The Association Between Teaching Students with Disabilities and Teacher Turnover

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Abstract

More students with disabilities (SWDs) are being educated in general education classrooms than ever before, resulting in higher expectations for the abilities of general education teachers to meet SWDs' educational needs. Yet few recent, quantitative studies have examined if teaching SWDs influences general education certified or special education certified teachers' decisions to remain teaching at their same school. We fit multilevel logistic regression models to a large state administrative dataset in order to examine (1) if the percentage of SWDs a teacher instructs was associated with turnover, (2) if this association varied by student disability, and (3) how these associations were moderated by special education certification. The percentage of SWDs in teachers' classes was associated with an increase in the odds of turnover after controlling for teacher, classroom, and school characteristics. This association was completely moderated by special education certification and dual-certification in special education and general education such that there was not an association between the percentage of SWDs in these teachers' classes and their odds of turnover. Teaching students with behavioral disorders was associated with a large increase in the odds of turnover for all categories of teachers. Results suggest the need for more training and supports for teachers with SWDs in their classrooms.

keywords: teacher turnover, teacher attrition, inclusion, special education, multilevel modeling, teacher certification

The Association Between Teaching Students with Disabilities and Teacher Turnover

Teacher turnover has significant detrimental effects on schools and students (Feng & Sass, 2017; Milanowski & Odden, 2007; Ronfeldt, Loeb, & Wyckoff, 2013). Turnover contributes to inequities in the distribution of effective teachers across schools as teachers move from low- to high-resource schools (Clotfelter, Ladd, & Vigdor, 2006; Feng & Sass, 2017; Lankford, Loeb, & Wyckoff, 2002; Mason-Williams, 2015; Mason-Williams & Gagnon, 2017), and creates a financial burden for schools and districts who must recruit new teachers to fill vacant positions (Milanowski & Odden, 2007). Turnover negatively affects student academic outcomes by disrupting instructional cohesion (Ronfeldt et al., 2013; Hanushek, Rivkin, & Schiman, 2016) and poses a significant challenge to the continuous implementation of effective educational programs (McLeskey & Billingsley, 2008). Leaving teaching, one aspect of turnover, has implications for understanding teacher shortages, but total turnover, both moving and leaving, has immediate consequences for schools and their students.

Understanding school-based variables associated with turnover is essential to designing policies and interventions that attenuate this pervasive problem. Researchers have consistently found that teachers who work in schools that serve students with lower average student achievement, larger percentages of minority students, and larger percentages of economically disadvantaged students have higher turnover rates than teachers who work in schools that serve less traditionally disadvantaged students (Boyd, Lankford, Loeb, Rockoff, & Wyckoff, 2008; Feng, 2009; Hanushek, Kain, & Rivkin, 2004; Ingersoll, 2001; Loeb, Darling-Hammond, & Luczak, 2005). Studies also find that special education teachers have higher average turnover rates than general education teachers (DeAngelis & Presley, 2011; Ingersoll, 2001). However, researchers have not examined if the number of students with disabilities (SWDs) in teachers'

classes is related to turnover. General education and special education teachers share responsibilities for educating SWDs (Dewey et al., 2017; Eisenman, Pleet, Wandry, & McGinley, 2011; McLeskey, Landers, Williamson, & Hoppey, 2012), thus examining if teaching SWDs is associated with teacher turnover and the extent to which special education certification attenuates this association is critical for improving the academic and social outcomes of these students.

The present study examines if teaching SWDs is related to teacher turnover and if special education certification moderates this association. We begin by reviewing existing literature suggesting that the students teachers instruct may influence teachers' career decisions. Next, we describe how teacher training and certification are related to turnover and the differences between special education certified and general education certified teachers, before presenting the research questions and hypotheses.

The Influence of Students on Turnover

Teachers within a school may work with students of varying achievement levels (Clotfelter et al., 2006) and disabilities (Gilmour & Henry, 2018a). Few studies, however, have examined if the students in teachers' classes influence turnover; most studies have focused on the association between student characteristics at the school-level and teacher turnover (e.g., Boyd et al., 2008; DeAngelis & Presley, 2011; Hanushek et al., 2004; Loeb et al., 2005). One study that has linked students to teachers at the classroom level suggests that the students in teachers' classes potentially influence teacher turnover (Feng, 2009). Using a sample of beginning teachers in Florida, Feng (2009) found that a one unit change in the average discipline incidents per student in teachers' classes was associated with an average increase in the odds of teachers moving within district of 8%, a 14% increase in the odds of moving to another district, and an

8% increase in the odds of leaving teaching in Florida. Though understudied in the turnover literature, the characteristics of students in teachers' classes may influence teacher career decisions.

Student behavior problems, in particular, appear to influence teachers' attitudes towards teaching and the demands of their jobs (Martin, Lloyd, Kauffman, & Coyne, 1995; Olson, Chalmers, & Hoover, 1997; Soodak, Podell, & Lehman, 1998; Westling, 2010). In Westling's study, 44% of general education teachers reported that student behavior problems made them think about quitting teaching. Other quantitative research suggests that student behavioral challenges are associated with teacher burnout (Aloe, Shisler, Norris, Nickerson, & Rinker, 2014), a strong predictor of turnover or intentions to leave teaching (Billingsley, 2004). Additionally students without disabilities have lower academic performance and exhibit more behavioral challenges when in a class with a peer who has a behavioral disorder (BD; Gottfried, 2014; Gottfried & Harven, 2015) and new survey data suggests that teachers spend less time on instruction when teachers' report that students exhibit challenging behavior (Cooc, working paper). Teachers appear to be influenced by the students they instruct in ways that may be reflected in their career decisions

The associations between student characteristics at the school- and class-level and turnover raise concerns for teachers of SWDs, both general education and special education teachers. Many SWDs exhibit low academic achievement and behavioral challenges (Gilmour, Fuchs, & Wehby, 2018; Blackorby et al., 2005; Institute for Education Sciences, 2006; Reschly & Christenson, 2006; U.S. Department of Education Office for Civil Rights, 2014). These are the same student characteristics identified in prior research as associated with turnover (Boyd et al., 2008; Feng, 2009; Hanushek et al., 2004; Ingersoll, 2001; Loeb et al., 2005). Additionally, prior

research suggests that special education teachers have higher odds of turnover than general education teachers (Borman & Dowling, 2008; DeAngelis & Presley, 2011; Ingersoll, 2001). For example, drawing on nationally representative data, Ingersoll found that special education teachers had a 37% higher probability of turnover than teachers certified in other areas, after accounting for teacher and school characteristics. These studies of special education teacher turnover estimate the association between all aspects of being a special education teacher (e.g., paperwork, providing instructional support, writing and leading IEP meetings, etc., in addition to teaching SWDs) and turnover, rather than specifically examining the link between teaching SWDs and turnover. This omission from the literature is notable as most general education teachers, in addition to special education teachers, have SWDs in their classrooms (Gilmour & Henry, 2018a). The simultaneous characteristics of low academic achievement and greater behavioral challenges could put teachers of SWDs at greater risk for turnover unless they are prepared to meet the dual needs of these students.

Preparation As a Moderator

Unfortunately, research suggests that teachers are rarely prepared to meet the academic and behavioral needs of SWDs (Freeman, Simonsen, Briere, & MacSuga-Gage, 2014; Greenberg, Putman, & Walsh, 2014; Jenkins & Ornelles, 2009; Oliver & Reschly, 2010; Ornelles, Cook, & Jenkins, 2007; Scruggs & Mastropieri, 1996). This is problematic because training and preparation, as indicated by certification, may attenuate teacher turnover (Billingsley, 2004; Borman & Dowling, 2008; Kane, Rockoff, & Staiger, 2008; Redding & Smith, 2016). Studies of out-of-field placement, when a teacher is assigned classes in an area in which they are not certified or trained, also suggest the importance of training and certification to attenuate to turnover (Donaldson & Johnson, 2010; Ingersoll, 1999). Preparation or skill,

commonly indicated in the existing literature by certification (e.g., Feng & Sass, 2013; Gottfried et al., 2016; Mason-Williams, 2015; Mason-Williams & Gagnon, 2017), could play an important role in teacher turnover especially in light of the varied skills indicated by special education and general education certification.

Differences Between Special Education and General Education Teachers

Philosophical differences between general education and special education teacher certification programs are particularly important to consider when examining how teaching SWDs influences turnover (Brownell, Ross, Colon, & McCallum, 2005; Jones & Brownell, 2014). General education teacher training is often characterized as a constructivist approach; an approach that may at times conflict with the explicit and strategy focused instruction that is characterized as effective instruction for SWDs (Jones & Brownell, 2014). Further, research suggests that general education teacher preparation may not provide general educators with the experiences and skills necessary for effectively teaching SWDs (Jenkins & Ornelles, 2009; Ornelles et al., 2007; Scruggs & Mastropieri, 1996). When general education teachers have classes that include large numbers of SWDs, their job requirements may not match their training and teaching skills.

Special education certification, or coursework in special education, appears to include a set of skills particularly important for working with SWDs (Feng & Sass, 2013; Gottfried, 2014; Gottfried, Egalite, & Kirksey, 2016; Nougaret, Scruggs, & Mastropieri, 2005; Sindelar, Daunic, & Rennells, 2004). Some literature has shown that SWDs score better on state standardized assessments when they are taught by a special education certified teacher (Feng & Sass, 2013). Moreover, special education certified teachers have higher ratings of classroom performance when they teach SWDs than uncertified or alternatively certified teachers teaching SWDs

(Nougaret et al., 2005; Sindelar et al., 2004). Gottfried and his colleagues (2016) report that the association between having a classmate with BD and student absences was moderated by having a special education certified teacher. However, this research base is limited and should be interpreted with caution as some recent studies do not find a consistent positive association between special education certification and the academic outcomes of SWDs with varying learning needs (Gilmour, under review). Relatedly, emerging research regarding teacher candidates who are becoming dual-certified, certified in both general education and special education, suggests that dual-certified pre-service teachers report that they are, on average, more supportive of inclusion, feel more prepared to implement inclusion, and have had more opportunities for field work in inclusive classrooms than general education teacher candidates (Gehrke & Cocchiarella, 2013; Shippen, Crites, Houchins, Ramsey, & Simon, 2005). These studies provide tentative evidence that special education certification and coursework signals specific skills for working with this population of students.

Research Questions and Hypotheses

Examining if teaching SWDs is associated with teacher turnover is important as growing numbers of SWDs are included in general education classrooms and taught by general education teachers (Dewey et al., 2017; McLeskey et al., 2012) and in light of recent evidence highlighting unintended consequences of including SWDs in general education classrooms (Cooc, working paper; Gottfried, 2014; Gottfried et al., 2016; Gottfried & Harven, 2015). The studies reviewed above suggest three hypotheses. First, teaching SWDs may be associated with teacher turnover. Second, teaching students with specific disabilities associated with greater behavioral challenges might be most highly associated with turnover. Third, any identified associations between teaching SWDs or students with behavioral challenges and turnover might be moderated by

special education certification such that teaching SWDs or students with specific disabilities is not associated with turnover for teachers with special education certification. We pose three research questions to examine these hypotheses:

1. Is an increase in the percentage of SWDs in teachers' classes associated with an increase in the odds of turnover after accounting for teacher, class, and school characteristics?
2. Is an increase in the percentage of students with specific disabilities in teachers' classes associated with an increase in the odds of turnover after accounting for teacher, class, and school characteristics?
3. Does special education certification moderate these associations such that the association between the percentage of SWDs, or students with specific disabilities, in teachers' classes has a weaker association with turnover for special education certified teachers?

Methods

Data Source and Sample

We addressed these questions using extant administrative panel data linking students to teachers and teachers to schools over three school years, 2009/10, 2010/11, and 2012/13, in North Carolina (NC). We did not include data from 2011/12 because the dataset did not include the primary disability label for SWDs. We included all teachers in regular public schools who taught kindergarten through twelfth grade, worked in a single school during a single school year, and were linked to students. We excluded teachers in years when they did not teach any SWDs (10.22% of teacher-by-year records) and when they were missing certification status (0.4% of teachers), gender (0.79% of teachers), race/ethnicity (0.79% of teachers), and years of experience (0.53% of teachers). Ninety-eight percent of teacher-by-year records were not missing any variables. Teachers who were missing variables more often taught in high schools (42.82% vs. 31.35%), more frequently had an entry to teaching designated as unclassified (29.16% vs.

4.84%), were less frequently certified in a content area (48.16% vs. 33.17%), when certification information was not missing. The states' data collection efforts were intended for use in student-level accountability reporting and for linking teachers to students in tested grades and subjects to assess teaching effectiveness. The missing data patterns may be related to less focus on data quality for teachers in untested areas and grades. The final sample used for the analyses included 116,827 teachers in 2,305 schools. The dataset included 217,285 teacher-by-year records (i.e., teachers could have multiple observations in the dataset).

Table 1 presents the demographics of this sample. Each teacher was included once in the calculations of means and percentages across the demographic variables. Teachers in this sample were most often white woman with ten years of experience. The majority of teachers in the sample were certified in elementary education or were certified in an area other than English, math, science, social studies, or special education. Only 6.31% of teachers were certified in special education, another 5.33% of teachers were certified in special education and a content area. The majority of teachers were prepared in NC. Table 2 includes the average characteristics of students in these teachers' classes. Nearly 20% of the students in teachers' classes were classified as SWDs. The majority of these students had LD followed by OHI, SLI, and ID. On average, only 0.86% of students in teachers' classes had BD. Teachers taught diverse students, however the percentage of students of different races/ethnicities varied across classrooms. General education certified teachers, on average, taught classes where 12.84% of their students were SWDs (SD=11.63; range= 0.12-100). Special education certified teachers, on average, taught classes where 89.77% of their students were SWDs (SD=22.16; range= 0.31-100). Dual-certified teachers taught classes where an average of 60.34% of their students were SWDs (SD=41.18; range=0.28-100) and test dual-certified teachers taught classes where an average of

69.36% of their students were SWDs (SD=38.17; range=0.46-100). (Note that the three categories of special education certified teachers are discussed in more detail in the moderator section below). School characteristics are presented in Table 3. The majority of schools in the sample were elementary schools. Slightly over half of the schools were in rural areas and qualified for Title I funding. Schools primarily served White and Black students, but student characteristics varied across schools, as did the proportion of students who qualified for FRL, school funding, and acts of violence per 1000 students.

Variables

Dependent variables. We examined total end of year turnover, both moving and leaving, as the outcome of interest because both types of turnover result in the loss of a teacher to a school. We determined teachers' end of year turnover statuses, using NC pay files from 2009/10, 2010/11, 2011/12, 2012/13, and 2013/14. The NC pay files included each teacher who was paid in each pay period during a school year and at which school each teacher was employed during that pay period. Teachers were coded as experiencing turnover if (1) the teacher was in one school for all pay periods in one school year and was not paid at all during the following school year by NC public schools (leaving teaching in NC) or (2) the teacher was in one school for all pay periods in one school year and was not in the same school for any periods the following school year, but was still paid by NC public schools during any pay period (moving schools).

Teaching SWDs. The first independent variable of interest was the average percentage of SWDs in teachers' classes in a given school year. We calculated this variable by linking students to teachers in each school year using classroom roster data and calculating the percentage of SWDs in each of a teacher's classes in a school year. We averaged the percentages of SWDs in a

teacher's classes across all the classes where the teacher was the instructor of record in a given school year. We then grand mean centered the average percentage of SWDs.

Students with Specific Disabilities. We calculated the average percentage of students with specific disabilities in teachers' classes in a given school year using the approach described above. The administrative student demographic files included dummy variables indicating each student's main disability eligibility area if the student was eligible for special education services. These eligibility areas included learning disability, speech/language impairment, other health impairment, intellectual disability, autism, behavioral disorder, hearing impairment, multiple disabilities, orthopedic impairment, vision impairment, developmental delay, and traumatic brain injury. Students were less frequently identified with hearing impairments, multiple disabilities, orthopedic impairments, vision impairment, developmental delay, or traumatic brain injury. We grouped students with these disabilities into one group labeled "other" and included the average percentage of students with "other" disabilities in the models. We grand mean centered each disability specific predictor.

Moderator. Following prior research**,** we used certification as an indicator for training to work with SWDs. We examined three categories of special education certification. We classified teachers as special education certified if the teachers were certified only in special education. We classified teachers as dual-certified if the teachers were certified in special education and another area. Other researchers have noted that dual-certification includes two groups of teachers; those who have completed coursework to obtain both certification and those that have passed a licensure test to obtain at least one of their certifications (Brownell, Sindelar, Kiely, & Danielson, 2010). We separated these two types of dual-certification. Teachers that we classified as dual-certified completed a teacher preparation program that focused on both general education

and special education or completed an additional degree to become dual-certified. We classified teachers as test dual-certified when the teachers had obtained dual-certification by passing a licensure test. Certification information was included in the administrative dataset. These variables act as moderators when interacted with the percentage of SWDs or students with specific disabilities in teachers' classes. Of note, when special education certification, dual-certification, and test dual-certification are included in the models without an interaction, the coefficients capture the average change in the odds of turnover for teachers in each certification category.

Control variables. Past research has identified teacher and school characteristics that are associated with turnover (Borman & Dowling, 2008). These variables could also be associated with the percentage of SWDs a teacher instructs, though past research has not examined this question. We controlled for teacher characteristics, aggregate characteristics of students in teachers' classrooms, and school characteristics to better isolate the association between the average percentage of SWDs in teachers' classes and turnover.

Teacher control variables. We included two demographic variables in the models, dummy codes for teacher race/ethnicity (Black, Hispanic, White [comparison], Native American, Other) and gender (male, female [comparison]). Teacher race and gender were reported by the teacher to NC and included in teacher files. We included dummy codes indicating if the teacher was certified in English, science, math, social studies, or other areas, with certification in elementary education as the comparison category. The "other" certification designation included certification in art, music, physical education, or foreign language. We classified teacher entry into teaching into six categories, traditional out-of-state preparation, Teach for America, other alternative entry, visiting teacher, unclassified entry to teaching, or in-state preparation, and

controlled for these in the model. The comparison category for entry was in-state traditional entry into teaching (i.e., completing a teacher preparation program at an institute of higher education in NC). We included three dummy variables indicating if teachers were in their first, second, third, or thirtieth and above year of teaching to capture the non-linear association between years of experience and turnover (Boe, Cook, & Sunderland, 2008; Kelly 2004), with teachers in their fourth to twenty-ninth year of teaching as the comparison group. These variables are summarized in Table 1.

Classroom control variables. For each year of data, we calculated the aggregate characteristics of students in teachers' classes and averaged across the number of classes the teachers instructed in a given school year following the same approach described above to calculate the average percentage of SWDs in teachers' classes. We included these classroom control variables in the models to eliminate potential student demographic variables that could confound the association between the percentage of SWDs in teachers' classes and turnover, such as a higher percentage of SWDs who are also classified as economically disadvantaged (Gilmour & Henry, 2018b). The classroom control variables are summarized in Table 2. We calculated the average percentage of Black, Hispanic, Asian, other minority students, male students, students qualifying for free/reduced lunch, English language learners, and gifted students in teachers' classes each year. We included teachers' average class sizes and the average of the average absences per pupil across a teacher's classes. All of these variables were grand mean centered.

School control variables. School level characteristics in the dataset include dummy variables indicating if the school was a middle school (grades 6-8), high school, elementary school, or a different grade combination (such as a K-8 school). We also included dummy

variables for the school area designation, urban, town, rural, or suburban, provided by the National Center for Educational Statistics. We included indicators for if the school exceeded, met, or did not meet state growth goals and if the school received Title I funding. We included a continuous variable with state recorded violent acts per 100 students and the grand mean centered total per pupil expenditure in hundreds. We included the percentage of Black, Hispanic, Asian, and other minority students in the school and the percentage of students qualifying for free/reduced lunch as an indicator of economic disadvantage. These variables were also grand mean centered. We treated school level variables as time invariant by averaging these variables across the school years.

Analyses

We fit a series of multilevel logistic models using *xtlogit* and *gllamm* (Rabe-Hesketh, Skrondral, & Pickles, 2005) in Stata 15. *gllamm* is a program for fitting generalized mixed models by maximum likelihood using adaptive quadrature (Rabe-Hesketh & Skrondal, 2006). We used eight integration points and robust standard errors based on a sandwich estimator (Rabe-Hesketh & Skrondal, 2006). Building the models by adding groups of control variables provided us with additional information regarding variables that changed the association between turnover and teaching SWDs. In the final model, we used school fixed effects to eliminate unmeasured time invariant school characteristics, such as working conditions, that could be associated with turnover and the assignment of SWDs to teachers. *xtlogit* is a program for fitting conditional fixed-effects models. It provides a convenient method for estimating the within-school association between variables. In all models, we used $p<.05$ as the cutoff for statistical significance.

Models addressing SWDs as one category. In Model 1, we used a three-level model with random teacher and school intercepts. Model 1 included the average percentage of SWDs in teachers' classes, a dummy variable indicating that the teacher did not teach any SWDs, dummy variables for each school year to account for changes in turnover across school years, and random teacher and school intercepts. This model was:

$$logit(y_{ijk})) = \gamma_{000} + \gamma_{100} PercSWD_{ijk} + \gamma_{200} 10/11_{ijk} + \gamma_{300} 11/12_{ijk} + U_{00k} + V_{0jk}$$

$$U_{00k} \sim N(0, \psi_{00})$$

$$V_{0jk} \sim N(0, \psi_{11}) \quad (1)$$

where:

$logit(y_{ijk})$ is the log odds of turnover for teacher *j* leaving in school *k* at time *i*;

γ_{000} is the log odds of turnover where all predictors are 0;

γ_{100} is the change in the log odds of turnover associated with a one percentage point change in the percentage of SWDs in a class;

$PercSWD_{ijk}$ is the average percentage of SWDs in a class for teacher *j* in school *k* at time *i*;

γ_{200} is the change in the log odds of turnover associated with the school year 2010/11;

$10/11_{ijk}$ indicates if the data for teacher *j* in school *k* at time *i* is from the 2010/11 school year;

γ_{300} is the change in the log odds of turnover associated with the school year 2011/12;

$11/12_{ijk}$ indicates if the data for teacher *j* in school *k* at time *i* is from the 2011/12 school year;

U_{00k} is the random school effect; and

V_{0jk} is the random teacher effect.

The random effects were assumed to be independent and identically distributed and independent of the covariates. The model included robust standard errors in all models to address potential model misspecification (Raudenbush & Bryk, 2001).

In Model 2, we added teacher characteristics to Model 1 to account for differences between teachers. In Model 3, we added other classroom characteristics to Model 2 to control for other student variables that might be associated with disability status and turnover. We further added school level control variables to Model 4. The results of Model 4 provided an estimate of the association between the category of the average percentage of SWDs in a teacher's class and the change in the odds of turnover after controlling for teacher, class, and school level variables. However, this model did not account for variables unobserved in this dataset, such as school working conditions, which could be related to turnover.

The final model for RQ1, Model 5, included a school fixed effect to address unobserved time invariant differences across schools that may be related to teacher turnover and the percentage of SWDs in a classroom. We eliminated the school characteristics and school random effects from Model 4 and added school fixed effects. The sample used for Model 5 eliminates 31 schools in which all teachers have the same value for the dependent variable (in 16 schools all teachers in the sample stayed in their positions, in 13 school all teachers in the sample moved schools or left teaching). Model 5 acted as a check against omitted variable bias due to excluded time invariant school level covariates, such as, variations across schools in how they identify students for special education services or working conditions (Johnson, Kraft, & Papay, 2012; Kraft, Marinell, & Yee, 2016).

Models addressing specific disability categories. We repeated the model building approach described above to examine the association between teaching SWDs and turnover considering SWDs as one group, but replace the independent variable, the percentage of SWDs in teachers' classes, with the percentage of students with specific disabilities.

Moderator analyses. We evaluated special education certification, dual-certification, and test dual-certification as moderators by adding an interaction term between each certification category and the percentage of SWDs in teachers' classes or the percentage of students with specific disabilities in teachers' classes to the models with teacher, classroom, and school characteristics (Model 4). We included interactions when the main effects of the certification category and the percentage of SWDs or students with specific disabilities were statistically significant. We further probed the interaction using two approaches. First, we ran models that re-centered the percentage of SWDs or students with specific disabilities in teachers' classes at 25%, 50%, 75%, and 100%. Re-centering provides a significance test of the interaction at different values of the independent variable (Preacher, Curran, & Bauer, 2004; Sommet & Morselli, 2017). Second, we ran the original moderator models, with the average percentage of SWDs or students with specific disabilities in teachers' classes, changing the comparison group in the dummy coding of the four certification variables (general education certification, special education certification, dual-certification, and test dual-certification). These models provided a statistical test of the association between the percentage of SWDs, or students with specific disabilities, and turnover for each category of teacher.

Results

In this sample, 15.10% of teachers left teaching or moved schools over the three years we studied. In 2009/10, 13.12% of the teachers in the sample moved schools or left teaching; in 2011, 15.08% of teachers moved schools or left teaching, and in 2013 17.10% of teachers moved schools or left teaching. Consistent with prior research, teachers who moved schools or left teaching were more frequently beginning or late career teachers (13.09% of teachers who left or moved were in their first year, 9.04% were in their second year, 7.69% were in their third year,

and 12.39% had taught thirty or more years). Teachers who remained in their position at their school were more frequently prepared in state (28.72% vs, 33.13% of teachers), less frequently had completed an alternative preparation program (16.14% vs. 14.30%), and were more often not certified in special education (5.80% vs. 7.12%) than teachers who did not stay in their positions. Also aligned with prior research, teachers who left or moved taught classes in which a higher percent of their students were black (32.39% vs. 26.16%), qualified for FRL (59.46% vs. 54.38%), and received special education services (22.15% vs. 19.60%). Turnover was higher in schools that had higher percentages of students who were minorities, higher percentages of students qualifying for FRL, and more acts of violence per 1,000 students.

SWDs and Turnover

Across all models, the percentage of SWDs in teachers' classes was associated with turnover. These results are presented in Table 4. The association between the percentage of SWDs in a class and turnover decreased with the addition of teacher and classroom control variables. This coefficient remained the same after the addition of school control variables and school fixed effects. Table 5 shows the conditional probabilities of turnover for teachers with 25%, 50%, 75%, or all of their students classified as SWDs calculated from Model 1, the model without control variables, and Model 4, the model including all control variables. The conditional probabilities ranged from 0.04 to 0.05 after accounting for differences between teachers, their students', and the schools in which they taught.

Moderation of the association between teaching SWDs and turnover. We added the interaction between special education certification, dual-certification, and test dual-certification and the percentage of SWDs in teachers' classes to Model 4. The association between the percentage of SWDs in teachers' classes and turnover remained statistically significant and

substantively large. A one percentage point change was associated with a 0.005 logit increase in the odds of turnover for general education teachers ($p<.001$) after controlling for teacher, class, and school characteristics. The interactions between certification and teaching SWDs were all statistically significant (Table 6) across the range of percentage of SWDs in teachers' classes. We probed these interactions by running models with each certification group as the comparison in order to obtain an estimate of the association between each special education certification type and turnover. Special education certification completely moderated the association between teaching SWDs and turnover such that the percentage of SWDs in special education certified teachers' classes was not associated with turnover ($b=-0.001$; $p>.05$). Test dual-certification also moderated the association between teaching SWDs and turnover such that the association between teaching SWDs and turnover was not statistically significant for test dual-certified teachers ($b=-0.003$; $p>.05$) Similarly, dual-certification moderated the association between teaching SWDs and turnover, but teaching SWDs was still associated with turnover for these teachers ($b=0.003$, $p<.01$). The conditional probabilities are reported in the bottom half of Table 5.

Specific Disabilities and Turnover

Next, we fit the same models but included the percentage of students with specific disabilities instead of the percentage of SWDs as a group. The coefficients are interpreted as the logit change in turnover associated with a one percentage point change in the percentage of students with a specific disability label after controlling for the percentage of students with other disabilities in the class. In Model 1, the model without control variables, all disability categories were associated with a change in turnover; these results are presented in Table 7. The coefficients decreased with the addition of classroom and teacher control variables, and the

association between teaching students with SLI and turnover was no longer statistically significant. A one percentage point change in the percentage of students with LD or ID in teachers' classes was associated with a 0.002 logit change in turnover, after controlling for all other variables. The strongest association was between the percentage of students with BD in teachers' classes and turnover. A one percentage point increase in the percentage of students with BD in a class was associated with a 0.011 logit change in turnover after accounting for teacher, class and school characteristics. This translates to a conditional probability of 0.051 when a quarter of the students in a teacher's class had BD, and a conditional probability of 0.11 when all of the students in a teacher's class had BD (Table 5).

Moderation of the association between specific disabilities and turnover. We examined the interactions between special education certification, dual-certification, and test dual-certification and the percentage of students with specific disabilities in teachers' classes. The percentage of students with BD in teachers' classes was positively associated with turnover ($p<.01$) and was not moderated by special education certification or dual-certification. Special education certification and test dual-certification moderated the association between teaching students with LD or autism and teacher turnover, but not other disability categories, such that teaching students with these disabilities was not associated with teachers' odds of turnover. Dual-certification moderated the association between teaching students with LD and turnover, and the association between teaching students with OHI and turnover such that teaching these students was not associated with turnover for dual-certified teachers. These moderations were statistically significant across the range of percentages of students with specific disabilities.

Teachers with Special Education Certification

Special education certification and dual-certification were consistent predictors of teacher

turnover when SWDs were considered as one group (Table 1). Once we disaggregated SWDs by disability category, certification category was not associated with a change in the odds of turnover. This suggests that differences in turnover rates between special education certified or dual-certified teachers and general education certified teachers were likely due to differences in the characteristics of the SWDs that they taught, differences better captured by the disaggregated disability categories.

Discussion

Turnover is widely recognized as detrimental to schools and students. Past research has identified that turnover is associated with the characteristics of schools and teachers (Boyd et al., 2008; Hanushek et al., 2004; Loeb et al., 2005), but, prior to this study, researchers have not directly examined if teaching SWDs is associated with turnover despite the large numbers of SWDs that are educated in general education classrooms. We found that the odds of turnover increased as teachers had a higher percentage of SWDs in their classes and that this association was moderated by special education certification, dual-certification, and test dual-certification. The association between the percentage of SWDs teachers instructed and turnover varied by disability type. The percentage of students with BD in teachers' classes was strongly associated with turnover, the associations between the percentage of students with LD, ID, autism, or OH in teachers' classes were moderate and similar to considering SWDs as one group, and the association between the percentage of students with SLI and turnover was not statistically significant. Teaching students with LD was not associated with an increase in turnover for teachers with any type of special education certification, and teaching students with autism was not associated with turnover for teachers with special education certification or test dual-certification. Teaching students with BD was a strong predictor of turnover across all teacher

categories. These results suggest that teachers' decisions about continuing to teach may be influenced by the students in their classrooms, particularly those at greatest risk for exhibiting challenging behavior and that training in special education, as indicated by certification, may be important for attenuating the associations between teaching students with some types of disabilities and turnover.

These findings are not particularly surprising in light of prior research on both teacher turnover and teachers' attitudes towards inclusion. Similar to our findings, student behavior appears strongly aligned with teachers' career decisions (Feng, 2009; Westling, 2010). Student behavior is also related to how general education teachers feel about including SWDs' in their classrooms (Olson et al., 1997; Soodak et al., 1998). The results here quantitatively show that teachers, both general education and special education certified teachers, are responding to teaching SWDs, and may struggle with instructing students with BD. These findings have implications for student outcomes, identifying malleable mediators and moderators for intervention, and training and supporting teachers.

Turnover and SWDs' Outcomes

Our finding that the odds of turnover increased when general education teachers taught more SWDs has potentially negative implications for SWDs' academic outcomes in two ways. First, higher general education teacher turnover in inclusive settings could result in SWDs' exposure to a revolving door of general education teachers resulting in lower instructional cohesion and student achievement (Hanushek et al., 2016; Ronfeldt et al., 2013). Second, general education teachers may not only be making different career decisions when they instruct more SWDs, they may also change the instruction they deliver in undesirable ways. For example, teachers report spending less time on instruction when they have more SWDs in their classes

(Cooc, working paper). The emerging findings that SWDs' peers without disabilities may have lower academic and behavioral outcomes when they have classmates with disabilities (Gottfried, 2014; Gottfried et al., 2016; Gottfried & Harven, 2015) could reflect unintended and/or ineffective instructional changes that teachers make when they have more SWDs in their classrooms. Future research should examine if teaching SWDs results in immediate changes in teacher instruction, such as spending less time on instruction and more time on addressing student behavior.

Mediators of Turnover

Our models suggest a need to study other measured and unmeasured mediators of turnover. Similar to past research (Borman & Dowling, 2008; Ingersoll, 2001), we found that special education certification alone was associated with an increase in the odds of turnover after accounting for teacher, classroom, and school characteristics, including the percentage of SWDs that these teachers had in their classrooms. However, the estimate of the association between special education certification and turnover decreased substantially after the addition of school fixed effects to the model. Unmeasured school working conditions (e.g., principal leadership, support from colleagues) may mediate turnover for special education certified teachers. Special education certified teachers may be at higher risk of turnover not because of the students that they teach, but because of other aspects of their jobs. Working conditions consistently mediate the association between teaching low-achieving, economically disadvantaged students and turnover (Johnson et al., 2012; Kraft et al., 2016). Future work aimed at stemming special education teacher turnover should focus on identifying the specific malleable aspects of working conditions that are most important for retaining special education teachers.

Other findings also support the importance of school working conditions as mediators for all teachers. We found that the association between teaching SWDs, or students with BD, and turnover decreased after the addition of classroom, teacher, and school characteristics. For example, a percentage point increase in the percentage of students with BD in teachers' classes was associated with a 0.016 logit change in the odds of turnover before accounting for differences in class composition, teachers, and schools. This association decreased to 0.014 after the inclusion of teacher control variables and further decreased to 0.008 (Table 7). The change in the coefficient reflecting the association between teaching students with BD and turnover from the model with all controls and the model with school fixed effects suggests that future research should examine if and how school working conditions attenuate turnover when teachers instruct students with BD. This would provide information for developing school-level supports for in-service teachers.

Supporting and Training Teachers

In the present study, the association between teaching SWDs and turnover was completely moderated by special education certification and test dual-certification; the percentage of SWDs in these teachers' classes was not associated with their odds of turnover. This may reflect the alignment of teachers' training to their teaching assignment.

Unlike special education certified teachers, dual-certified teachers in this sample had higher odds of turnover as they instructed more SWDs, but the strength of this association was weaker than that of general education certified teachers. These findings may reflect a potential problem with dual-certification identified by Brownell and her colleagues (2010). Teacher preparation programs that result in dual-certification may decrease the amount of coursework that pre-service teachers receive in special education or general education so as not to extend the

amount of time it takes students to graduate with certification. If this thinning of the curriculum takes place, dual-certified teachers may not have sufficient training to meet the needs of SWDs and their peers without disabilities. Theoretically, dual-certification appears to be a method for supporting SWDs in general education classrooms, but very little research has focused on the training of dual-certified teachers. More research is warranted to examine how dual-certified teachers are prepared and if they are more effective teachers for students with and without disabilities than teachers without training in both general and special education. Findings from these studies could inform additional training requirements for general education teachers who have SWDs in their classes.

Across all certification areas, teaching students with BD was associated with large increases in the odds of turnover. This finding reflects prior research that suggests working with students with BD is particularly challenging for special education and general education teachers (Olson et al., 1997; Scruggs & Mastropieri, 1996), that student problem behavior leads to burnout (Aloe et al., 2014), and research suggesting that problem behavior is associated with general education teacher turnover (Feng, 2009). Teaching classes that include students with BD might also be more challenging as the peers without disabilities in these classes may exhibit more problem behavior than in a class without any students with BD (Gottfried, 2014; Gottfried & Harven, 2015). The results of the current analyses may reflect the lack of training in classroom management reported by most teachers (Freeman et al., 2014; Greenberg et al., 2014; Oliver & Reschly, 2010).

Fortunately, research has identified effective classroom management and behavior interventions (Simonsen, Fairbanks, Briesch, Myers, & Sugai, 2008). School-wide systems such as School-wide Positive Behavior Interventions and Supports are associated with decreases in

problem behavior at the school level (Bradshaw, Mitchell, & Leaf, 2010). In addition to and in consort with school-wide systems, teachers can change their instruction to include behavior specific praise (Sutherland, Wehby, & Copeland, 2000), more opportunities to respond (Sutherland & Wehby, 2001), and active supervision (De Pry & Sugai, 2002). Training on these systems, strategies, and interventions should be included in all teacher preparation program and part of on-going, supportive in-service teacher professional development. Additionally, research suggests that teachers with stronger classroom management have students who exhibit greater academic gains than teachers without classroom management skills (Grossman, Cohen, Ronfeldt, & Brown, 2014; Kane, Taylor, Tyler, & Wooten, 2011). Requiring classroom management as a component of teacher education and certification for general education and special education teachers should be researched as it may attenuate the increase in turnover associated with teaching students with BD while improving academic outcomes for all students.

At the in-service level, future research should examine what types of interventions help to support general education teachers with SWDs' in their classrooms, special education certified teachers working in settings that include students with and without disabilities, and teachers who have students with BD in their classes. For example, coaches or behavioral support staff hired to support the implementation of school-wide systems of behavior support might assist teachers with implementing effective practices for working with SWDs. Another approach might be to create programs that match teachers who are skilled in working with SWDs to teachers who are struggling to teach SWDs in order to provide peer support. Prior work suggests that these types of on-going, peer-supported professional development opportunities may be associated with improved outcomes for students (Papay, Taylor, Tyler, & Laski, 2016).

Limitations and Conclusion

These results should be interpreted while considering the limitations of the study. Some limitations are directly related to choices that we made regarding the sample and to variables included the dataset. We excluded teachers who were missing demographic characteristics (2% of teachers). The teachers who were missing demographic characteristics more often taught untested subjects in untested grades than teachers with complete data; the findings here should not be extended to teachers with these characteristics. Our sample also only included teachers who had SWDs in their classes. Eliminating teachers who did not teach SWDs (10% of teachers) aligned with the research questions, but the results do not compare the probability of turnover for teachers who have SWDs in their classes to the probability of turnover for teachers who do not have SWDs in their classes. Additionally, these data are from one state and the findings may not generalize to other settings. We used certification as an indicator of a teacher's special education training. Though certification is often used in research as an indicator of skill and training in special education (e.g., Feng & Sass, 2013; Gottfried et al., 2016; Mason-Williams, 2015; Mason-Williams & Gagnon, 2017), certification is a coarse indicator as training, and teachers' skills, likely vary across certification programs.

Of note are additional limitations that present areas for future research. We only examined special education certification as a moderator when it is likely that other malleable teacher and school level variables moderate or mediate the association between the percentage of SWDs or students with specific disabilities in teachers' classes and turnover. It is likely that the association between teaching SWDs and turnover is actually indirect, that is self-efficacy or burnout may be important mediating variables and should be studied in future research. We did not examine the effectiveness of the teachers who left teaching or moved schools. Some turnover might be valuable if this turnover is primarily of ineffective teachers (Henry, Bastian, & Fortner,

2011). Moving and leaving have the same human resources impact at the school level, positions need to be filled and students' academic achievement suffers, but moving schools and leaving teaching have different implications for addressing state-level shortages as would examining teachers who change positions both within and between schools. Our models also focused on overall associations rather than context specific associations. Within school associations could be examined through cluster mean centering variables instead of grand mean centering variables and other state longitudinal datasets may have better measures of working conditions and other important contextual variables that influence turnover. Of note, the specification check we ran in Models 5 supported that the average associations we observed across schools exists within schools. Our choice to use the average percentage of SWDs in teachers' classes assumed that job demands related to students were distributed evenly across a day. Instead the demands of teaching SWDs might be sensitive to having a single class of hard to serve students. Considering these limitations future research should examine if the association between teaching SWDs and general education certified teachers' odds of turnover varies by teacher effectiveness, consider moving and leaving separately, specifically examine contextual variables that influence the association between teaching SWDs and turnover, and test if how the number or percentage of SWDs a teacher instructs is calculated changes the results.

In light of the expanded inclusion of SWDs in general education settings (McLeskey et al., 2012) and concerns regarding the effects of teacher turnover on students, it is important to consider how teaching SWDs affects teachers. The results of this study suggested that teacher turnover was responsive to the percentage of SWDs that they instruct and that training to work with SWDs, as indicated by certification, may be important in decreasing turnover. The results also suggest that teachers face challenges when working with students who have BD. Future

research must consider the importance of teachers as mediating the experiences of SWDs in their educational placements and address how to support the needs of all teachers who instruct SWDs.

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Table 1
Teacher demographics (*n*=116,827).

Variable	Percent or Mean (SD)
Years of experience	10.99 (9.57)
Male	20.91
White	82.13
Black	13.36
Hispanic	1.56
Asian	0.70
Native American	1.00
Other minority	1.25
Special education only certification	6.19
Dual certification	4.89
Test dual certification	0.94
English certification	15.08
Science certification	9.91
Social studies certification	13.18
Math certification	11.24
Other certification	33.64
Elementary certification	58.77
Out of state prepared	29.44
Teach for America	0.77
Other alternative entry	15.17
Visiting teacher	0.66
Unclassified entry to teaching	4.72

Note. SD= Standard deviation. The certification categories add up to above 100% because teachers could have certifications in multiple areas such as an elementary certification and math certification.

Table 2
Classroom characteristics averaged by year per teacher (n=217,285).

Variable	Mean %	SD	Range
Students with disabilities	19.98	25.76	0.12 – 100
SLI	3.05	6.54	0 – 100
LD	7.26	11.25	0 – 100
OHI	3.65	7.38	0 – 100
Autism	1.77	8.31	0 – 100
ID	3.12	10.70	0 – 100
BD	0.86	4.40	0 – 100
Other disability	2.04	8.06	0 – 100
Students without disabilities	80.02	25.76	0 – 99.88
White	51.60	28.09	0 – 100
Black	27.10	23.96	0 – 100
Hispanic	12.73	14.17	0 – 100
Asian	2.23	4.90	0 – 100
Other race	5.28	8.70	0 – 100
Male	52.43	14.44	0 – 100
Economically disadvantaged	55.15	24.923	0 – 100
English language learner	7.58	12.93	0 – 100
Gifted	10.16	13.59	0 – 100
Class size*	17.56	7.01	1 – 439
Absences per pupil**	8.31	3.72	0 – 132

Note. Teachers may have multiple years of classroom data and all years are included in the descriptive statistics. *Class size reflects mean class size not a percentage. The large classes are primarily due to marching band and other electives. **Absences per pupil reflects the mean absences per pupil not a percentage. SLI=Speech/language impairment. LD= learning disability, OHI= other health impairment, ID= intellectual disability, BD= behavior disorder, SD= standard deviation

Table 3
School characteristics (n=2,305)

Variable	Percentage/Mean Percentage	SD	Range
Elementary school	56.18		
Middle school	18.79		
High school	21.30		
Elementary and middle	4.99		
Other grade configuration	0.39		
Suburb	13.63		
Rural	55.79		
City	26.68		
Town	14.36		
Met growth goals	45.03		
Exceeded growth goals	44.29		
Did not meet growth goals	21.43		
Title 1	53.89		
White	52.75	27.18	0.24 – 100
Asian	2.13	3.43	0 – 47.19
Black	26.91	23.32	0 – 97.50
Hispanic	12.84	11.11	0 – 74.42
Other	5.37	7.22	0 – 95.73
Economically disadvantaged	59.27	23.79	0 – 100
Total per pupil expenditure in hundreds	89.92	34.55	13.86 – 1443.40
Acts of violence per 1000 students	6.15	7.71	0 – 93.35

Note. Some school locations, grade level, and growth designations changed over time. These schools are coded between 0-1 depending on the proportion of years with the specific designation. These percentages are rounding schools coded as .5 to 1. This is also why the percentages do not add to 100. SD=standard deviation

Table 4

Models addressing the association between the category of the average percentage of SWDs teachers' classes and the odds of turnover (RQ1).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
% SWDs	0.005***	0.000	0.004***	0.001	0.003***	0.001	0.003***	0.001	0.003***	0.001
SPED cert.			0.153***	0.053	0.143**	0.053	0.142**	0.053	0.094*	0.041
Dual-cert.			0.108*	0.047	0.093*	0.046	0.098*	0.047	0.064	0.035
Dual test			0.006	0 .090	-0.01	0.089	-0.002	0.089	-0.004	0.066
Intercept	-3.009***	0.045	-3.176***	.050	-3.099***	0.048	-3.185***	0.070		
Teacher var.			X		X		X		X	
Class var.					X		X		X	
School var.							X			
School FE									X	
Variances										
Teacher	3.719	0.159	2.128	0.132	2.00	0.128	2.031	0.129		
School	0.609	0.032	0.402	0.022	0.287	0.017	0.273	0.016		
Fit statistics										
LL (df)	-89557.2 (6)		-87808.5 (29)		-87525.4 (40)		-87468.4 (57)			
AIC	179126.3		175675.1		175130.8		175050.8			
BIC	179188.1		175973.5		175542.3		175637.3			
Sample size										
Observations	217,285		217,285		217,285		217,285		216,869	
Teachers	116,827		116,827		116,827		116,827		105,178	
Schools	2,305		2,305		2,305		2,305		2,274	

Note. SWDs= Students with disabilities. S.E.=Standard error. LL=Log likelihood. df=Degrees of freedom. Var.= variables. FE= Fixed effects. Coefficients are on a logit scale. All models include a year fixed effect. *p<.05. **p<.01. ***p<.001. Intercepts are school specific in Model 5 so are not included in the table. Fit information is excluded for Model 5 because the sample is not the same as the sample used in prior models.

Table 5
Conditional probabilities of turnover.

	Model 1	Model 4		
RQ1				
25% SWDs	0.048	0.040		
50% SWDs	0.055	0.043		
75% SWDs	0.062	0.047		
100% SWDs	0.071	0.050		
RQ2				
25% LD	0.052	0.039		
50% LD	0.058	0.042		
75% LD	0.066	0.046		
100% LD	0.074	0.049		
25% ID	0.052	0.040		
50% ID	0.059	0.042		
75% ID	0.065	0.044		
100% ID	0.073	0.046		
25% BD	0.068	0.048		
50% BD	0.098	0.062		
75% BD	0.140	0.080		
100% BD	0.195	0.102		
25% AU	0.052	0.041		
50% AU	0.057	0.045		
75% AU	0.063	0.049		
100% AU	0.069	0.053		
25% OH	0.053	0.042		
50% OH	0.061	0.046		
75% OH	0.070	0.052		
100% OH	0.080	0.057		
	Gen. Ed. Cert.	SPED Cert.	Dual-Cert.	Test Dual
RQ3				
25% SWDs	0.041		0.046	
50% SWDs	0.046		0.050	
75% SWDs	0.052		0.054	
100% SWDs	0.058		0.058	

Note. Model 1 includes year fixed effects but does not include control variables. Model 4 includes year fixed effects, teacher variables, classroom variables, and school variables.

Table 6
Interactions

	General Ed.		SPED		Dual		Dual-test	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
SPED*SWD	-0.006***	0.002			-0.004*	0.002	0.002	0.003
Dual*SWD	-0.002***	0.001	0.004*	0.002			0.006*	0.002
Test*SWD	-0.008***	0.002	-0.002	0.003	-0.006*	0.002		
Gen.*SWD			0.006***	0.002	0.002	0.001	0.008***	0.002
% SWDs	0.005***	0.000	-0.001	0.002	0.003**	0.001	-0.003	0.002
Gen. Ed. cert.			-0.410***	0.0107	-0.93	0.055	-0.280*	0.133
SPED cert.	0.410***	0.107			0.319**	0.119	0.130	0.170
Dual-cert.	0.092	0.055	-0.318**	0.119			-0.188	0.143
Dual test	0.280*	0.133	-0.130	0.170	0.188	0.144		
Intercept	-3.166***	0.070	-2.756***	.050	-3.088***	0.089	-2.886***	0.149
Variances								
Teacher	2.015	0.129	2.011	0.129	2.058	0.146	2.010	0.129
School	0.272	0.016	0.272	0.016	0.274	0.017	0.272	0.016
Fit statistics								
LL (df)	-87457.97 (60)		-87458.0 (60)		-87458.34 (60)		-87458.0 (60)	
AIC	175035.9		175036.0		175036.7		175036.0	
BIC	175653.3		175653.3		175654.0		175653.4	
Sample size								
Observations	217,285		217,285		217,285		217,285	
Teachers	116,827		116,827		116,827		116,827	
Schools	2,305		2,305		2,305		2,305	

Note. SWDs= Students with disabilities. S.E.=Standard error. LL=Log likelihood. df=Degrees of freedom. Var.= variables. Coefficients are on a logit scale. All models include a year fixed effect. *p<.05. **p<.01. ***p<.001. Intercepts are school specific in Model 5 so are not included in the table. Fit information is excluded for Model 5 because the sample is not the same as the sample used in prior models.

Table 7

Models addressing the association between the category of the average percentage of students with specific disabilities teachers' classes and the odds of turnover (RQ2).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
% LD	0.005***	0.001	0.004***	0.001	0.002*	0.001	0.002*	0.001	0.002*	0.001
% SI	-0.004*	0.002	-0.002	0.001	-0.001	0.002	0.001	0.002	0.001	0.001
% ID	0.005***	0.001	0.004***	0.001	0.002*	0.001	0.002*	0.001	0.002*	0.001
% BD	0.016***	0.002	0.014***	0.002	0.010***	0.002	0.011***	0.002	0.008***	0.001
% AU	0.004***	0.001	0.003**	0.001	0.003**	0.001	0.004**	0.001	0.003***	0.001
% OH	0.006***	0.002	0.005***	0.001	0.004**	0.001	0.005**	0.001	0.004**	0.001
SPED cert.			0.091	0.055	0.109*	0.055	0.117*	0.056	0.075	0.042
Dual cert.			0.067	0.048	0.070	0.047	0.081	0.048	0.052	0.036
Dual test cert.			-0.036	0.091	-0.028	0.089	-0.018	0.091	-0.011	0.067
Intercept	-2.999***	0.044	-3.156***	0.050	-3.091***	.048	-3.235***	0.077		
Teacher var.			X		X		X		X	
Class var.					X		X		X	
School var.							X			
School FE									X	
Variances										
Teacher	3.707	0.158	2.120	0.132	1.998	0.128	2.189	0.162		
School	0.595	0.031	0.399	0.022	0.287	0.017	0.280	0.017		
Fit statistics										
LL (df)	-89518.2 (12)		-87781.4 (35)		-87510.95 (46)		-87450(63)			
AIC	179060.4		175632.8		175113.9		175026.2			
BIC	179183.9		175992.9		175587.2		175674.4			
Sample size										
Observations	217,285		217,285		217,285		217,285		216,869	
Teachers	116,827		116,827		116,827		116,827		105,178	
Schools	2,305		2,305		2,305		2,305		2,274	

Note. LD= Learning disabilities. SI= Speech/language impairments. ID= Intellectual disabilities. BD= Behavior disorders. AU= Autism. OH= Other health impairment. S.E.=Standard error. LL=Log likelihood. df=Degrees of freedom. Var.= variables. FE= Fixed effects. Coefficients are on a logit scale. All models include a year fixed effect and the percentage of students with other disabilities (visual impairment, hearing impairment, traumatic brain injury, etc.) in the class. *p<.05. **p<.01. ***p<.001. Intercepts are school specific in Model 5 so are not included in the table. Fit information is excluded for Model 5 because the sample is not the same as the sample used in prior models.