

Seeds of Science/Roots of Reading: An Integrated Approach to Science and Literacy Instruction

Closing the achievement gap in our nation between native English speakers and English language learners will require educators to address the needs of the English language learners. Along with being the fastest growing segment of the school population, English language learners are also among the most academically vulnerable students in schools today (Wong-Fillmore & Snow, 2000). In science achievement, in particular, English language learners score significantly below their native English-speaking peers. The 2005 National Assessment of Educational Progress data shows only 28% of fourth-grade English language learners scored at or above basic level for science compared with 71% of native English speakers (National Center for Educational Statistics, 2005). Moreover, this achievement gap between native speakers of English and English language learners is persistent. The average science scores of eighth- and twelfth-graders identified as being English language learners did not change significantly between 1996, 2000, and 2004, remaining markedly below those of native English speakers (National Center for Educational Statistics, 2005).

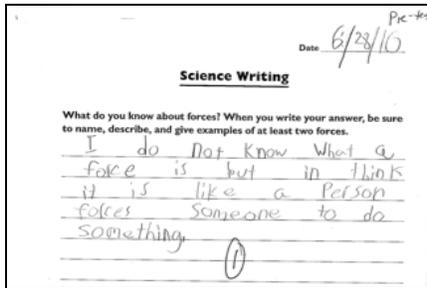
Background

Seeds of Science/Roots of Reading (Seeds/Roots), developed jointly by the University of California, Berkeley's Lawrence Hall of Science and Graduate School of Education, set out to address this growing reality in our nation's schools. The Seeds/Roots curriculum program for grades 2–5 provides students with multiple ways to access science knowledge through a Do-it, Talk-it, Read-it, and Write-it approach. It engages students in deep forays in science learning, while increasing student skills in reading, writing, and discussing as scientists do. Explicit instruction on how to read and write science text and engage in science talk provides students with the support they need to successfully participate in all class activities. Finally, teachers are provided with just-in-time support and suggestions for strategies for accommodating the needs of English language learners in their classes.

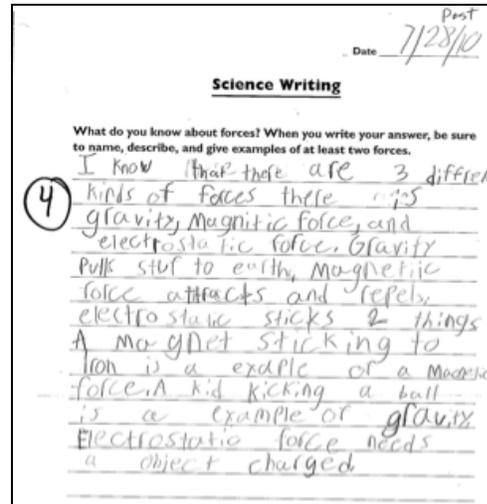
Documented Results

More than 300 teachers and their students have participated in studies to test the efficacy of the Seeds/Roots curriculum units. An independent evaluator, the National Center for Research on Evaluation, Standards and Student Testing (CRESST) at UCLA, has conducted randomized control studies on two of the grades 2–3 units, one of the grades 3–4 units, and one of the grades 4–5 units. Looking across the studies, students using the Seeds/Roots curriculum have consistently outperformed students using business-as-usual, content-comparable science units on measures of science understanding and science vocabulary, with mixed results for science writing and science reading comprehension (Cervetti, Barber, Dorph, Pearson, & Goldschmidt, 2012; Duesbury, Werblow & Twyman, 2011; Wang & Herman, 2005). Analysis of the performance of English language learners in these studies provides growing evidence that the Seeds/Roots model of instruction provides greater access to science knowledge than typical science programs and helps English language learners develop academic language. In the study, we focused on grades 2–3 Seeds/Roots units, over 1/3 of the 89 classrooms had at least 30% English language learners. The English language learners in that study made equivalent gains on all science measures and most literacy measures to their English-speaking counterparts (Wang & Herman, 2005). Using results from the study focused on a grades 4–5 Seeds/Roots unit, Duesbury, Werblow, & Twyman (2011) found that English language learners in the Seeds/Roots classrooms outperformed a comparison group of English language learners in the areas of science understanding, understanding of the nature of science, and science vocabulary. Finally, in a random control study focused on the support characteristics of the Seeds/Roots teachers guides, teachers with access to just-in-time suggestions of strategies to use in accommodating the needs of English language learners employed more (and a broader range of) accommodation strategies than comparison teachers.

Taken together, these results provide a promising picture of the effectiveness of the Seeds/Roots program for use in our nation's increasingly language-diverse classrooms.



Pre-and Post-Test Science Writing (before and after 3rd-grade ELL student participates in the Seeds/Roots Gravity and Magnetism unit)



References

- Barber, J., Cervetti, G., Bravo, M., & Kulikowich, J. (2012, June). *The role of educative curriculum materials in supporting science teaching practices with English language learners*. Poster presented at the NSF Discovery Research K-12 Principal Investigator's meeting in Washington, D.C.
- Billman, A., & Cervetti, G. N. (2012, April). *Building a teaching intervention for ELLs*. Paper presented at the Annual Meeting of the American Educational Research Association, Vancouver, Canada.
- Bravo, M. A. Cervetti, G. N., Duong, T., & Hernandez, S. (2012, April). *Identifying and accommodating the language demands of science for English learners*. Paper to be presented at the Annual Meeting of the American Educational Research Association, Vancouver, Canada.
- National Center for Education Statistics (2005). *Science 2005: Assessment of student performance in grades 4, 8, and 12*. Washington, DC: U.S. Department of Education, Office of Educational Research and Improvement.
- Wong-Fillmore, L. & Snow, C. (2000). *What teachers need to know about language*. Washington, DC: Center for Applied Linguistics.

For More Information

For general programmatic information: <http://www.scienceandliteracy.org>

For research and efficacy data: http://www.scienceandliteracy.org/research/efficacy_studies

For information about purchasing Seeds/Roots: <http://www.wirelessgeneration.com/ordersos>