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Growth and gaps in mathematics achievement of students with and without disabilities on a statewide achievement test☆

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ABSTRACT

This study estimated mathematics achievement growth trajectories in a statewide sample of 92,045 students with and without disabilities over Grades 3 to 7. Students with disabilities (SWDs) were identified in seven exceptionality categories. Students without disabilities (SWoDs) were categorized as General Education (GE) or Academically/Intellectually Gifted (AIG). Students in all groups showed significant growth that decelerated over grades as well as significant variability in achievement by student group, both at the initial assessment in Grade 3 and in rates of growth over time. Race/ethnicity, gender, parental education, free/reduced lunch status, and English language proficiency were also significant predictors of achievement. Effect size estimates showed substantial year-to-year growth that decreased over grades. Sizeable achievement gaps that were relatively stable over grades were observed between SWoDs and students in specific exceptionality categories. Our study also demonstrated the importance of statistically controlling for variation related to student demographic characteristics. Additional research is needed that expands on these results with the same and additional exceptionality groups.

1. Introduction

Foundational skills in mathematics are essential for the development of proficiencies that lead to later achievement and success in school and career (National Early Literacy Panel, 2008), and are a key focus in national efforts to reform education in the United States. However, recent reports of state test score trends have indicated that although students with disabilities (SWDs), have participated in their state assessments in mathematics, the majority of SWDs' performances have not met state proficiency standards (Center on Education Policy, 2009; Thurlow, Altman, Cormier, & Moen, 2008). The purpose of this study was to examine mathematics achievement growth in school children, especially those with disabilities, as a context for understanding the mathematics achievement gap and the implications for policies targeted at closing the achievement gap between students with and without disabilities.

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1.1. The No Child Left Behind Act

The No Child Left Behind Act (NCLB, 2002) represented a fundamental change in educational accountability practices in the United States. It involved the federal government more deeply in state educational practices and created more formal expectations for educational achievement. States were mandated to establish high reading and mathematics proficiency standards at each grade and to evaluate whether students met those standards by conducting annual testing of all students in Grades 3 to 8. Another signature feature of NCLB was its emphasis on the progress of all students, with an explicit goal of closing achievement gaps by 2014 between student groups historically at risk for low achievement relative to the general student population. Progress toward this long-term goal was to be examined yearly through the establishment of adequate yearly progress (AYP) targets stated in terms of the percent of students reaching grade-level proficiency in each grade in mathematics and reading.

Along with the federal emphasis on the progress of all students and closing achievement gaps, NCLB required states to examine AYP by evaluating both the performance of all students relative to the grade-level proficiency standards, and the performance of disaggregated student groups. These disaggregated groups included student race/ethnicity; students living in poverty as indicated by receipt of free or reduced price lunch at school; and students with disabilities. Of the disaggregated groups, the group that has typically displayed the largest achievement gap relative to the general student population has been students with disabilities (SWD). Achievement of SWDs has been a concern for decades (Carlberg & Kavale, 1980; McDonnell, McLaughlin, & Morison, 1997), and currently many states report that over 70% of SWDs perform below proficiency on annual statewide reading and mathematics tests (Center on Education Policy, 2009). Further evidence of the particular difficulties for this group is provided in a study by Eckes and Swando (2009), who found that the most frequent reason for schools' AYP failure was the performance of the SWD group.

Although NCLB (2002) mandates that states establish high and uniform standards for proficiency in mathematics at each grade, there is not a strong empirical basis on which states can draw to establish these proficiency standards or for the expectation that all students will meet them. Knowledge about early development of mathematics skills and abilities is limited (Carlson, Jenkins, Bitterman, & Keller, 2011), with even less information available about the developmental trajectories of mathematics achievement, especially for disaggregated groups including SWDs. This lack of information about developmental trajectories is important because one implication of the establishment of uniform proficiency standards for all students is that groups who start significantly lower in achievement in Grade 3 must attain greater rates of growth to meet grade-level expectations for proficiency.

Adding to the importance of a better understanding of developmental trajectories and the extent of achievement gaps observed at each grade are recent changes to NCLB. The Race To The Top (RTTT) legislation (U.S. Department of Education, 2009) introduced greater flexibility in NCLB requirements for state accountability, including the use of growth models to examine not only current year performance of students but also the degree to which student achievement is progressing toward expectations (Manna & Ryan, 2011). However, we know little about trends in growth for SWDs as a whole or for students in specific exceptionality groups (Wei, Blackorby, & Schiller, 2011; Wei, Lenz, & Blackorby, 2013), and there is no large-scale, published research on mathematics achievement growth of students with specific exceptionalities on the actual state tests used for accountability reporting.

1.2. Mathematics achievement and achievement gaps for SWDs

A significant gap in mathematics achievement between students with and without disabilities has been well-documented (Council for Exceptional Children, 2013; Watson & Gable, 2013). For example, on the 2013 National Assessment of Educational Progress (NAEP) mathematics test, in comparison to students without disabilities (SWoDs), much lower percentages of SWDs demonstrated performance at or above "proficient" in Grade 4 (18% vs. 45%) and Grade 8 (9% vs. 39%; U.S. Department of Education, 2013). This gap is further documented on a variety of academic achievement tests. Specifically, researchers have consistently noted the lower mathematics performance of SWDs and differences in skills and abilities that may persist from early learning through later grades (Carlson et al., 2011; Chatterji, 2005; Denton & West, 2002; Lee & Burkam, 2002; LoGerfo, Nichols, & Reardon, 2006; Morgan, Farkas, & Wu, 2009; Princiotta, Flanagan, & Germino-Hausken, 2006; Shin, Davison, Long, Chan, & Heistad, 2013; Wei et al., 2013).

Although NCLB (2002) treats SWDs as one undifferentiated group, specific exceptionality categories represent very different kinds of learners whose average performance may differ significantly (Geary, Hoard, Nugent, & Bailey, 2012; Morgan, Farkas, & Wu, 2011; Wei et al., 2013). For example, in a meta-analysis of characteristics of different exceptionality groups, Sabornie, Cullinan, Osborne, and Brock (2005) found that compared to students with emotional/behavioral disabilities, students with mild intellectual disabilities, on average, scored two thirds of a standard deviation lower in academic achievement. Similarly, Morgan et al. (2011) found that, in fifth grade, students with speech-language impairments were approximately one half standard deviation below SWoDs, whereas students with learning disabilities were more than one standard deviation below SWoDs. So, although NCLB focuses on the achievement gap for SWDs as a whole, it is important to investigate and document the extent to which the achievement gap differs for specific exceptionality groups.

Central to NCLB and RTTT policy is the goal of closing or eliminating the achievement gap as students progress across grades. However, longitudinal studies of achievement gaps for SWDs report varying results. A number of studies have found increases in achievement gaps over time using district, state, and federal mathematics and reading assessments (Geary et al., 2012; Judge & Watson, 2011; Morgan et al., 2011; Wei et al., 2013). Less frequently, studies have reported stable achievement gaps over time (Jordan, Kaplan, & Hanich, 2002; Scarborough, 1998; Shaywitz et al., 1995). Finally, a number of researchers have reported decreases in the achievement gap, again across a variety of mathematics and reading assessments including district, state, and federal tests (Bast & Reitsma, 1998; Ding, Davison, & Petersen, 2005; Galindo, 2010; Han, 2008; Jordan et al., 2002; Protopapas, Sideridis, Mouzaki, & Simos, 2011; Scarborough & Parker, 2003; Tate, 1997).