Impacts of the Ongoing Assessment Project on Teachers and Students

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Background: To effectively implement more challenging standards in classrooms, teachers must have a wealth of knowledge about subject matter, student thinking and understanding, and instructional pedagogies (Ball, Thames, & Phelps, 2008; Shulman, 1987). In particular, the focus on *learning trajectories* places new demands on teaching, as teachers must understand the mathematical ideas and skills embodied in the standards, as well as assess where students are in the trajectory of learning those concepts and skills. Teachers then use that information to design and enact instructional responses that support students' movement along the trajectory (Petit, Laird, & Marsden, 2010; Sztajn, Confrey, Wilson, & Edginton, 2012).

Purpose and Research Questions: The purpose of this study is to experimentally assess a third thru fifth grade mathematics intervention in multiplicative reasoning, called the Ongoing Assessment Project (OGAP) that uses a learning trajectory-oriented formative assessment process. The primary questions of interest are: (1) what are the impacts of OGAP on teachers' instructional practices and (2) what are the impacts of OGAP on student learning outcomes.

Setting: In the spring of 2014, CPRE recruited 60 schools (both public and charter) in two school districts in the Philadelphia area to participate in a randomized experiment of OGAP in multiplication in grades three thru five. Thirty of the schools received OGAP training and support for two years (2014-2016). Teachers in the other 30 schools received incentives to participate in data collection.

Subjects: The subjects included approximately 600 teachers in the 60 schools and their students. The students included approximately 11,600 students in grades 3-5.

Intervention: The OGAP program includes training, tools, and support. Teachers received four days of summer professional development as well as ongoing support and coaching across the school year. Training focused on frequent and regular use of formative assessments with their students, as well as the importance of regular meetings of teachers in professional learning communities to collectively develop skills in analyzing student work and making appropriate instructional responses. Tools included an OGAP item bank and a learning progression that shows how students develop their multiplicative reasoning fluency.

Research Design: Schools were recruited to participate and then randomly assigned to either the treatment or control group by blocks. The blocks included school district (School District of Philadelphia and Upper Darby) and type (public or charter).

Data Collection and Analysis: Teachers were surveyed at three time points during the study: fall 2014, spring 2015, and spring 2016. The major feature of the teacher survey was an assessment of teachers' ability to measure a student's mathematical development and to formulate appropriate instructional responses. This measure, called *The Teacher Assessment of Student Knowledge* (TASK), consisted of a series of items that assess three distinct but related domains – analysis of student thinking, learning trajectory orientation, and instructional decision

making. Domain-specific average scores were created and aggregated to construct an overall TASK score in which each domain is given equal weight. We use this overall TASK score as our teacher outcome measure.

To assess impacts on students, we developed a test that measured both students' correctness and solution approaches. According to research in mathematics learning, students often move back and forth between multiplicative, transitional, additive, and non-multiplicative strategies as they interact with different problem structures and contexts (Kouba & Franklin, 1995). In the OGAP project, teachers learn to use a learning progression framework to continually assess and adapt their instruction to students' developing understanding, aiming to move them towards more sophisticated strategies in a range of multiplicative contexts. For this reason, OGAP puts a premium on students' sophistication of solution as well as correctness.

To develop a sophistication assessment, in the spring of 2014 we field tested a large set of Common Core State Standards for Mathematics (CCSSM)-aligned items to 1,400 students outside the OGAP study. Items were constructed to represent the range of difficulty and problem structures expected by the CCSSM.

We measured each item according to a ranking of strategy sophistication on a five-point scale. We used an IRT model to analyze the results. The final grade-specific forms used in the study were each composed of seven items with four common items across grades. This assessment is an important development not just for measuring outcomes in the OGAP project, but for researchers and practitioners interested in assessing student performance in relation to the more rigorous expectations of the CCSSM. Our two main student-level outcomes are correctness (on a two point scale) and sophistication (on a five point scale).

Findings: (1) Teacher Impacts: In both years (2014-2015 and 2015-2016), teachers exposed to OGAP significantly outperformed teachers in the control schools on the TASK score, after controlling for baseline TASK performance and various teacher and school characteristics. The year 1 results are stronger than year 2, but actually strongest across the full-time period (for teachers who persisted across both years from fall 2014 to spring 2016). Almost no other variables in the model predict TASK score.

(2) Student impacts: In the first year of OGAP students in treatment schools outperformed their peers in control schools at each grade level on both measures of correctness and sophistication, after controlling for baseline performance and student and school characteristics. In the second year, although students in treatment schools performed, on average, higher than students in control schools, the differences were not statistically significant in any of the grades. Students who experienced both years of OGAP, however, continued to significantly outperform their control school peers across the two-year time period.

Conclusion: The results show strong improvement in teacher's ability to evaluate student's mathematical development as a result of OGAP training across the full study. Children taught by OGAP teachers show strong effects in multiplicative reasoning, both in year one and overall. As there is growing recognition of the beneficial impact of incorporating students' knowledge base and learning trajectories into lesson plans, these findings speak directly to the mission of public education teachers to foster opportunities and possibilities for aspiring students.

References

Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? Journal of Teacher Education, 59(5), 389-407.

Kouba, V. L., & Franklin, K. (1995). Multiplication and division: Sense making and meaning. *Teaching Children Mathematics*, *1*(9), 574-578.

Petit, M. M., Laird, R., & Marsden, E. (2010). They "get" fractions as Pies; Now what. *Mathematics Teaching in the Middle School*, *16*(1), 5-10.

Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review 57*(1), 1-22.

Sztajn, P., Confrey, J., Wilson, P.H., & Edgington, C. (2012). Learning trajectory based instruction: Towards a theory of teaching. *Educational Researcher*, 41, 147-156.