

## Mathematics and Reading Proficiency Rates for Students in Specific Exceptionality Groups

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Key words: Mathematics and reading proficiency, students with disabilities, accountability

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This work was supported by the Institute of Education Sciences, U.S. Department of Education, through grant R32C110004 awarded to the University of Oregon. The opinions expressed are those of the authors and do not necessarily represent views of the Institute or the U.S. Department of Education.

## Abstract

*Introduction/Background.* The purpose of this paper is to describe differences in performance between Students With Disabilities (SWD) and Students Without Disabilities (SWoD) on a statewide test of academic achievement. The study estimated mathematics and reading proficiency in a statewide sample of North Carolina students in Grades 3-8. Foundational skills in mathematics and reading are considered to be essential for the development of proficiencies that lead to later achievement and success in school and career (National Early Literacy Panel, 2008). However, on annual tests that states administer to comply with the No Child Left Behind (NCLB, 2002) legislation, there is a significant gap in mathematics and reading achievement between students with and without disabilities that is well documented in both national reports and published research (Sabornie, Cullinan, Osborne, & Brock, 2005).

NCLB, represented a fundamental change in educational testing and accountability practices. 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 3-8. NCLB also changed reporting practices by requiring, schools, districts, and states to publish results on the progress of *all* students, with an explicit goal of closing achievement gaps by 2014 between the general education student population and student subgroups who were historically at risk for low achievement. The legislation also established Adequate Yearly Progress (AYP) targets to evaluate progress over time in achieving these goals.

Along with this emphasis on the progress of all students, NCLB required states to evaluate the performance of disaggregated student subgroups. The rationale for disaggregation

was that reporting of overall results could mask lower performance of traditionally challenged subgroups and divert attention from some of the most important areas of need and intervention. The subgroups disaggregated under NCLB included student race/ethnicity; students living in poverty; and students with disabilities. Of the disaggregated subgroups, the subgroup that has typically displayed the largest achievement gap relative to the general student population has been students with disabilities (SWD). The achievement levels of this group have been a concern for decades (Carlberg & Kavale, 1980; McDonnell, McLaughlin, & Morison, 1997) and additional evidence of the challenges posed by SWD performance is provided by Eckes and Swando (2009), who found that the most frequent reason for schools' AYP failure was the performance of the SWD subgroup.

Although these policy changes revolutionized educational testing and accountability and focused much greater attention on the performance of SWDs, the same rationale for disaggregation of subgroups originally applied in NCLB can be further extended within the SWD subgroup. The SWD subgroup is an umbrella that covers great diversity of different student exceptionalities whose performance differs greatly from each other and who display very different magnitudes of achievement gap in comparison to general education students. Thus the purpose of the present study was to explore performance within the SWD subgroup by examining proficiency in mathematics and reading for students in 10 specific exceptionality groups.

*Research Objectives.* The present study addressed questions about the academic performance of SWDs in mathematics and reading including: (a) How does proficiency in mathematics and reading for specific student exceptionality subgroups differ from SWoD students? (b) How does proficiency in mathematics and reading for specific student

exceptionality subgroups differ from SWD overall? (c) What is the size of achievement gaps in proficiency for students in specific exceptionality categories and SWD overall in comparison to SWoD? (d) How do proficiency rates and achievement gaps vary for Grades 3-8?

*Methodology.* Results presented in the proposed paper are based on a statewide sample of North Carolina students in grades 3-8. The overall sample consisted of 98,292 students who were present in the state accountability database in 2009 (sample size of tested students varied by content and grade as shown in Table 1). The outcome measure was the student developmental scale score on the standardized, second edition North Carolina End of Grade (EOG) Mathematics Tests. A student was included in our analyses if they had either a mathematics score, a reading score, or both.

We used the state's published cutscores for proficiency to calculate the percent of students proficient on each test (North Carolina Department of Public Instruction, 2006). We also evaluated the achievement gap between SWD and SWoD as a contextual aid in interpreting students' proficiency using effect sizes as empirical benchmarks (Bloom et al., 2008). For SWD overall and for each specific exceptionality group, we computed the difference in proficiency between each subgroup and SWoD using Cohen's  $h$ , a measure of effect size for proportions. Cohen provides rules of thumb for  $h$  (Cohen, 1988, pp. 184-85), interpreting effect sizes of .20 as "small," about .50 as "medium," and .80 and greater as "large." .

*Results and Discussion.* Table 1 shows proficiency rates (percent) for all SWoD, all SWD, and for 10 specific exceptionality groups in mathematics and reading for each grade from 3-8. Listed in parentheses on the second row of each cell is the sample size for the group. Results are reported only for  $N \geq 10$ . The third row in each cell reports the achievement gap between that subgroup and SWoD in that content and grade expressed as Cohen's  $h$ . As can be seen in Table

1, the differences in proficiency between SWoD and SWD in mathematics and reading range from about 25% to 40%. These percentages translate into effect sizes ranging from .54 to .81. There also appears to be some tendency for achievement gap effect sizes to be larger for middle school grades than elementary grades in both mathematics and reading. Inspection of the succeeding rows in Table 1 shows that there is great variation in proficiency rate and achievement gap effect size depending on which specific exceptional subgroup is examined ranging from subgroups with relatively smaller achievement gaps (e.g., autism, visual impairment) to subgroups with substantial achievement gaps (e.g., intellectual disability).

Figures 1-4 present the same proficiency information for mathematics and reading after combining Grades 3-5 into an elementary group and combining Grades 6-8 into a middle school group. This was done to increase sample sizes for a more stable depiction of subgroup performance. In each figure, a dashed line shows proficiency rate for all SWD and a solid line shows proficiency rate for all SWoD to aid comparisons. The graphs make apparent the variability across student exceptionality subgroups with some groups well below the overall SWD proficiency rate (dashed line) and some well above. It is also apparent in both grade groups in both reading and mathematics that some subgroups display a relatively small achievement gap in comparison to SWoD students (solid line) and some subgroups are substantially below SWoD.

Our findings are largely consistent with many previously published studies showing a sizable achievement gap in mathematics and reading between SWD and SWoD. However, we found great variation in proficiency for specific student exceptionality subgroups that may be masked by the aggregation of these subgroups into a single special education category. A central goal of NCLB is the closing of the achievement gap including performance differences between disabled and nondisabled students. However, the policy may not fully reveal important

performance differences as a result of the aggregation of students with different exceptionalities into a single SWD subgroup. Our results showed that there is substantial variability in proficiency within the SWD subgroup and there are large achievement gaps for several subgroups in mathematics and reading in all grades. As noted by others (Morgan et al., 2011), this raises important questions about how much progress should be expected for some of these subgroups as well as what are reasonable expectations for "proficiency" and for narrowing the achievement gap.

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Table 1

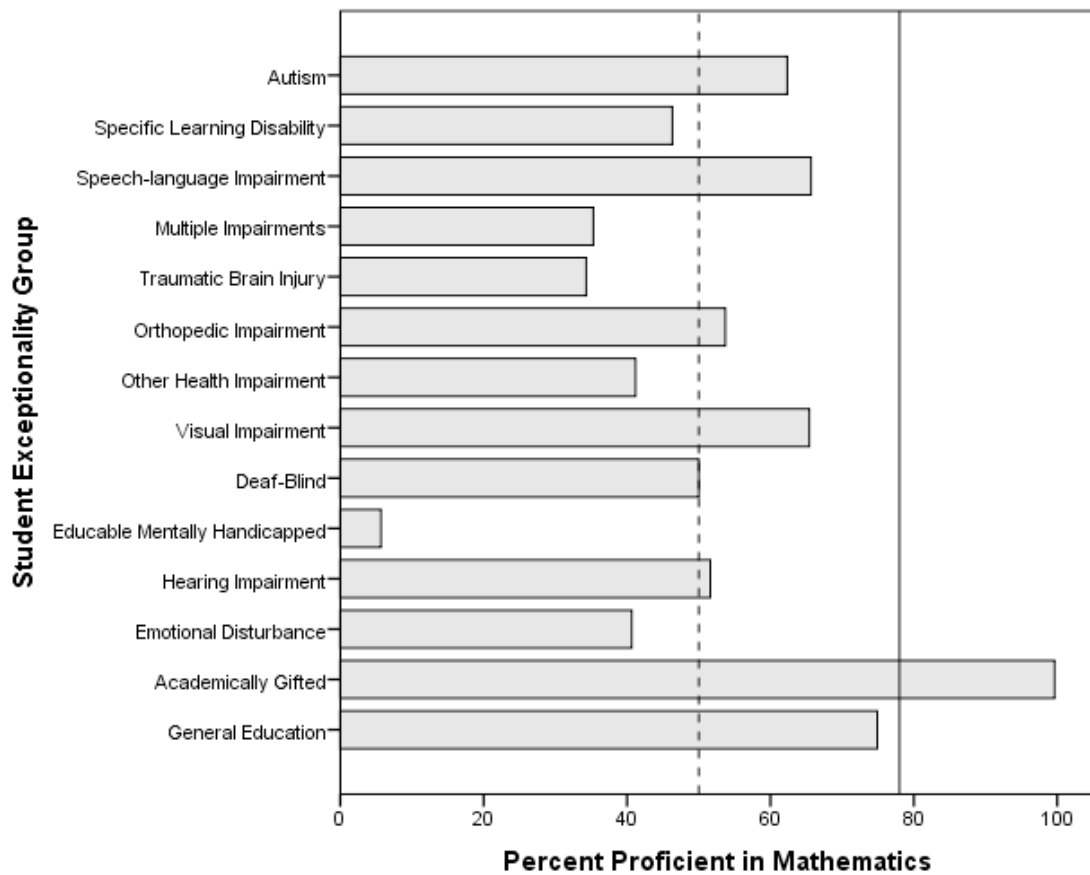
*Percent Proficient, Sample Size, and Effect Size in Mathematics and Reading in North Carolina Grades 3-8.*

	Mathematics						Reading					
Grade	3	4	5	6	7	8	3	4	5	6	7	8
Student Group												
SWoD	78.3 (97680)	79.3 (94162)	77.2 (92973)	74.4 (91406)	75.4 (90642)	76.8 (91668)	61.7 (97625)	66.1 (94111)	64.1 (92935)	67.7 (91370)	60.0 (90607)	62.3 (91627)
All SWD	53.2 (11208) .54	49.9 (11046) .63	45.3 (9934) .67	39.7 (9310) .72	38.5 (8728) .76	39.9 (8613) .77	30.8 (10759) .63	32.1 (10475) .69	27.8 (9466) .75	28.5 (9059) .81	23.0 (8510) .77	24.1 (8459) .79
Autism	62.4 (351) .35	64.9 (365) .32	59.7 (365) .38	62.1 (330) .27	64.8 (244) .23	57.4 (284) .42	41.9 (346) .40	48.3 (360) .36	50.6 (360) .27	47.2 (335) .42	51.6 (252) .17	47.4 (289) .30
Communication	67.3 (3842) .25	66.3 (2501) .29	59.7 (1354) .38	51.8 (651) .47	51.2 (369) .51	48.4 (223) .60	46.6 (3838) .30	50.8 (2496) .31	43.2 (1353) .42	42.8 (649) .51	32.2 (370) .57	29.1 (223) .68
Emotional Impairment	44.4 (331) .71	43.9 (394) .75	35.1 (453) .88	29.2 (510) .94	26.5 (475) 1.02	22.6 (562) 1.15	28.8 (323) .67	44.6 (166) .44	26.3 (453) .78	22.4 (510) .95	22.7 (476) .78	17.9 (570) .95
Hearing Impairment	49.0 (143)	50.0 (130)	56.0 (134)	46.7 (105)	41.0 (100)	44.1 (111)	20.6 (136)	30.9 (123)	32.3 (133)	34.3 (102)	21.9 (96)	24.1 (112)



	.62	.63	.45	.58	.71	.68		.86	.72	.65	.68	.80	.79
Intellectual	7.9 (252) <i>1.60</i>	4.8 (229) <i>1.76</i>	3.7 (215) <i>1.76</i>	4.4 (225) <i>1.66</i>	4.2 (240) <i>1.69</i>	6.1 (296) <i>1.64</i>		1.7 (239) <i>1.55</i>	3.2 (218) <i>1.54</i>	2.8 (216) <i>1.52</i>	2.2 (230) <i>1.63</i>	0.0 (250) <i>1.59</i>	1.7 (295) <i>1.56</i>
Orthopedic	55.6 (36) <i>.49</i>	40.5 (37) <i>.82</i>	62.5 (48) <i>.32</i>	47.7 (44) <i>.56</i>	58.8 (34) <i>.36</i>	54.7 (53) <i>.47</i>		42.1 (38) <i>.39</i>	45.9 (37) <i>.41</i>	50.0 (48) <i>.29</i>	42.6 (47) <i>.51</i>	58.8 (34) <i>.02</i>	40.0 (55) <i>.45</i>
Other	44.1 (1663) <i>.72</i>	41.7 (2085) <i>.79</i>	38.5 (2218) <i>.81</i>	36.0 (2347) <i>.79</i>	33.8 (2299) <i>.86</i>	36.7 (2172) <i>.83</i>		24.7 (1625) <i>.77</i>	27.7 (2043) <i>.79</i>	26.7 (2204) <i>.77</i>	29.9 (2371) <i>.78</i>	22.2 (2313) <i>.79</i>	25.6 (2189) <i>.76</i>
Specific Language Disability	47.1 (4524) <i>.66</i>	46.4 (5246) <i>.70</i>	45.5 (5085) <i>.67</i>	40.8 (5058) <i>.69</i>	40.9 (4909) <i>.72</i>	43.6 (4865) <i>.69</i>		19.6 (4148) <i>.89</i>	24.2 (4761) <i>.87</i>	22.7 (4638) <i>.86</i>	26.1 (4776) <i>.86</i>	21.9 (4662) <i>.80</i>	23.7 (4680) <i>.80</i>
TBI	30.0 (10) <i>1.01</i>	– (8) –	35.3 (17) <i>.87</i>	38.5 (13) <i>.74</i>	36.8 (19) <i>.80</i>	20.0 (15) <i>1.21</i>		– (9) –	– (7) –	43.8 (16) <i>.41</i>	25.0 (12) <i>.89</i>	15.8 (19) <i>.95</i>	6.7 (15) <i>1.30</i>
Visual Impairment	62.8 (43) <i>.34</i>	75.0 (48) <i>.10</i>	57.1 (42) <i>.43</i>	60.9 (23) <i>.29</i>	62.9 (35) <i>.27</i>	74.1 (27) <i>.06</i>		50.0 (44) <i>.24</i>	53.3 (45) <i>.26</i>	57.1 (42) <i>.14</i>	39.1 (23) <i>.58</i>	54.3 (35) <i>.12</i>	46.2 (26) <i>.32</i>

*Note.* Percent proficient reported only when  $N \geq 10$ ; group  $N$ -size in parenthesis; effect size in comparison to SWoD group reported in italics.



*Figure 1.* Mathematics proficiency for grades 3-5 by student subgroup. Dashed line shows proficiency rate for all SWD; solid line shows proficiency rate for all SWoD.

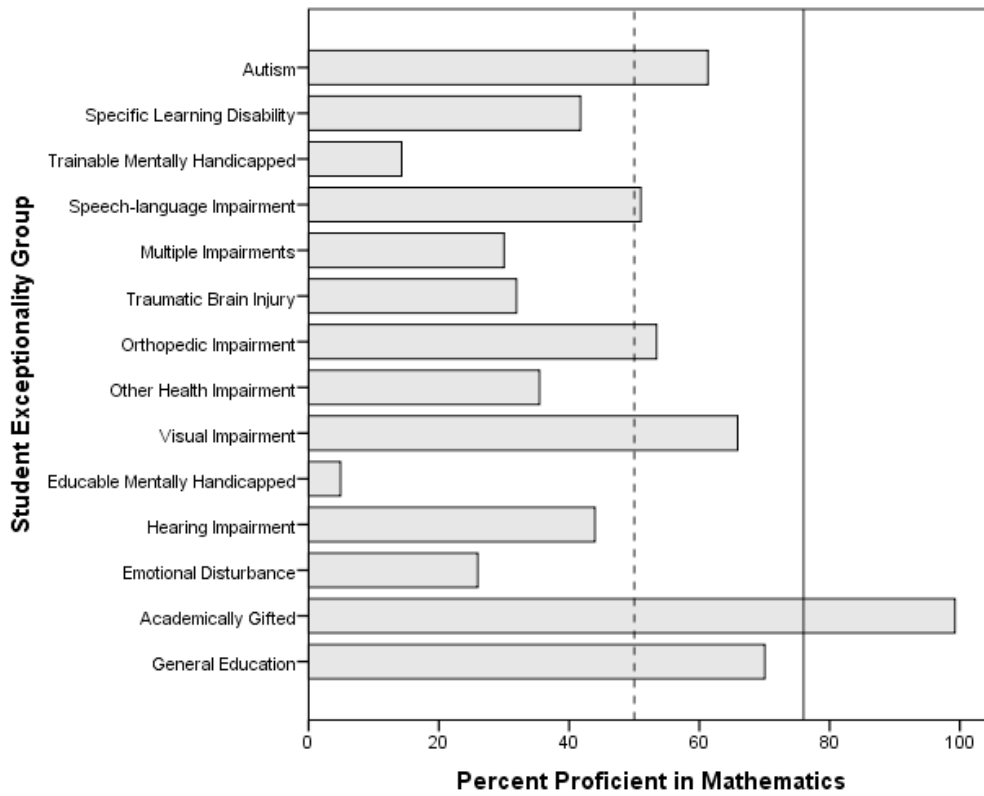


Figure 2. Mathematics proficiency for grades 6-8 by student subgroup. Dashed line shows proficiency rate for all SWD; solid line shows proficiency rate for all SWoD.

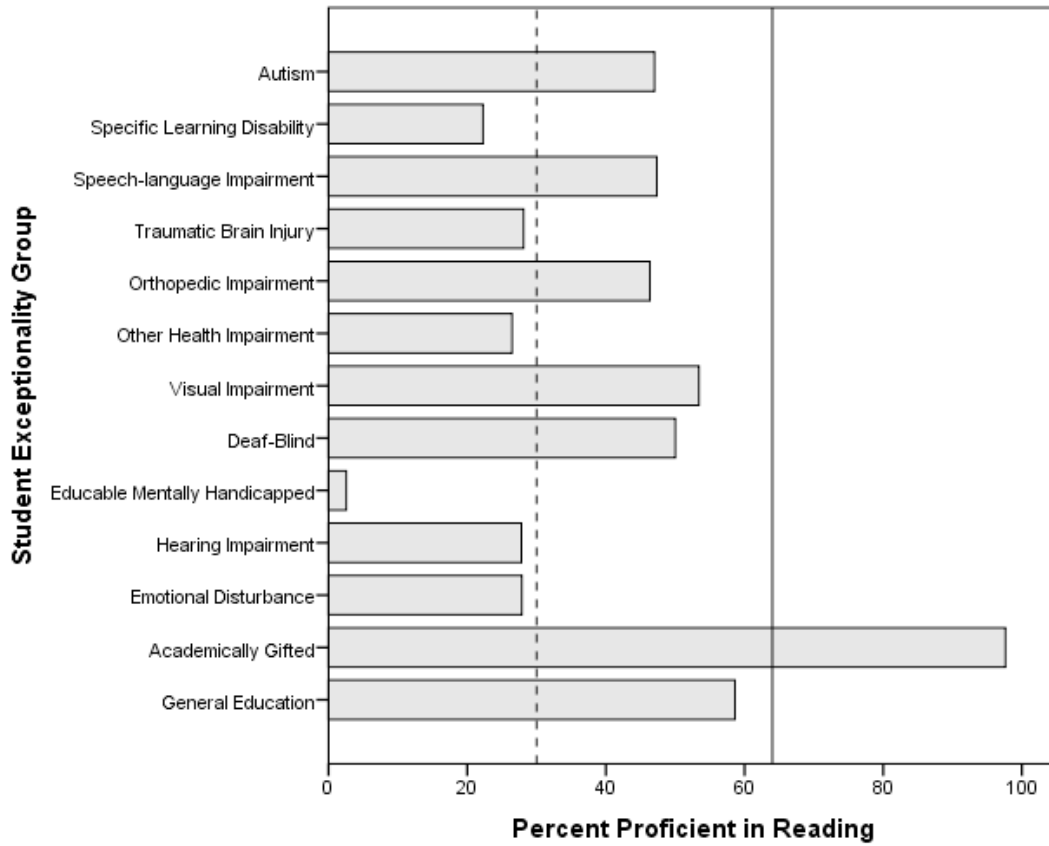
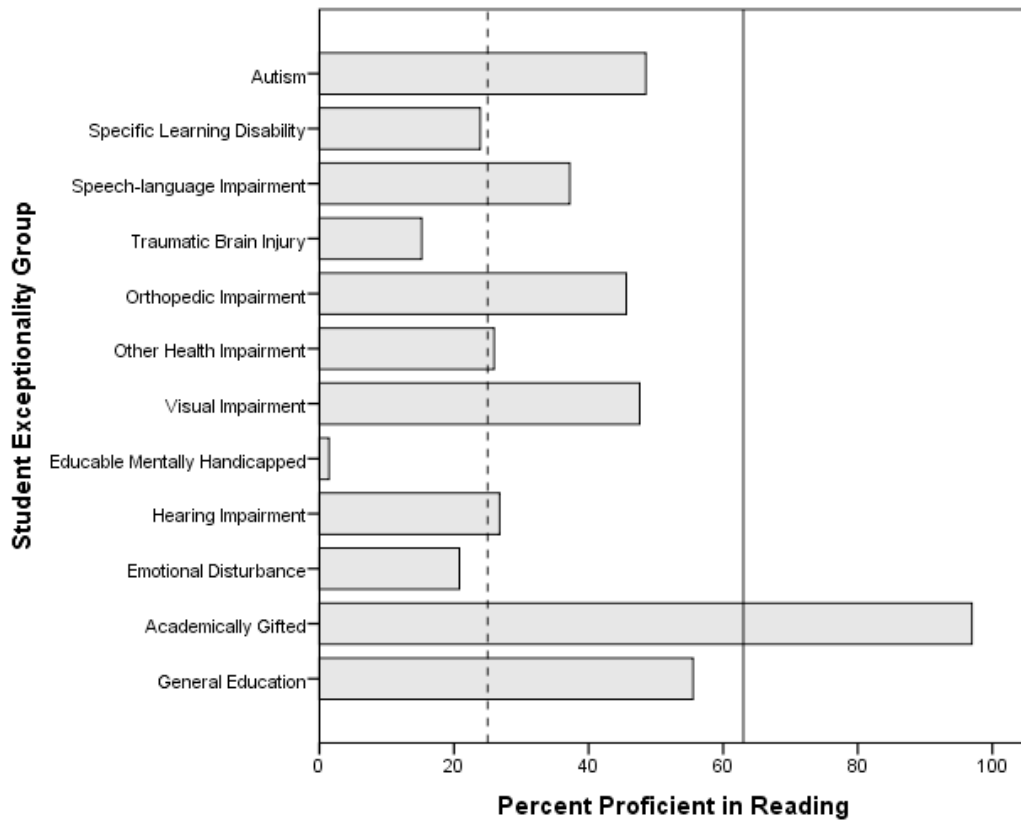


Figure 3. Reading proficiency for grades 3-5 by student subgroup. Dashed line shows proficiency rate for all SWD; solid line shows proficiency rate for all SWoD.



*Figure 4.* Reading proficiency for grades 6-8 by student subgroup. Dashed line shows proficiency rate for all SWD; solid line shows proficiency rate for all SWoD.