

Cross Sectional and Longitudinal Portrayals of the Special Education Mathematics Achievement Gap¹

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ABSTRACT

We contrasted portrayals of the achievement gap on the North Carolina state mathematics assessment for students with disabilities (SWD) using two different ways of identifying this group of students. The first method used students' disability status in third grade as the basis for identifying SWD, and then tracked the achievement gap between SWD and students without disabilities (SWoD) across grades. With our second method, we allowed student disability status to change at each grade, so that only students who were receiving special education services in a particular year were considered members of the SWD subgroup for that year.

reference and focal groups in percentage of students in each group reaching or exceeding grade-level proficiency. For example, the Center on Educational Policy has reported that differences of 30 or 40 percentage points are common between the percent of SWD scoring at or above grade level proficiency compared to SWoD on states' large scale assessments of mathematics and reading achievement (Chudowsky et al., 2009).

A second way of examining achievement gaps is simply looking at differences in means between groups. As an example, a recent report (National Center for Education Statistics, 2013) concerning achievement score trends on the National Assessment of Education Progress (NAEP) found that the average mathematics score for 9-year-old Black students grade had increased substantially since 1971. Although White students had also made gains across time, they were not as large as the gains for Black students. The report concluded that the White/Black achievement gap in mathematics on the NAEP for this grade had narrowed because the difference between the means for the two groups was smaller than it had been in 1971.

A third way of characterizing achievement gaps is with effect sizes (Bloom, Hill, Black, & Lipsey, 2008). Effect sizes standardize the characterization of group mean differences by expressing them in ratio to the standard deviation of observed test scores. For example, a mean difference of 15 points between two groups on a test would be viewed quite differently if the standard deviation of scores on the test for the two groups was 25 versus 100 points. When characterizing achievement gaps, effect sizes permit gaps obtained on different measures to be more appropriately compared, because the gaps are all reported using the same metric. To illustrate, an achievement gap effect size of -0.5 can be interpreted

Achievement Gaps

One of the overarching goals in many educational reform efforts including the No Child Left Behind Act of 2001 (NCLB, 2002) and the recent Common Core State Standards Initiative (www.corestandards.org) has been high levels of achievement for all students. The examination of achievement gaps between reference and focal (at risk) groups of students has been widely used as a way to identify groups for whom the educational system is falling short of this goal, as well as a way to then monitor progress in "closing the gap."

Although the term "achievement gap" appears often in the educational lexicon (Chudowsky, Chudowsky & Kober, 2009; Konstantopoulous & Hedges, 2008; Lee, 2010) there are multiple ways of describing these gaps. NCLB requires states, districts, and schools to disaggregate and report the percent of students reaching grade level proficiency in reading and mathematics by gender, race/ethnicity, economic status, and English proficiency level. Here, achievement gaps are defined as differences between

as indicating that the mean for the focal group (e.g., economically disadvantaged students) fell one half standard deviation below the mean for the reference group (e.g., students not economically disadvantaged).

Each of these ways of characterizing the achievement gap produces a different portrayal of group performance differences. The three approaches appear frequently in public reporting and publications that characterize achievement gaps or trends in achievement gaps across time or grades, although in most cases, effect sizes are the preferred metric (Bloom et al., 2008).

The Achievement Gap for Students with Disabilities

Low academic achievement for students with disabilities (SWD) has been a longstanding concern (Blackorby, Chorost, Garza, & Guzman, 2005; McDonnell, McLaughlin, & Morison, 1997). In recent years, addressing the achievement gap between SWD and SWoD has been one of the most problematic aspects of NCLB. For example, Eckes and Swando (2009), in a study of three states, found that the most frequent reason for schools failing to make Adequate Yearly Progress was that too many students in the SWD subgroup had scored below grade level so that this subgroup did not meet the percent proficient benchmarks set by their state.

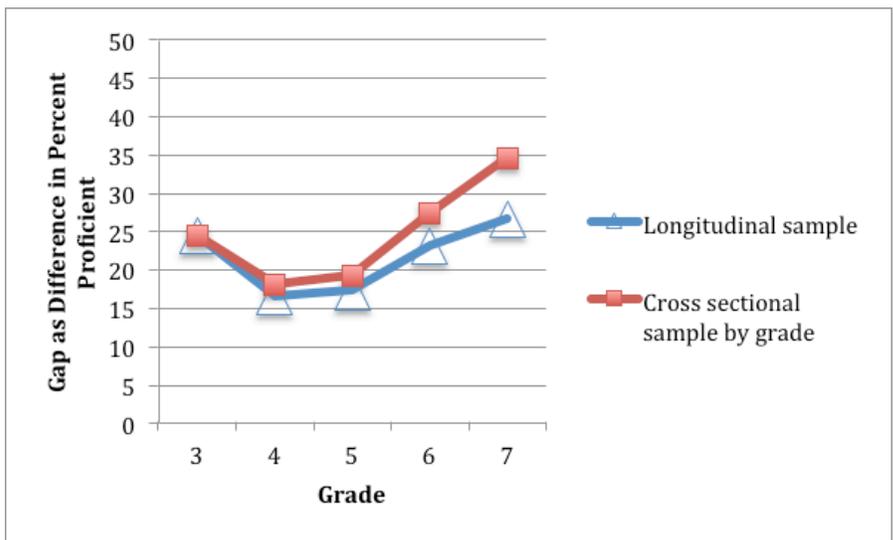


Figure 1. Size of achievement gap between students with and without disabilities, in terms of percent of students reaching grade level proficiency, for longitudinal and cross sectional samples.

Although there are likely many reasons schools encounter difficulties closing the achievement gap for this subgroup, Ysseldyke and Bielinski (2002) raised concerns that identifying the SWD subgroup on the basis of student's annual participation in special education masks achievement progress by this subgroup. Disability classification is less stable than many of other student characteristics that are tracked in terms of achievement gaps, such as student gender. Each year students who are academically successful are more likely to exit from special education, and students who are experiencing academic difficulty in general education are more likely to enter special education. Using large-scale assessment data from one state, Ysseldyke and Bielinski reported special education turnover rates of approximately 20% per year. They found that achievement gaps between SWD and SWoD were smaller when a stable subgroup of SWD, defined on the basis of special education membership at one point in time, was tracked rather than reconstituting membership in the SWD subgroup each year.

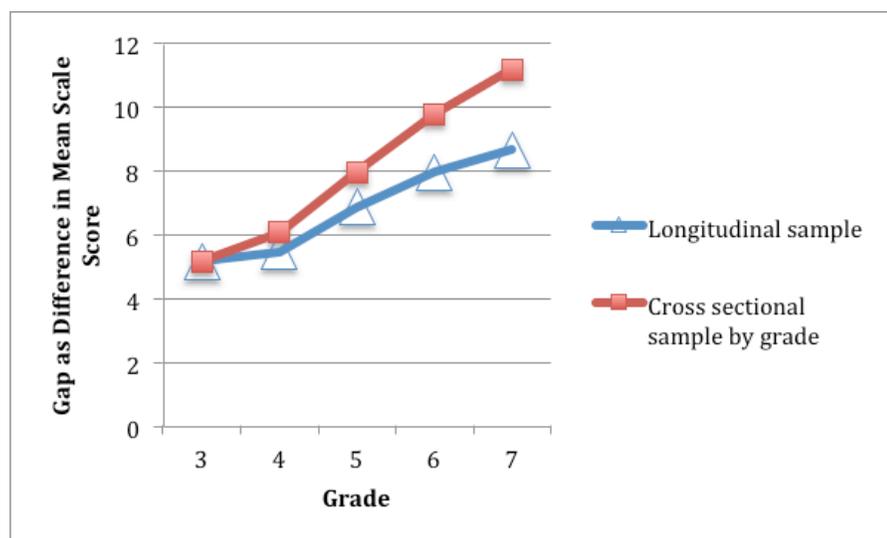


Figure 2. Size of achievement gap between students with and without disabilities, in terms of difference in mean scores, for longitudinal and cross sectional samples.

In our study, we examined how achievement gaps differed (whether stated as differences in percent proficient, mean score differences, or effect sizes) when a stable, longitudinal sample of students comprised the SWD subgroup versus a sample that changed annually depending on special

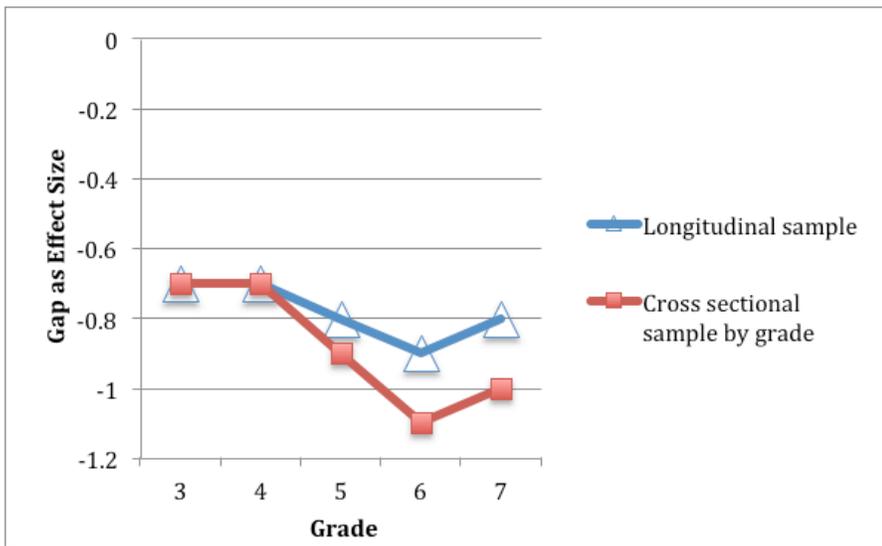


Figure 3. Size of achievement gap between students with and without disabilities, in terms of effect size, for longitudinal and cross sectional samples.

education participation for that year. The total sample was 92,045 students, all of whom were in the third grade for the first time in 2001, were not retained across grades three to seven, and had participated in the general assessment in mathematics at least once during the five-year time period of the study. In third grade, approximately 12% of the total sample was identified as a student with a disability. These students comprised the longitudinal SWD sample. We then contrasted the achievement gap for this stable sample of SWD with cross sectional samples at each grade, where membership in the SWD subgroup was defined by participation in special education that year.

Figure 1 depicts the size of the achievement gap in terms of the difference in the percent of SWD reaching grade level proficiency for a grade compared to SWoD. In grade three, the longitudinal and cross sectional SWD samples were the same students (because each group was defined as those students who were in special education in grade three). About 81% of SWoD had mathematics scores that placed them at or above grade level proficiency; only 56% of the SWD subgroup achieved scores in this range. Thus, there was an achievement gap of 25% in terms of the students in each group scoring in the proficient range or higher. Across grades, the achievement gap fluctuated up and down somewhat, and the values for the two different ways of constituting the SWD subgroup tracked these year-to-year fluctuations closely. However, in every year after third grade, the gap was more extreme when the SWD subgroup was cross sectional.

Figures 2 and 3 depict SWD achievement gaps

at each grade based on the difference between mean scores for SWD and SWoD. In Figure 2, each gap is the difference between the mean score for the SWoD and the SWD subgroups for that grade and way of defining the SWD subgroup. As in Figure 1, after grade three, the mathematics achievement gap was more extreme (i.e., larger) when the SWD subgroup was based on a cross sectional sample. In Figure 3, the differences between the means for the SWD and SWoD groups have been converted to effect sizes at each grade by dividing the mean difference between the SWD and SWoD groups by the pooled standard deviation of mathematics scores for that grade.

More extreme gaps result in effect sizes that are more negative. Again, the gaps were generally larger when the SWD subgroup was based on a cross sectional rather than longitudinal sample. Note also that, although the achievement gap grew wider with increasing grade level in Figure 2 for both SWD subgroups, when the gap was stated as an effect size, it narrowed from grade six to seven. This discrepancy in depictions of the achievement gap as widening or narrowing depending on whether mean differences or effect sizes are used is a result of the fact that effect sizes adjust mean differences for changes in the natural variation in scores across grades. The natural variation in scores increased in later grades, and interpreting achievement gaps in light of this change in the dispersal of student scores provides a more accurate context for interpreting the achievement gap.

In sum, regardless of how the SWD subgroup is comprised, there is a sizable gap between the achievement of students with and without disabilities across grades. However, because entrance and exits from special education are related to student achievement, failing to take this factor into account when examining achievement gaps may lead to mistaken conclusions about schools' effectiveness in addressing SWD achievement needs. It is also important to recognize the achievement gap can be portrayed in multiple ways, such as differences in the percent of students reaching proficiency and effect sizes, and results from the different approaches may yield discrepant results.

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References

- Blackorby, J., Chorost, M., Garza, N., & Guzman, A. M. (2005). The academic performance of elementary and middle school students with disabilities. In J. Blackorby, M. Chorost, N. Garza & A. M. Guzman (Eds.), *Engagement, academics, and social adjustment, and independence: The achievements of elementary and middle school students with disabilities* (pp. 4.1-4.22). Menlo Park, CA: SRI International. Retrieved from http://www.seels.net/info_reports/engagement.htm
- Bloom, H. S., Hill, C. J., Black, A. R., & Lipsey, M. W. (2008). Performance trajectories and performance gaps as achievement effect-size benchmarks for educational interventions. *Journal of Research on Educational Effectiveness*, 1, 289-328.
- Chudowsky, N., Chudowsky, V., & Kober, N. (2009). *State test score trends through 2007-2008, part 4: Has progress been made in raising achievement for students with disabilities?* Washington, DC.: Center on Education Policy.
- Eckes, S., & Swando, J. (2009). Special education subgroups under NCLB: Issues to consider. *Teachers College Record*, 111, 2479-2504.
- Konstantopoulos, S., & Hedges, L. V. (2008). How large an effect can we expect from school reforms? *Teachers College Record*, 110, 1611-1638.
- Lee, J. (2006). *Tracking achievement gaps and assessing the impact of NCLB on the gaps: An in-depth look into national and state reading and math outcome trends*. Cambridge, MA: The Civil Rights Project at Harvard University. Retrieved from <http://www.civilrightsproject.harvard.edu>
- McDonnell, L. M., McLaughlin, M. J., & Morison, P. (Eds.). (1997). *Educating one and all: Students with disabilities and standards-based reform*. Washington DC: National Academy Press.
- National Center for Education Statistics (2013). *The Nation's report card: Trends in academic progress 2012* (NCES 2013 456). Washington, D.C.: Institute of Education Sciences, U.S. Department of Education.
- No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107-110, § 115, Stat. 1425 (2002).
- Ysseldyke, J., & Bielinski, J. (2002). Effect of different methods of reporting and reclassification on trends in test scores for students with disabilities. *Exceptional Children*, 68, 189-200. Longitudinal Transition Study-2 (NLTS2).