Academic Growth of Exceptional Children in Reading and Mathematics: Findings from the National Center on Assessment and Accountability for Special Education

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Research Questions

The objective of this paper is to share information with Australian educators about research conducted by the National Center on Assessment and Accountability for Special Education (www.NCAASE.com) in the United States (US). NCAASE was funded by the US Department of Education's Institute of Education Sciences with the primary goal of increasing knowledge about the academic growth of special education students and its implications for school accountability models. This goal reflects the growing interest in holding schools accountable for student achievement growth as a more valid and fair way of judging schools' performance than annual reports of the percent of students reaching grade level proficiency (Linn, 2005; Stevens, 2005).

Although accountability indices based on growth are promising, there is limited research on academic growth for students in general education (GE) across multiple grades, and even less for students with disabilities (SWDs). Here we summarize selected results from three recent NCAASE studies (Schulte & Stevens, in press; Schulte & Stevens, 2014; Stevens, Schulte, Nese,

Elliott, & Tindal, in press) that addressed the following questions: (1) What is the nature of reading achievement across grades, and how does it differ for students in general and special education? (2) What is the nature of mathematics achievement across grades, and how does it differ for students in general and special education? (3) How do entrances and exits from special education affect reports of achievement outcomes for SWDs?

Study 1: Reading Growth Across Grades Three to Seven

Brief Overview of Methodology

In this study (Schulte & Stevens, 2014), we followed a single state cohort of 94,650 students who were in third grade in 2003. Students were included if they had participated in the large scale testing in reading at least one time in grades three to seven. Of the students included in the study, 12.3% were SWDs, 6.2 % were academically gifted, and 81.1% were GE students. SWD classification was based on students' exceptionality category, as indicated in their third grade test data. SWDs fell into one of seven exceptionality categories; autism, emotional disturbance, hearing impairment, intellectual disability, other health impairment, specific learning disability, or speech-language impairment. Although there are other exceptionality categories used in the US (e.g., deaf-blindness), we only included exceptionality categories where the number of students in our sample was at least 100 to ensure stable statistical estimation.

The outcome measure was the annual grade level multiple-choice reading comprehension tests tied to the state's English/Language Arts curriculum. Scores were on a developmental scale with scale scores vertically equated across grades so that students' reading growth could be followed longitudinally. We examined students' reading comprehension growth using

descriptive statistics, such as means and standard deviations by exceptionality by grade, and longitudinal growth models.

Results

Figure 1 shows growth for GE students and students in three exceptionality groups (other exceptionality groups were included in the analyses, but are not depicted in the graph). Analyses showed that all subgroups had significant growth that decelerated over grades. SWDs initial achievement in third grade was lower than students in GE, but they generally showed somewhat more rapid growth than GE students, particularly students with intellectual disabilities and specific learning disabilities. Race/ethnicity, gender, free lunch subsidy status, and English language proficiency were all significantly related to achievement growth as well.

Conclusions

Our findings are largely consistent with studies showing significant but decelerating reading growth of students over grades (e.g., Lee, 2010; Rescorla & Rosenthal, 2004). Students in all exceptionality categories evidenced growth. We found substantial differences among the various student exceptionality subgroups in terms of intercept (starting point) but smaller differences in growth. These differences in intercept and growth would have been masked by aggregation of these students into a single special education category.

Study 2: Mathematics Growth Across Grades Three to Seven

Brief Overview of Methodology

In this study (Stevens et al., in press) we again followed a single state cohort of students. In this case, we followed 92,045 students who were in third grade in 2001.[1] Students were

[1] Our selection of specific cohorts for reading and mathematics was based on the availability of 5 years of a single test edition for each subject.

included if they had participated in the large scale mathematics test at least one time in grades three to seven. Of the students included in the study, 11.8% were SWDs, 6.7 % were academically gifted, and 80.8% were GE students. Students fell into the same seven exceptionality categories as in the reading study: autism, emotional disturbance, hearing impairment, intellectual disability, other health impairment, specific learning disability, and speech-language impairment. As in the previous study, we only included exceptionality categories where the number of students in our sample was at least 100 to ensure stable statistical estimation.

The outcome measure was the state's mathematics test, tied to its mathematics curriculum. Scores were on a developmental scale with scale scores vertically equated so that students' mathematics growth could be examined across the grade span studied. Growth was again examined using descriptive statistics, including means and standard deviations by exceptionality by grade, and longitudinal growth models.

Results

Figure 3 shows growth for GE students and students three exceptionality groups in mathematics achievement. Again, all subgroups had significant growth that decelerated over grades. Students in each of the exceptionality groups had lower initial mathematics achievement in third grade. Unlike reading comprehension, where growth was generally more rapid for SWDs, in mathematics, growth was significantly slower for students in several exceptionality categories compared to GE students. Exceptionalities with slower growth included students with intellectual disabilities, other health impairments, and specific learning disabilities. Race/ethnicity, gender, parental education, free lunch subsidy status, and English language proficiency were all significantly related to mathematics growth.

Conclusions

Similar to our findings when examining reading comprehension, we found that SWDs in all exceptionality categories exhibited a pattern of curvilinear growth like the one observed in GE students. Again, all exceptionality groups started out behind their non-disabled peers. Given the large initial performance gaps observed for many of the exceptionality groups, SWDs would need to make substantially more growth than GE students to close the mathematics achievement gap in the later grades. Yet, on average, students in a number of these exceptionality groups grew more slowly.

Looking across the reading and mathematics results, it is interesting to note that growth for SWDs tended to be more rapid in reading, compared to GE students, but similar or slower than GE students in mathematics. As these were different cohorts of students and separate analyses, direct comparisons are not possible. The slope differences may be a result of cohort effects, test scaling, or a number of other factors. However, given the strides made in understanding the nature of early reading difficulties and in the development of interventions to address these difficulties (e.g., Torgesen, 2000), the slope differences may also may reflect more instructional time devoted to addressing reading problems for students in special education, compared to the time spent addressing mathematics skill deficits.

Study 3: How Do Entrances and Exits From Special Education Affect Outcomes Reported?

In Schulte and Stevens (in press), we again made use of the mathematics dataset described in Study 3. However our research question was directed toward a policy issue, how should the SWD subgroup be defined in reporting outcomes? In most cases, when states comply with the No Child Left Behind Act of 2001 (NCLB, 2002) and report results separately for SWDs, they identify this subgroup on the basis of whether or not they are receiving special

education services within the year for which results are reported. For example, a student who receives learning disability services in one year is included in reporting SWD outcomes for that year, but not included in the subsequent year if he or she exits special education. Although this reporting practice is useful for *descriptive* purposes (i.e., if one wishes to know how well students who received special education services this year performed), it is likely biased as a measure of how SWDs fare across time, or whether schools are improving in serving this population. Students who are doing well are more likely to exit special education, and students who are doing poorly in general education are more likely to enter special education (Ysseldyke & Bielinski, 2002). Thus, our interest in this study was how different ways of constituting the SWDs subgroup affected the size of the achievement gaps for SWDs found across grades.

Brief Overview of Methodology

We took the same dataset used in Study 2, and defined SWDs in multiple ways. Reported here is how results differed based on whether the students were classified as SWDs in the particular year examined, or in the initial year of the study (third grade). In other words, we contrasted a longitudinal sample identified as SWD in third grade with a cross sectional sample, where who were considered SWD determined each year. We then calculated achievement gaps between SWDs and GE students with each method across grades 3 to 7.

Results

The two ways of constituting the SWD subgroup resulted in different prevalence estimates. Based on placement in special education in third grade, the percent of students identified as SWD was 11.8%. With the SWD group defined by membership in special education in the current year, prevalence rates varied year to year, from 11.1 to 12.4%.

As illustrated in Figure 3, the magnitude of the achievement gap in mathematics was related to the criterion used to constitute the SWDs group. Reporting achievement results for an annually defined subgroup showed a much larger increase in the achievement gap across grades compared to following students longitudinally.

Conclusions

Concerns have been raised about using cross-sectional results rather than growth of students over time in school accountability models (e.g., Linn & Haug, 2002) because the composition of a school population may change from year to year. The present study suggests that examining cross sectional or annual results for SWDs is particularly problematic given that students appear to enter and leave special education partly on the basis of their achievement. Compared to following a cohort longitudinally, reporting cross sectional outcomes for SWDs is likely to produce different results and portray outcomes for students served in special education less positively.

General Discussion

These three studies illustrate the type of research questions addressed by NCAASE and the complexities that arise when results from this population are incorporated into school accountability models. The first two studies summarized here (Schulte & Stevens, 2014; Stevens et al., in press) provided important information about the growth of SWDs in reading and mathematics achievement across grades, suggesting that this heterogeneous group experiences considerable achievement growth across grades, although not enough to close the achievement gaps observed initially. The third study (Schulte & Stevens, in press) is one of several studies planned to examine the impact of different policy choices on the validity of the indicators used for tracking SWDs' performance in school accountability models. In research studies in process

for this upcoming year, we plan to replicate our studies examining achievement growth using additional states' test data. We also plan to compare multiple ways of operationalizing school effects (e.g., gain scores, value-added models, growth percentiles) and compare results when the different models are applied to elementary and middle schools in four different states.

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Figure 1. Mean reading achievement by grade and student group.

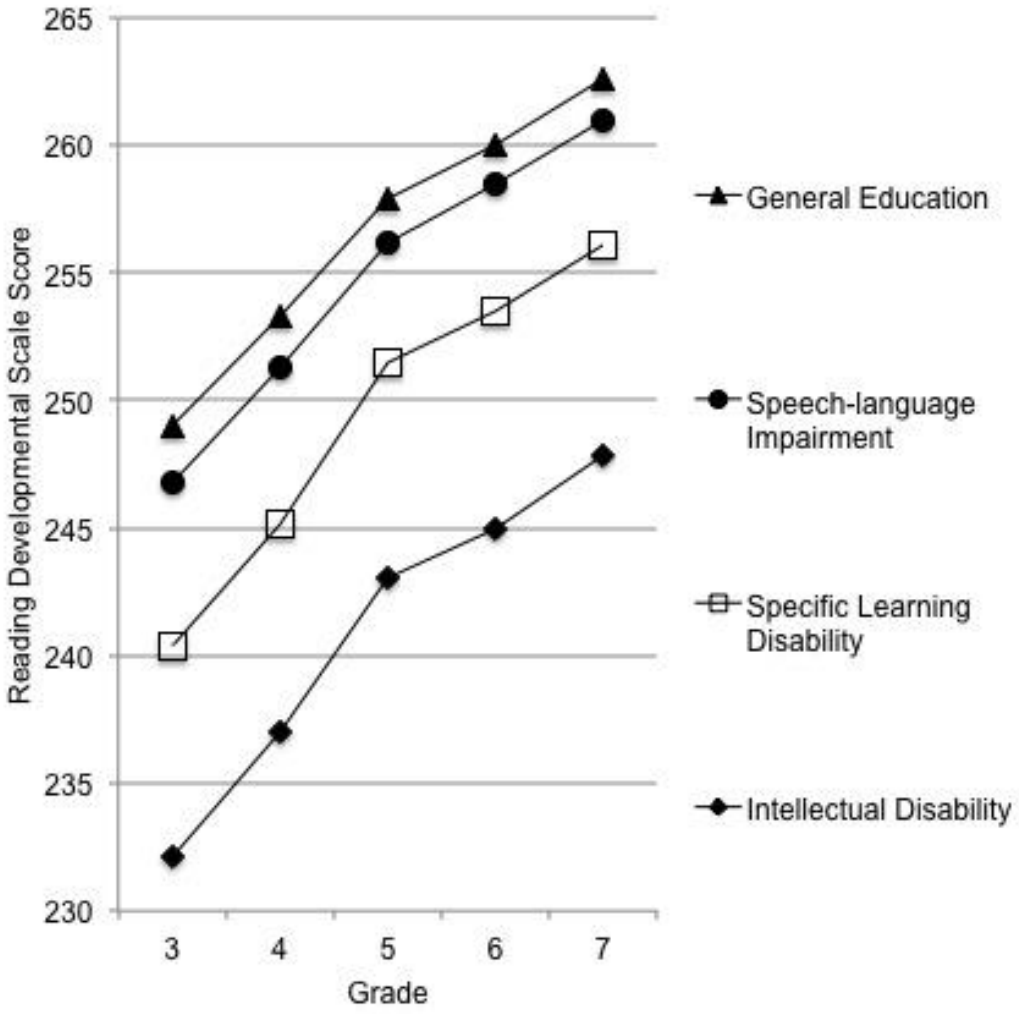

Figure 2. Mean mathematics achievement by grade and student group.

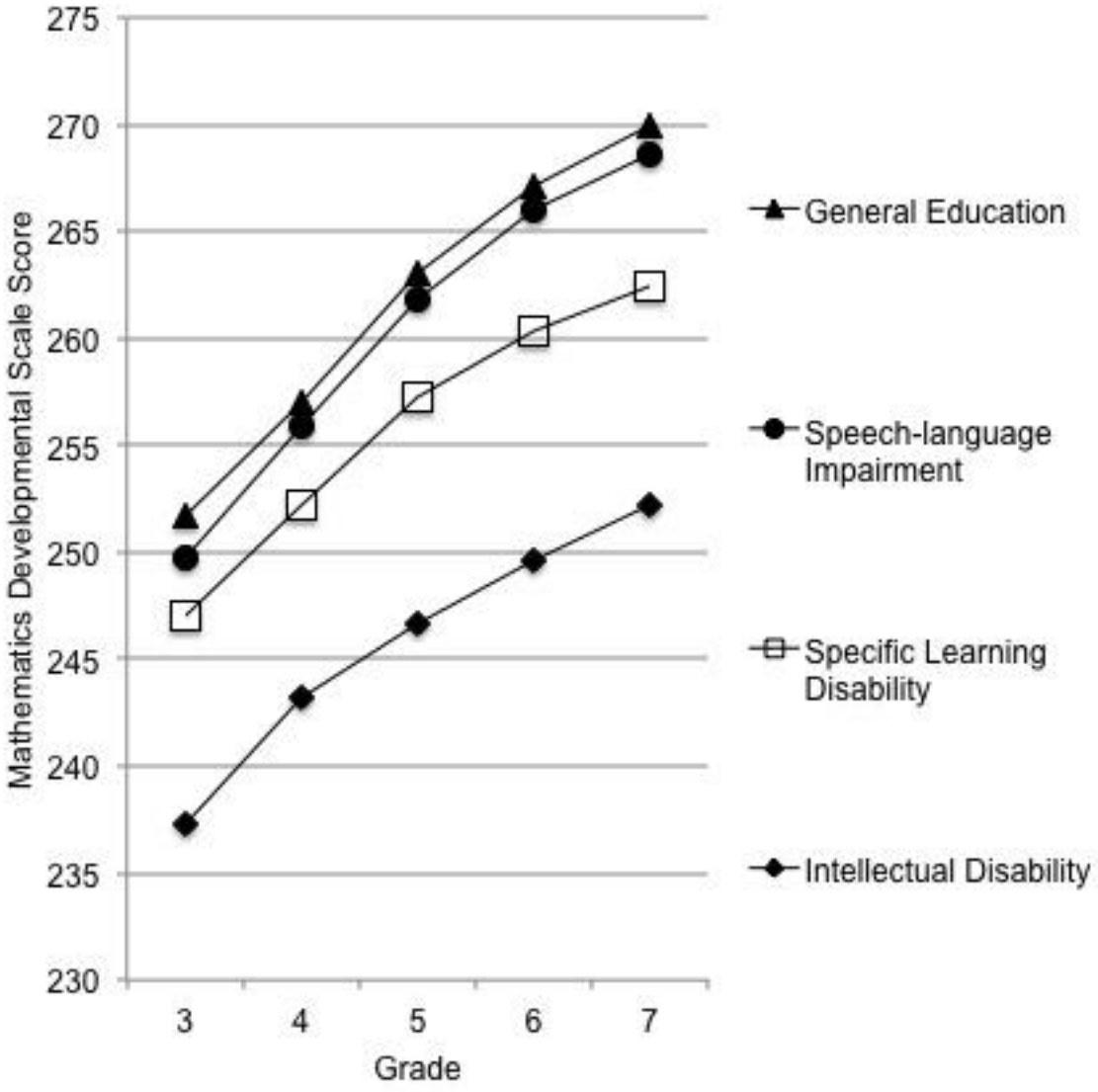

Figure 3. Mathematics achievement gap for students with disabilities when identified on the basis of third grade status (Wave 1) versus annually determined special education status (Current Year in Special Education).