NEPC Review: Language Counts: Supporting Early Math Development for Dual Language Learners (Bellwether Education Partners, October 2020)

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Summary

Bellwether Education Partners recently published *Language Counts: Supporting Early Math Development for Dual Language Learners*. Using data from the Migrant Policy Institute in 2017 and the Early Childhood Longitudinal Study, the report establishes the need to focus on the mathematics education of young Dual Language Learners (DLLs). It presents lessons from research and practice on engaging families of DLLs in early mathematics learning. Drawing from the strengths of students, families, and communities, it highlights two case studies, Mighty Math and Zeno Math, on engaging dual language families to support mathematics with their young children. Unfortunately, the report omits major studies that are key to advancing our understanding of the capacity of young DLLs to engage in rigorous mathematical concepts when given opportunities to do so. Also, in its recommendations for teacher education/professional development, the report misses the opportunity to address what early childhood educators need to know about how young DLLs develop languages. Nonetheless, this report can inform policymakers and other stakeholders as they build asset-based programs that can support families and communities in engaging young DLLs in mathematics learning.

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I. Introduction

Recently, Bellwether Education Partners published a report, *Language Counts: Supporting Early Math Development for Dual Language Learners*, by Brandon Lewis, Melissa Steel King, and Jennifer O'Neal Schiess.[1] This topic is critical in that there is a paucity of studies that address how to support dual language families at a large scale to engage their children in early mathematics learning. This report establishes the need for this topic with data from the Migrant Policy Institute in 2017, which shows that Dual Language Learners (DLLs) comprise one third of the student population from birth through age eight in the United States. Further, the report focuses on data from California, which is the state with the highest number of DLLs.

The report presents key lessons learned from research and practice on engaging families of DLLs in early mathematics learning. Drawing from the strengths of students, families, and communities, it highlights two case studies—Mighty Math in Chicago, IL, and Zeno Math in Seattle, WA—on engaging dual language families to support their young children in learning mathematics. The report provides information for readers to make informed decisions based on the background, program description, impact, and key lessons from each of these case studies.

This review emphasizes the need to include instrumental studies that have shown the underestimated capacity of young DLLs to engage in rigorous mathematics problem solving and the need to engage teachers, early care providers, and parents in learning about how young DLLs develop languages so that they can better support mathematics learning with young DLLs. Readers can use this information to make sense of the findings and conclusions made in this report.

II. Findings and Conclusions of the Report

The findings and conclusions are based on existing research and practice about early mathematics learning with DLLs in the classroom and about engaging families of DLLs in early mathematics learning. Two case studies illustrate how this research and practice can be implemented in programs when working collaboratively with families, communities and nonprofit organizations to advance the early mathematics education of DLLs. These two case studies are included to serve as models for engaging families in doing mathematics with other parents and with their children.

The key lessons that cut across research, practice, and the two case studies include the following:

- Use a strengths-based approach that honors the family's language and culture to foster positive relationships in learning mathematics;
- Draw from culturally relevant, play-based practices to not only develop mathematical concepts but also to develop mathematical discourse;
- Position parents as knowers and doers of mathematics to engage them in learning mathematics with their young children; and
- Support parents in leadership roles that afford them opportunities to network with other parents, to advocate for their community, and to co-plan/co-lead professional development for educators.

III. The Report's Rationale for Its Findings and Conclusions

The report relies on a 20-year analysis of National Assessment of Educational Progress (NAEP) data,[2] the Early Childhood Longitudinal Study (ECLS), and two case studies. Most of the findings and conclusions drawn from the case studies are consistent with the research presented earlier in the report on strengths of families, students, and communities in learning early mathematics. This report explicitly assumes that strategies that work with older English learners will work with young DLLs in the mathematics classroom. For the context of this report, older English learners refers to students who are in the second or third grades since the ages included in early childhood education are from birth to eight years. The use of "older students" may also be attributed to the fact that there are fewer studies in mathematics education that relate to DLLs from birth through age four.

IV. The Report's Use of Research Literature

A strength of the report is the connection to frameworks that draw from asset-based approaches using González, Moll, and Amanti's[3] work on Funds of Knowledge, which Marta Civil[4] extended to mathematics education. These frameworks have been instrumental in viewing language and culture in diverse communities as intellectual resources and moving

away from deficit-oriented views often reported on historically marginalized student populations and communities.

Despite the use of important research, there is a key study missing from the report. Carpenter and colleagues'[5] work on Cognitively Guided Instruction (CGI) has been used widely in the field of mathematics education to understand children's mathematical thinking. CGI is student-centered learning based in context-rich word problems. Children's strategies in solving different types of mathematical problems are used to inform how teachers can clarify, support, and extend students' mathematical thinking. This work has shown that young children's capacity to engage in rigorous mathematics problems, including multiplication and division, is often underestimated.

Another key study missing from the report is that of Turner and colleagues.[6] Drawing from CGI and Opportunities to Learn frameworks, they conducted a study with primarily Latinx DLLs and considered *time* spent on and the *quality* of word problems across three kindergarten classrooms. The findings indicate that although students in all three classrooms showed growth on pre-/post-assessment measures, bilingual teachers' classrooms were distinguished by more time spent on problem solving; exposure to a broader range of problems involving multiplication, division, and multiple steps; and consistent access to students' native language (in this study, Spanish). The report's recommendation to use the native language for instruction and assessment is consistent with the last finding. Missing from the report, however, is the need to support early childhood providers and educators in understanding *how* young learners develop languages and *how* they can use the home language when teaching mathematics to young DLLs. Understanding what teachers need to know about languages is also critical, and is missing from this report.[7]

Carpenter and colleagues have extended the use of CGI to early childhood education.[8] Their work demonstrates how young learners apply their counting skills to problem solving, how teachers can effectively support young children's mathematical development, and how teachers can bridge children's mathematical experiences between home and school. Additional studies have combined frameworks using Funds of Knowledge and CGI with young DLLs in early childhood classrooms[9]. Collectively, this work offers counterevidence to the deficit views often voiced about what young children from culturally and linguistically diverse backgrounds can do.

V. Review of the Report's Methods

Two case studies are used to illustrate key lessons from research and practice on engaging families with supporting their young children in learning mathematics. Each case study provides background information, a description of the program's activities, and the program's impact on the communities. It is surprising, given that the report cited data indicating California has the highest number of Spanish-speaking DLLs, that it did not include early dual language programs from California[10] among the case studies it reported.

For the Mighty Math program, impact was measured using pre/post surveys administered

to family math event attendees. Although the report states that this program recruited 145 parents and children to attend seven family early math events, it is unclear how many participants completed the pre and the post survey and how many of these attendees were parents with dual language children. Thus, the number of dual language families served through this program is unclear. The report uses good research practices by including other data from roundtables and interviews held with participants to capture how the program impacted parents and children directly in engaging with early mathematics learning.

To measure its impact, Zeno Math used three tools: retrospective surveys, net promoter scores (NPS) and participant retention. Because Zeno serves 400 providers at community-based organizations and early learning programs, in addition to 3,000 families, 32% of who speak a language other than English, the reader would have benefited from knowing how many participants completed the retrospective surveys and who they were. Using the net promoter scores, the report concludes that " . . . families enjoyed Zeno's games and events, and would recommend them to other families in their community."[11] More details would have been helpful to understand the nature of this customer satisfaction measure and why it was chosen to measure the program's impact in the education field.

VI. Review of the Validity of the Findings and Conclusions

The lessons the report draws from the two case studies are consistent with what have been shown to be promising practices in engaging Latinx families to work with their young DLLs in early mathematics learning. They are also consistent with literature that points to these practices as effectively positioning parents as leaders or co-leaders of professional development offered to other parents and of creating networks by recruiting other families.[12] Building capacity to provide professional development at a larger scale to early care providers and early childhood educators is critical to advance the work in early math learning, and this report illustrates these points through the two case studies.

While there is consistency with some of the recommendations from the two case studies, there are issues with using an achievement gap lens. In its review of dual language students' math achievement, for example, the report points to a Bellwether analysis of NAEP data for the years 2000-2019. It infers from these data that " . . . while ELLs . . . across the nation's schools have made gradual gains in math achievement over time, achievement has plateaued in recent years, and the gap between ELLs and monolingual students in fourth-grade math achievement persists."[13] One issue with using the achievement gap is the unfair comparison between non-DLLs, who are proficient in the language they are being tested on, and DLLs, who are lumped into one group no matter what their English proficiency is—beginning, intermediate, or advanced. The report acknowledges grouping DLLs into one group as being problematic. A second issue is that the data do not include the quality of the dual language programs these students attended. Third, using 20-year achievement data behooves readers to consider the sociopolitical context of the banning of bilingual education through Proposition 227 in California in 1998 and its recent reversal. Although the report acknowledges this event at the end of the report, its impact on students' mathematics achievement is not

taken into account. This continued achievement gap discussion can lead to deficit views of DLLs.[14] A discussion of opportunity gaps that come with policy changes during the past 20 years would have begun to address unjust systems that perpetuate underachievement of historically marginalized student populations.

VII. Usefulness of the Report for Guidance of Policy and Practice

This report would have been more helpful to policymakers and practitioners had it discussed critical studies that have demonstrated how young learners develop languages and how their home language can be used as an asset when teaching mathematics to young DLLs. However, the report contributes to an understanding of the benefits and challenges involved in engaging dual language families to support their young children in learning mathematics. The recommendations drawn from the research, practice, and two case studies are consistent with asset-based approaches used in engaging families to support young DLLs in early mathematics learning. These can inform policymakers in making decisions on the components needed to scale up the number of high-quality early childhood mathematics programs that place families, communities, and students at the center of their work.

Notes and References

1 Lewis, B., Steel King, M., & O'Neal Schiess, J. (2020). *Language Counts: Supporting early math development for dual language learners*. Bellwether Education Partners. Retrieved January 21, 2021, from https://bellwethereducation.org/sites/default/files/Bellwether_LanguageCounts-HSF_Final.pdf

2 Bellwether analysis of NAEP fourth-grade math achievement, US Department of Education, 2000-2019.

3 González, N., Moll, L.C., & Amanti, C. (Eds.) (2005). *Funds of knowledge: Theorizing practices in households, communities, and classrooms*. London: Routledge.

4 Civil, M. (2007). Building on community knowledge: An avenue to equity in mathematics education. In N.S. Nasir & P. Cobb (Eds.), *Improving access to mathematics: Diversity and equity in the classroom* (pp. 105-117). New York, NY: Teachers College Press.

5 Carpenter, T., Fennema, E., Franke, M., Levi, L., & Empson, S. (1999). *Children's mathematics: Cognitively guided instruction*. Portsmouth, NH: Heinemann.

6 Turner, E., & Celedón-Pattichis, S. (2011). Problem solving and mathematical discourse among Latino/a kindergarten students: An analysis of opportunities to learn. *Journal of Latinos and Education, 10*(2), 146-169.

7 Adger, C.T., Snow, C.E., & Christian, D. (Eds.) (2018). *What teachers need to know about language* (2nd Ed.). Blue Ridge Summit, PA: Multilingual Matters.

8 Carpenter, T.P., Franke, M.L., Johnson, N.C., Chan Turrou, A., & Wager, A.A. (2017). *Young children's mathematics: Cognitively guided instruction in early childhood education*. Portsmouth, NH: Heinemann.

9 For example, Anita Wager and colleagues illustrate how a teacher affords opportunities for young DLLs to engage in rich mathematics that provide agency by encouraging them to write their own recipes or to put prices on the food served at their restaurant. The math talk in this classroom, which is 90% Spanish, combines language and mathematical knowledge that positions young DLLs as doers of mathematics. (See Karabon, A., Martinez Negrette, G., Smith, M., & Wager, A.A. (2017). "Tengo toda la receta acá": Developing mathematical agency in young emerging bilinguals. In S. Celedón-Pattichis, D.Y. White, & M. Civil (Eds.), *Access and equity: Promoting high-quality mathematics, PreK-Grade 2*. Reston, VA: National Council of Teachers of Mathematics).

10 See Early Edge California as an early dual language program at https://earlyedgecalifornia.org/coronavirus-resources-for-the-early-learning-community-in-california/

11 Lewis, B., Steel King, M., & O'Neal Schiess, J. (2020). *Language counts: Supporting early math development for dual language learners*. Bellwether Education Partners. Retrieved January 21, 2021, from https://bellwethereducation.org/sites/default/files/Bellwether_LanguageCounts-HSF_Final.pdf

12 See the work of Marta Civil and colleagues for Math And Parent Partners (MAPPS) at https://www.math.arizona.edu/outreach/programs/mapps and Hablemos de Matemáticas-Let's Talk about Mathematics at https://sites.google.com/a/math.arizona.edu/hablemosdematematicas/about

13 This statement, which is on p. 12 of the report, appears to refer to Figure 6 on p. 13. Figure 6 shows 4th grade NAEP mathematics average scores for dual language (ELL) and non-dual language students. Figure 6 is not explicitly referenced in the text.

Lewis, B., Steel King, M., & O'Neal Schiess, J. (2020). *Language counts: Supporting early math development for dual language learners*. Bellwether Education Partners. Retrieved January 21, 2021, from https://bellwethereducation.org/sites/default/files/Bellwether_LanguageCounts-HSF_Final.pdf

14 Gutiérrez, R. (2008). A "gap-gazing fetish in mathematics education?" Problematizing research on the achievement gap. *Journal for Research in Mathematics Education, 39*(4), 357-364.