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Mathematics Achievement Gaps for Elementary and Secondary Students: The Influence of Opportunity to Learn and Special Education Status*

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ABSTRACT

We examined the relationship among key instructional process variables and the achievement of students with and without disabilities as measured by both interim and end-of-year summative assessments. Examination of the instructional process data indicated that students with and without disabilities receiving mathematics instruction in the same classrooms had virtually equal opportunities to learn (OTL), yet there were significant differences in these two groups of students' mathematics achievement on both interim and summative tests. Subsequent regression analyses indicated that the collection of five OTL scores, along with Grade Level and Special Education status, accounted for 44% of the variance in student's end-of-year mathematics scores. Discussion of these results focuses on equality and equity of opportunity to learn and the role these processes may play in interim and end-of-year achievement gaps between students with and without disabilities.

Background

Most large-scale assessment and accountability systems assume that all participating students have an equal opportunity to learn (OTL) what they are expected to know and are tested on. This OTL assumption has rarely, if ever, been tested, but practically has resulted in many students with disabilities (SWD) in the United States receiving their mathematics instruction in the general education curriculum and the same classrooms with students without disabilities (SWOD). Although the proportion of students with disabilities who spend 80% or more of their instructional time in general education classrooms has increased substantially to over 61% (McLeskey, Landers, Williamson, & Hoppey, 2012), their achievement outcomes have remained far below desirable levels (National Center on Education Statistics, 2012; National Council on Disability, 2011) and there continue to be substantial achievement gaps in mathematics between these students and their classmates without disabilities (e.g., Stevens, Schulte, Elliott, Nese, & Tindal, in press).

Given this situation, understanding the instructional processes related to the achievement of students with and without disabilities receiving instruction in the same general education classrooms is a research, practice, and policy issue worthy of investigation. This is a particular concern for SWD for who federal mandates such as the Individuals with Disabilities Education Act (IDEA, 1997, 2004) stress access to same general curriculum offered to SWOD. McLaughlin (1999) argued that these federal mandates indicate "a clear presumption that that all students with disabilities should have access to the general curriculum and to the same opportunity to learn challenging and important content that is offered to all students" (p. 9). Moreover, Kurz (2011) argued that OTL should not only be equal across all students, but rather equitable for SWD and their individual intended curricula. However, recent research examining OTL indicated that SWD experienced significantly less time on standards, more non-instructional time, and less content coverage compared to their overall class. Specifically, differences in class-wide and student-specific OTL scores were statistically significant with effect sizes in the medium to large range (Kurz, Elliott, Lemons, Zigmond, & Kloo, 2014).

Purpose of the Study

The purpose of this study was to document instructional processes in classrooms where both students with and without disabilities received their mathematics instruction and to examine the relationship among these instructional process variables and the achievement of students as measured by both interim CBM probes and end-of-year summative assessments. To measure instructional processes we used the My Instructional Learning Opportunities Guidance System (MyiLOGS®; Kurz & Elliott, 2011), an online teacher log used daily to document key instructional processes related to time, content, and quality associated with student achievement. To measure classroom achievement we used easyCBM© (Tindal, Alfonzo, & Anderson, 2009) throughout a school year to gain insights into students' within year achievement growth and also collected end-of-year achievement via state tests.

Research Questions

Given the aforementioned educational policy context and research programs on OTL and CBM, the specific research questions motivating the study were: (a) Do students with and without disabilities who received instruction in the same general education classrooms have an equal opportunity to learn mathematics? (b) What is the predictive relationship among five instructional variables (characterized as OTL) and within year academic growth on an interim assessments? (c) What is the predictive relationship among five instructional OTL variables and students' end-of-year mathematics achievement?

To answer these questions, we examined how instructional processes and special education status predicted students' achievement in mathematics as measured by interim and summative assessments. Specifically, we had teachers in Arizona and Oregon schools (a) record daily via MyiLOGS their instructional time, content, and quality of classroom instruction and (b) administer online EasyCBM© interim assessments to their students with and without disabilities on four occasions (September, December, February, and May). The MyiLOGS variables were used in a multilevel longitudinal model to predict students' initial performance in September and their growth throughout the school year. Because the two states have different testing systems and end-of-year tests, the MyiLOGS variables were also used in two separate regression analyses, one for AZ classrooms and one for OR classrooms, to predict students' performance on their end-of-year state mathematics achievement tests.

Based on the previous research and theory about OTL and CBM, we predicted (a) the instructional processes would be different (e.g., less instructional time on standards and cover less of the intended curriculum) for SWD, in comparison to SWOD in the same classrooms, and (b) OTL indices would meaningfully contribute to understanding growth in CBM scores and predicting end-of-year achievement of students with and without disabilities.

Participant Sample

Teachers (N = 67; 35 AZ, 32 OR) from general education classrooms in grades 4 through 8 in Arizona and Oregon schools participated for an entire academic year. Students (N = 255; 139 AZ, 116 OR) who consented to participate were all in the classrooms of the teachers who qualified for the study. Of the total sample of students, 134 were identified as SWD; the remaining 121 were not known to have a disability and were thus characterized as SWOD. Students in these two groups received mathematics instruction in the same classroom and were selected from their class roster by their teachers, who used a common stratified (according to disability status) random sampling procedure to identify two SWD and two SWOD, respectively.

Measures

MyiLOGS®. This online measure (www.myilogs.com) is designed to assist teachers with the planning and implementation of intended curricula at the class and student levels. The instructional data collected via MyiLOGS are used to derive several OTL indices along each enacted curriculum dimension. The reliability and validity of MyiLOGS scores has been examined in a number of studies (e.g., Kurz, Elliott, Kettler, & Yel, 2014; Kurz, Elliott, Lemons, Zigmond, Kloo, & Kettler, 2014).

easyCBM©. This set of online interim assessments provided teachers brief tests aligned with the NCTM mathematics standards. Each assessment form was comprised of 48 multiple-choice items. We used four equivalent forms of the assessments within each grade. Within grade, form

difficulty has been equated using IRT. To facilitate comparisons of students' achievement within and across grades, we standardized easyCBM© scores within each grade. Because our interest was in academic growth within the year, we computed standard scores with a mean of 500 and a standard deviation of 100 based on September mean and SD within each grade. The internal consistency of the easyCBM© NCTM Math measures has been documented by Anderson, Lai et al (2010) and Nese, Lai, Anderson, Jamgochian et al. (2010). Validity evidence for the easyCBM© NCTM scores indicated they account for 50% to 65% of the variance in end-of-year mathematics achievement measures.

State mathematics achievement tests. The 2013 mathematics total test scores on the Arizona Instrument for Measuring Standards (AIMS; https://www.ideal.azed.gov/p/aims) or the Oregon Assessment of Knowledge and Skills (OAKS; http://www.oaks.k12.or.us/portal/) for participating students were collected from their respective schools. Both these assessments are multiple-choice tests with items on a vertical scale.

Data Analysis

Descriptive analysis of the five MyiLOGS instructional indices (IT = instructional time, CC = content covered, CP = cognitive processes, IP = instructional practices, GF = grouping format), easyCBM achievement scores for testing Time 1 through Time 4, along with grade cluster (Elementary 4-5 and Secondary 6-8), and disability status were reported. These variables were then analyzed using a two-level unconditional HLM model and two multiple regressions to examine the influence of variables on interim and end-of-year achievement as measured by either the Arizona state test (AIMS) or the Oregon state test (OAKS).

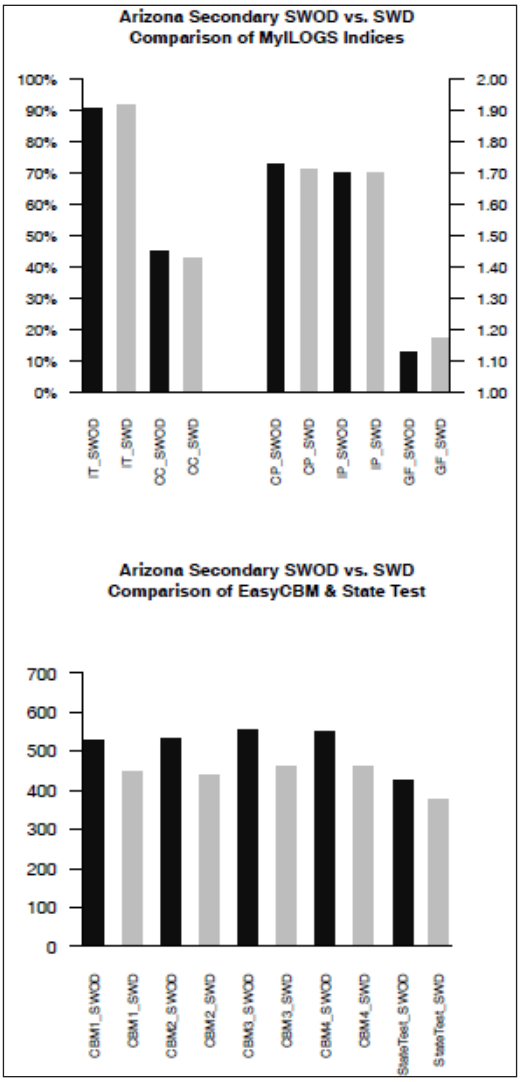

Figure 1. Comparisons of OTL and Test Scores for Arizona SWD and SWOD

Key Findings

Teachers in AZ and OR reported on their instructional time and content standards coverage an average of 174 and 164 days, respectively. They also provided detailed instructional data for two target students with and two without disabilities for a random subset of 38 days for the year. This instructional database represented 96.7% and 91.1% of the possible school days in AZ and OR during the 2012-2013 academic year.

The expected achievement gaps were observed between students with and without disabilities both on the four interim CBM assessments and the end-of-year achievement state test; however, we did not observe inequities in the instructional processes afforded these two groups of elementary or secondary students in either AZ or OR classrooms. (See Figure 1 for descriptive data for Arizona secondary students). To the contrary, over the course of an entire school year, teachers in both states reliably reported very similar opportunities to learn the intended curriculum standards for students, regardless of disability statues. Specifically, elementary teachers reported spending slightly less time (approximately 86%) than secondary teachers (approximately 90%) providing instruction on the CCSS and custom standards; however, the elementary teachers reported covering 12% to 14% more of the CCSS and custom standards than their secondary teaching colleagues with their allocated instructional time. Within the grade levels covered, teachers also reported the cognitive processes emphasized, instructional practices used, and grouping formats employed were not significantly different for students with and without disabilities.

With regard to the prediction of end-of-year achievement, we found that the collection of five MyiLOGS scores, along with grade level and special

education status, accounted for a substantial amount (i.e., 43% to 44%) of the variance in student's end-of-year mathematics scores. Detailed examination of the analyses provided further evidence that a subset of OTL indices explained a statistically significant, although relatively small portion of unique variance in the end-of-year mathematics scores.

Conclusions

Offering students with disabilities the same instruction on the same content standards in the same general education classrooms was found to offer the same historic results—large and persistent gaps in achievement -- in comparison to students without disabilities. If the findings in this study are replicated, they suggest that students with disabilities will need more instructional time on the intended curriculum, and perhaps more differentiated instruction to increase their rate of achievement enough to close gaps that currently exist between them and students without disabilities. Such an individualized approach to the instruction of students with disabilities is often planned for and reported; however, more careful study of the effects of such instruction is needed to advance knowledge about equitable and effective instruction that can lead to improvements in the rate of achievement of students with disabilities.

Note. The terms used to refer to disability categories are those used by the state(s) in this study for coding and reporting their assessment results.

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* The study reported is part of a series of research studies examining the achievement growth of students with disabilities. This report is for Year 1 of a 3-year investigation.

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References

Anderson, D., Rowley, B., Alonzo, J., & Tindal, G. (2014). *Critierion Validity Evidence for the easyCBM CCSS Math Measures: Grades 6-8* (Technical Report No. 1402). Eugene, OR: Behavioral Research and Teaching, University of Oregon.

Herman, J. L., Klein, D. C. ., & Abedi, J. (2000). Assessing students' opportunity to learn: Teacher and student perspectives. *Educational Measurement: Issues and Practice, 19*(4), 16–24.

Kurz, A. (2011). Access to what should be taught and will be tested: Students' opportunity to learn the intended curriculum. In S. N. Elliott, R. J. Kettler, P. A. Beddow, & A. Kurz (Eds.), *Handbook of accessible achievement tests for all students: Bridging the gaps between research, practice, and policy* (pp. 99-129). New York: Springer.

Kurz, A., & Elliott, S.N. (2011). *My instructional Learning Opportunity Guidance System (MyiLOGS)*. Tempe, AZ: Arizona State University.

Kurz, A., Elliott, S.N., Kettler, R.J., & Yel, N. (2014). Assessing students' opportunity to learn the intended curriculum using an online teacher log: Initial validity evidence. *Educational Assessment, 19*(1), 159-184. DOI:10.1080/10627197.2014.934606.

Kurz, A., Elliott, S.N., Lemons, C.J., Zigmond, N., & Kloo, A. (2014). Opportunity to Learn: A differentiated opportunity structure for students with disabilities in general education classrooms. *Assessment for Effective Intervention.* DOI:10.1177/1534508414522685.

McClinchey, M.T., & Hixson, M.D. (2004). Using curriculum-based measurement to predict performance standards on state assessments in reading. *School Psychology Review, 33*, 193-203.

McLaughlin, M. J. (1999). Access to the general education curriculum: Paperwork and procedures or redefining "special education." *Journal of Special Education Leadership, 12*(1), 9–14.

McLeskey, J., Landers, E., Williamson, P., & Hoppey, D. (2012). Are we moving toward educating students with disabilities in the less restrictive settings? *Journal of Special Education, 46* (3), 131-140.

Nese, J. F. T., Lai, C. F., Anderson, D., Jamgochian, E. M., Kamata, A., Saez, L., ... Tindal, G. (2010). *Technical adequacy of the easyCBM mathematics measures: Grades 3-8: 2009-2010 version* (Technical Report No. 1007). Eugene, OR: Behavioral Research and Teaching, University of Oregon.

Stevens, J., Schulte, A., Elliott, S.N., Nese, J.F., & Tindal, G. (in press). Mathematics achievement growth of students with and without disabilities on a statewide achievement test. *Journal of School Psychology.*

Tindal, G., & Nese, J. F. T. (2012). *Within Year Achievement Growth Using Curriculum Based Measures.* Paper presented at the National Council on Measurement in Education, Vancouver, BC.

Wang, J. (1998). Opportunity to learn: The impacts and policy implications. Educational *Evaluation and Policy Analysis, 20*(3), 137–156.