614***
		(0.0054)		(0.0131)
Student: Asian		−0.1178***		1.240***
		(0.0081)		(0.0420)
Student: other race		−0.1101***		1.185***
		(0.0131)		(0.0528)

(continued)

Table 3. (continued)

	Achievement		Postsecondary transition	
Variable	Unconditional	Conditional	Unconditional	Conditional
Student: attendance hours		0.0007***		1.001***
		(0.0000)		(0.0000880)
Student: English as a second language		−0.0105		1.104***
		(0.0062)		(0.0281)
Student: part time		0.0093		1.190***
		(0.0053)		(0.0261)
Student: unemployed		0.0203***		1.001
		(0.0041)		(0.0177)
Student: not in labor force		0.0099		0.833***
		(0.0058)		(0.0231)
Student: number of other instructors		0.0113***		1.047***
		(0.0021)		(0.00872)
Student: no disability		0.0433***		1.019
		(0.0073)		(0.0280)
Student NRS: ABE beginner		0.3046***		1.305***
		(0.0200)		(0.0947)
Student NRS: ABE intermediate–high		0.3937***		1.737***
		(0.0113)		(0.0696)
Student NRS: ABE intermediate–low		0.2520***		1.379***
		(0.0109)		(0.0528)
Student NRS: ASE high		0.1574***		1.289***
		(0.0095)		(0.0327)
Student NRS: ESL advanced		0.4765***		2.928***
		(0.0090)		(0.134)
Student NRS: ESL beginner		−0.0567***		0.933
		(0.0081)		(0.0486)
Student NRS: ESL high		0.1751***		1.144**
		(0.0066)		(0.0513)
Student NRS: ESL intermediate–high		0.3192***		2.011***
		(0.0071)		(0.0816)
Student NRS: ESL intermediate–low		0.2157***		1.489***
		(0.0074)		(0.0680)
Program size		0.0349***		0.976
		(0.0055)		(0.0241)
Program performance		0.3984***		2.741***
		(0.0448)		(0.440)
Program type: community college		−0.1233**		3.347***
		(0.0411)		(0.568)
Program type: CI		0.0155		1.423
		(0.1642)		(0.936)

(continued)

Table 3. (continued)

	Achievement		Postsecondary transition	
Variable	Unconditional	Conditional	Unconditional	Conditional
Program type: FBO		−0.4199*** (0.1016)		1.116 (0.471)
Program type: PU		−0.3453* (0.1745)		2.409 (1.655)
Program type: LEA		−0.0345 (0.0481)		1.722** (0.332)
Year: 2009		0.0605*** (0.0043)		1.013 (0.0170)
Year: 2010		0.0478*** (0.0045)		0.778*** (0.0139)
Constant	0.0029 (0.0248)	−0.1428** (0.0530)		
N (unique)	213,154	211,670	313,113	311,096
No. of students	163,518	162,338	250,993	249,325
No. of teachers	2801	2779	4177	4141
No. of programs	72	70	105	103
Program-level ICC	0.0446	0.0359	0.2800	0.0955
Teacher-level ICC	0.3010	0.1374	0.4694	0.1784
AIC	549984.1	462182.9	184256.4	175755.7
BIC	550025.1	462685.7	184288.4	176266.8

Note. Columns 3 and 4 display odds ratios and constants are not displayed. Robust standard errors appear in parentheses. Reference categories are White (for race/ethnicity), high school or lower (for education level), employed (for employment status), ESL (for instructional category), ABE beginner basic (for student NRS level), and CBO (for program type). *$p < .05$. **$p < .01$ ***$p < .001$. ABE = adult basic education; ASE = adult secondary education; ESL = English as a second language; NA = not applicable; NRS = National Reporting System for Adult Education; CBO = community-based organization; FBO = faith-based organization; PU = public university; LEA = local education agency; ICC = intracorrelation coefficient. AIC = Akaike information criterion; BIC = Bayesian information criterion.

Teacher specialization is also statistically significantly correlated with student outcomes. Comparing to teachers specialized in ESL, having an ASE teacher is correlated with a 17% point increase in test score gains, while having an ABE teacher is correlated with a 35% point decrease in test score gains. There were no statistically significant differences in posttest score gains between students with part-time teachers and those with full-time teachers. Having teachers with more adult education experience or more PD were not associated with better student posttest scores.

In Table 3, columns 3 and 4, we present results from the three-level HLM logit models with postsecondary education transition as an outcome variable. The coefficients in the table are odds ratios; they represent the relative odds, compared to the reference group, of a student entering postsecondary education given the teacher, student, or program characteristics. A coefficient of less than 1 implies that the characteristic is

associated with lower odds of student transition (i.e., a student is less likely to transition if he or she has a teacher with that characteristic); a coefficient larger than 1 denotes a higher odds of transition for the given characteristic. The ICCs from unconditional models for teacher and program levels were 0.280 and 0.469, respectively. About 28% of the variation in transition outcomes was due to teacher differences, and 47% was due to program-level differences. With the addition of covariates, the variation in transition outcomes at the teacher and program levels dropped to 18% and 9%, respectively. The model had an average variance inflation factor of 2.12, with a range of 1.02 and 8.02. For postsecondary education transition, having an ASE or ABE teacher is correlated with higher odds of transitioning to postsecondary education compared to having an ESL teacher (OR = 7.521 and OR = 3.219, respectively). We also found that higher levels of teacher PD were associated with lower odds of transitioning, though this counterintuitive relationship was very small in magnitude (OR = 0.997). Students with part-time teachers had lower odds of transitioning to postsecondary education compared to students with full-time teachers (OR = 0.812). Prior adult education experience and teacher demographic characteristics were mostly uncorrelated with student outcomes, except for teacher race. There was a marginally negative correlation between having a Hispanic or Asian teacher and test gains, and a negative correlation between having a Hispanic teacher and the odds of entering postsecondary education (OR = 0.749).

We should note that students may have multiple teachers throughout their adult education period. Our analyses for test score gains are course specific, which enables us to attribute any academic improvement to the teachers who taught that course. However, for our postsecondary education analysis, students might have benefited from multiple teachers before they are ready to transition to postsecondary education, leading to over- or underestimation of the relationship between the characteristics of their current teachers and student outcomes. We also control for the number of instructors that a student had during the period of our data to assess if teacher turnover is correlated with student outcomes. Our results show that the higher the number of teachers that a student had, the better the academic and postsecondary transition outcomes. It is also important to note that more dedicated teachers might self-select into teaching students facing more challenges or barriers to success, which may help explain our counterintuitive findings on the relationships between PD and education attainment and student postsecondary education transition.

Although teacher characteristics were the focus of our study, we should note that several student and program characteristics are highly correlated with student performance. The higher the overall performance of a local program, the higher the odds of a student from that program transitioning to postsecondary education. Among all program settings, students attending programs in a community college setting had higher odds of transitioning to postsecondary education (OR = 3.347). In addition, the number of hours of student attendance was positively correlated with student test score gains and was correlated with slightly higher odds of transitioning to postsecondary education (OR = 1.001). White students outperformed all other racial groups on post-tests, while Black and Asian students had higher odds of entering postsecondary

education (OR = 1.263 and 1.240, respectively). Additionally, students' employment and labor participation status were negatively correlated with their test score gains and their postsecondary transition. Students who were unemployed at the time performed significantly better on posttests than those who were employed. Students who were not in the labor force had slightly higher posttest scores and a lower probability of transitioning to postsecondary education compared to students who were full-time workers. Students who were working part time had higher odds of entering postsecondary education than full-time workers. These results imply that employment and postsecondary education are potential, complementary options for adult students. When students are employed full time, they may have less time to attend classes and commit to the time it takes to achieve a postsecondary credential. The reduced time may be reflected in lower test score gains and fewer postsecondary credentials achieved due to the longer time such gains would take for employed students to achieve them. For adults who are unemployed or underemployed, however, adult education programs successfully assist them in improving their academic learning and reaching higher educational attainment.

Conclusion

This study is the first attempt to explore the relationship between adult education teacher characteristics and adult student test score gains and the transition to postsecondary education. Our findings suggest that several teacher characteristics matter. Students whose teachers had a bachelor's or a graduate degree had higher posttest scores, although this relationship does not hold for helping students making the transition to postsecondary education. In addition, part-time status or prior adult education experience is not statistically significantly correlated with improved student scores from pretest to posttest, but part-time adult education teachers are less effective in helping students transition to postsecondary education compared to full-time teachers. Our findings suggest that part-time teachers are as effective as full-time teachers in helping adult students achieve better posttest scores, and that programs might therefore consider assigning full-time teachers to students who seek to transition to postsecondary education.

We should emphasize, however, that our study has several limitations and raises several questions for future research. First, the lack of longitudinal data systems for teachers and students in the adult education data system did not allow us to take student self-selection into account: It is likely that more motivated or capable students chose to enroll in courses with more qualified teachers or in programs with smaller sizes or better overall program performances, which may lead to over- or underestimation of the correlations between teacher characteristics and student performance. In addition, student and teacher data used in our sample were not collected consistently across programs—especially information on the type and quality of PD. To improve on the research design, states need to collect a wider range of student and teacher data and to collect these data uniformly across programs and over time. Using such data and an analytical approach that takes student self-selection into account, studies

can infer causal relationships between teacher characteristics and student outcomes to guide policy formation and implementation in the adult education field.

Second, the data used in our study are nearly a decade old and were obtained from only one state. Therefore, interpreting and drawing conclusions from this study should be approached with caution. Additional studies that use more recent data from other states, or smaller scale but higher quality data, are needed to confirm our findings. For instance, researchers can use longitudinal data from local education providers to conduct teacher the value-added analyses that are commonly used in the K–12 teacher effectiveness literature. Such analysis will provide richer information that can be used to observe students and teachers over multiple time points to analyze how teacher characteristics affect student achievement. In addition, blended or hybrid learning is gaining in popularity, and teachers are being offered PD opportunities to acquire the skills needed to offer blended learning in adult education (Rosen & Stewart, 2015). Studies that explore how teacher characteristics interact with different education modes and student outcomes will provide guidance for future adult education policy development and implementation.

Finally, our study, as the first step in exploring teacher quality in adult education, identified some basic teacher variables related to student performance; however, further analyses are needed to address research questions such as whether teacher quality affects student postsecondary education choices or how teacher quality correlates with students' labor market outcomes. The Workforce Opportunity and Investment Act (WIOA), the legislation that defines and funds the federal adult education program, articulates two central purposes goals of adult education: to help adults develop skills to enable them to participate in postsecondary education and to help adult students acquire the skills to enter and succeed in the labor market through workforce preparation and training. Recognizing the central role of the teacher in providing high-quality instruction and promoting adults' postsecondary and employment success, WIOA requires states to adopt rigorous instructional content standards and provide quality instruction. WIOA also requires every state to develop a comprehensive state PD system. This PD, funded by a categorical set-aside of state grant funds within WIOA specifically for this purpose, is designed to equip teachers with the knowledge and skills to provide quality teaching to enable adults to achieve employment and success in postsecondary education.

Our study marks the first step toward understanding the role of adult education teachers in building a more effective adult education teacher labor force to fulfill the WIOA mandate and guide state PD efforts. Further, WIOA recognizes the global consensus that adult education will play a critical role in transforming our labor force to meet the demand for human capital, as we welcome the fifth industrial revolution (UNESCO Institute for Lifelong Learning, 2016). Studies have shown that the United States risks losing its edge in global economic competitiveness because new American workers do not have the same level of educational preparation as many of their international counterparts—especially American adults who have dropped out of high school or who have completed high school but not gone on to college (Jones & Kelly, 2007; West, 2012). Through WIOA, the United States has prioritized

employment skills and postsecondary education, in the knowledge that the fastest growing jobs in the country will require workers to have postsecondary educational preparation (Bergeron & Martin, 2015). However, data from the 2019 U.S. Census indicate that over 40 million adults in the United States have low literacy, and more than 25 million adults—or 14% of working-age adults—have not completed high school or the equivalent. Among those with less than a high school diploma, approximately 35% dropped out before the ninth grade, and they speak English poorly or do not speak English at all. Thus, providing quality adult education is critical as a pathway to postsecondary education and the labor market, and equipping adult education with the most qualified and appropriate teachers is the key to its success.

Acknowledgments

The views expressed herein do not necessarily represent the positions or policies of the Office of Career, Technical, and Adult Education or the U.S. Department of Education. No official endorsement of any product, commodity, service, or enterprise mentioned in this material is intended or implied.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Office of Career, Technical, and Adult Education of the U.S. Department of Education (grant number ED-CFO-10-A-0066).

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Notes

1. These data are slightly outdated; however, they are the most recent data available. The composition of adult students and teachers has not changed significantly over the past few years; therefore, we are confident that the results of the analysis are relevant to the field.
2. The analytical sample excludes duplicates, students who cannot be linked to their teachers, and cases with missing or miscoded outcome variables. A detailed description the data cleaning and management methods is available upon request.
3. A detailed description of the standardization methodology is available upon request.
4. To test if there is any correlation between teacher–student race match and student outcomes, we also created 16 interaction terms (e.g., White teacher * White student, White teacher * Black student) and conducted a regression analysis including these interaction terms. We did not identify any consistent patterns of teacher–student matching effects. Results are available upon request.
5. We also tested a three-level logistic regression model with random slopes for potential differential relationships between teacher characteristics and student test score gains, and a

three-level OLS model with random slopes for postsecondary education outcome. Results from the two specifications (random intercept vs. random slopes) are comparable in magnitudes and signs of the coefficients. We based our inferences on the results from the random intercepts model, which is easier to interpret and present.

6. ICCs are computed using postestimation commands in Stata (version 15.0). In a three-level nested random intercept model. Level 3 ICC is

$$\rho^3 = \frac{\sigma_3^2}{\gamma + \sigma_2^2 + \sigma_3^2}$$

whereas level 2 ICC is

$$\rho^2 = \frac{\sigma_2^2 + \sigma_3^2}{\gamma + \sigma_2^2 + \sigma_3^2}$$

where γ the variance of level 1 error term, σ_2 and σ_3 are variances of level 2 and level 3 error terms (StataCorp., 2017).

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