

TEACHING CULTURALLY DIVERSE STUDENTS MATHEMATICS & SCIENCE

CENTER FOR RESEARCH ON EDUCATION, DIVERSITY & EXCELLENCE

NATIONAL CENTER FOR IMPROVING STUDENT LEARNING & ACHIEVEMENT IN MATHEMATICS & SCIENCE

CREDE
AND
NCISLA

EDUCATOR RESOURCES



The Chèche Konnen¹ group at TERC has spent a good many years studying diverse students' learning and teachers' professional development in mathematics and science. The following annotated list, contributed by Chèche Konnen researchers, includes resources that their teacher-colleagues have successfully used to hone their practice and understanding of student learning and mathematics and science content. The researchers believe that other interested educators are also likely to find these resources readable and useful.

BOOKS AND ARTICLES

Ball, D.L. (1993). With an eye on the mathematical horizon: Dilemmas of teaching elementary school mathematics. *Elementary School Journal*, 93, 373–397. The author presents three dilemmas — of content, discourse, and community — that arise in trying to teach mathematics to third-graders in ways that are, in Bruner's (1960) terms, "intellectually honest."

Ballenger, C. (1997). Social identities, moral narratives, scientific argumentation: science talk in a bilingual classroom. *Language and Education*, 11 (1), 1–14. A Haitian Creole bilingual science classroom that includes "everyday" and "scientific" talk allows students to explore the growth of mold in a way that leads them beyond the simple explanations typically developed in school.

Ballenger, C. (1999). *Teaching other people's*

children. New York: Teachers College Press. This book is a teacher's account of the ways with words of a classroom of Haitian pre-schoolers. It details both the sense the children were making of school from their own perspective, and the teacher's discoveries of her own assumptions about what she thought they ought to have been thinking.

Callanan, M., Alba-Speyer, C., & Tenenbaum, H. (2000). *Linking home and school through children's questions that followed Family Science Workshops*. Research Brief 8. Santa Cruz, CA and Washington, DC: Center for Research on Education, Diversity & Excellence. This brief describes preliminary findings from a research project that assesses the usefulness of children's questions for teachers as they design a science curriculum to fit the needs of these children. It discusses what children's questions can reveal about their thought processes and how linking home conversations with classroom practices are beneficial to all involved. (See RB8 at www.cal.org/crede/pubs/ResBrief8.pdf)

Conant, F., Rosebery, A., Warren, B. & Hudicourt-Barnes, J. (2001). The sound of drums. In E. McIntyre, A. Rosebery, & N. Gonzalez (Eds.), *Classroom Diversity: Connecting Curriculum to Students' Lives*. Portsmouth, NH: Heinemann. This chapter describes one teacher's efforts to use her immigrant students' knowledge of and experiences with drums and drumming to create a unit on sound.

Dalton, S., & Sison, J. (1995). *Enacting instructional conversation with Spanish-speaking students in middle school mathematics*. Research Report 12. Washington, DC: The National Center for Research on Cultural Diversity and Second Language Learning.

This report analyzes elements of student discourse in math classrooms to measure growth in students' conceptual understanding of mathematical material. The report shows how thematic instruction and instructional conversation can promote academic success in language minority students. (See RR5 at www.ncbe.gwu.edu/miscpubs/nccrdsl1)

Delpit, L. (1995). *Other people's children*. NY: The New Press. The author analyzes what is happening in classrooms today and suggests that many of the academic problems attributed to children of color are actually the result of miscommunication as schools and "other people's children" struggle with the imbalance of power and the dynamics of inequality plaguing U. S. system of schooling.

Duckworth, E. (1987). *The having of wonderful ideas*, pp. 70–82. New York, NY: Teachers College Press. In this collection of essays, the author touches on many subjects — science, mathematics, and language — as she discusses her view of education as "occasions" for learners, whether children or teachers, to construct their own knowledge.

Feynman, R. (1985). The making of a scientist. In *What do you care what other people think?* pp. 11–16. NY: Bantam Books. Richard Feynman, a Nobel Laureate in physics, talks about some of the early childhood experiences that instilled in him a lifelong love of exploring the natural world.

Gallas, K. (1995). *Talking their way into science*. New York: Teachers College Press. Based on five years of research in the author's own classroom, this book provides a window into children's thinking about the world, enabling readers to see how students build complex theories, identify important

questions, and begin to enter the world of science.

Garcia, E. (1991). *The education of linguistically and culturally diverse students: Effective instructional practices*. Educational Practice Report 1. Washington, DC: The National Center for Research on Cultural Diversity and Second Language Learning, University of California—Santa Cruz. This paper discusses instructional practices that are effective with students from homes and communities where English is not the primary language of communication. (See EPR1, available at www.ncbe.gwu.edu/miscpubs/nccrdsl1)

Gee, J.P. (1985). The narrativization of experience in the oral style. *Journal of Education*, 167, (1), 9–56. This analysis of a story told in a first-grade class by an African American child demonstrates the skill of the child-storyteller against the background of the story's negative evaluation by school.

Gee, J.P. & Clinton, K. (in press). An African American child's "science talk": Co-construction of meaning from the perspective of multiple discourses. In M. Gallego & S. Hollingsworth (Eds.), *Challenging a single standard: Multiple perspectives on literacy*. Mahwah, NJ: Erlbaum.) The authors show how their initial assumptions about the discourse of an African American child during an interview about her understanding of light led them to view her talk as "concrete" rather than "scientific". Re-analysis, however, showed them that she was engaging in scientific explanation, but of a form they did not expect. They discuss the implications of this for child-interviewer as well as child-teacher interactions.

Heath, S. B. (1983). *Ways with words*. NY: Cambridge University Press. This classic

¹ The Chèche Konnen Center is spearheading a national reform initiative to improve elementary and middle school science for language minority students. The Center is working with school districts across the country to implement an approach to teacher professional development that integrates inquiry and reflection on three strands: science, teaching and learning, and culture and language.

study documents children learning to use language at home and at school in two working-class communities, one white and the other black, only a few miles apart in the southeastern United States.

Henderson, R., & Landesman, E. (1992). *Mathematics and middle school students of Mexican descent: The effects of thematically integrated instruction*. Research Report 5. Washington, DC: The National Center for Research on Cultural Diversity and Second Language Learning. This report shows how math instruction based on integrated thematic units, cooperative learning, and hands-on activities affected the achievement, attitudes, and motivation in math among middle school students at risk for school failure. (See RR5 at www.ncbe.gwu.edu/miscpubs/ncrcdssl)

Hudicourt-Barnes, J. (1999). Our kids can't. *Hands On!* 22 (1), 4–8. In this article, the author challenges the notion that children in bilingual programs are not able to achieve at the same high levels as their English speaking peers. (To access PDF newsletter at TERC web site, go to <http://www.terc.edu/handsonissues/s99/s99.pdf>)

Lee, C. (1993). *Signifying as a scaffold for literary interpretation*. Urbana, IL: The National Council of Teachers of English (NCTE). Signifying is a traditional form of expression in African American communities that includes "rapping," "sounding," "playing the dozens," "loud talking," and "testifying." In this book the author reports on a study she conducted to investigate the effectiveness of signifying as an instructional scaffold for teaching literary interpretation to African American adolescents. (This book can be ordered through the NCTE online catalogue, at <http://www.ncte.org/>)

McLaughlin, B. (1992). *Myths and misconceptions about second language learning: What every teacher needs to unlearn*. Educational Practice Report 5. Washington, DC: The National Center for Research on Cultural Diversity and Second Language Learning. By

discussing commonly held myths and misconceptions, this paper attempts to clarify a number of important issues in the area of second language learning. (See EPR 5 at www.ncbe.gwu.edu/miscpubs/ncrcdssl)

Moll, L. Amanti, C. Neff, D., & Gonzalez, N. (1992). Funds of knowledge for teaching: Using a qualitative approach to connect homes and classrooms. *Theory Into Practice* 31 (2), 132–141. This article describes the ways that teachers in the Funds of Knowledge project learn about the scientific, literary, and other funds of knowledge residing in their students' families and communities and the ways they then use these as resources for teaching.

Nemirovsky, R. (1993). Don't tell me how things are, tell me how you see them. In R. Ruopp, S. Gal, B. Drayton, & M. Pfister (Eds.), *LabNet: Towards a community of practice*, pp. 269–280. Hillsdale, NJ: Erlbaum. This article describes all that an individual brings to a learning situation in terms of a sense of "wonder" and cautions us about the ways in which official explanations can suffocate wonder and shut down inquiry.

Paley, V. (1986). On listening to what the children say. *Harvard Educational Review*, 56, (2), 122–131. A growing number of teachers are investigating their students' learning. The author has developed a method for studying her kindergartners that is at the same time a new approach to teaching. In this essay, she explains how the method evolved and describes its effect in her classroom.

Paley, V. (1979). *White teacher*. Cambridge, MA: Harvard University Press. As Paley describes incidents from her kindergarten classroom, she tells us how she learned to deal more openly with her pupils and her own perceptions of race.

Puttick, G., Bodwell, M. & Wright, T. (1999). *Teaching and learning science and mathematics in diverse classrooms: A resource for collaboration and discussion*. Providence,

RI: The LAB at Brown University. This collection of articles presents broad and at times unconventional views of what counts as learning and what counts as science, as well as addresses how this new definition of schooling can further the learning of children who often experience academic failure.

Rosebery, A. S. & Warren, B. (Eds.). (1998). *Boats, balloons and classroom video: Science teaching as inquiry*. Portsmouth, NH: Heinemann. This collection of essays describes a model of professional development in which teachers conduct their own scientific investigations and explore their students' learning in the classroom.

Rosebery, A. S., Warren, B., Conant, F. R., & Hudicourt-Barnes, J. (1992). Chèche Konnen: Scientific sense-making in bilingual education. *Hands On!* 15 (1), 1–19. This article, showing how seventh and eighth grade Haitian Creole bilingual students explored water fountain preferences at their school, describes the students' engagement in "scientific sense-making," a process in which they collected, analyzed and interpreted data, evaluated evidence, and built and argued theories. (Request a copy of this article from TERC by E-mailing communications@terc.edu, attention Sherry Soares, or by calling tel. 617.547.0430.)

Tan, A. (1993). Mother Tongue. In S. Gillepsie & R. Singleton (Eds.), *Across cultures*, pp. 26–31. Boston: Allyn and Bacon. Chinese American novelist, Amy Tan, speaks of the influence her immigrant mother's language had on her English as she was growing up. She wonders whether her difficulties with standardized tests and other measures of language might result from her exposure to and use of her mother's "broken English" in childhood.

van Zee, E., & Minstrell, J. (1997). Reflective discourse: Developing shared understanding in a physics classroom. *International Journal of Science Education*, 19 (2), 209–228. This study examines ways of speaking that foster the communication of

physics principles through reflective discourse. The authors identify characteristic features of reflective discourse, including invoking metaphors for teaching and learning, following a student's lead in thinking, and structuring the discussion to foster and monitor changes in the students' conceptions.

Warren, B., & Rosebery, A. (1996). "This question is just too, too easy!": Perspectives from the classroom on accountability in science. In L. Schauble & R. Glaser (Eds.), *Innovations in learning: New environments for education*. pp. 97–125. Hillsdale: Erlbaum. This chapter explores a form of classroom discourse organized around student argumentation that brings into focus an alternative view of science and science education as socially and culturally constituted, meaning-making activities.

WEB SITES

Center for Applied Linguistics (CAL): www.cal.org

Center for Research on Education, Diversity, & Excellence (CREDE): www.crede.ucsc.edu

Eisenhower National Clearinghouse (ENC): www.enc.org

LAB (Northeast and Islands Regional Laboratory at Brown University): www.lab.brown.edu

National Center for Bilingual Education (NCBE): www.ncbe.gwu.edu/

National Clearinghouse for ESL Literacy Education (NCLE): www.cal.org/ncl/

Chèche Konnen Center: www.projects.terc.edu/cheche_konnen/

National Center for Improving Student Learning and Achievement in Mathematics and Science (NCISLA): www.wcer.wisc.edu/NCISLA/

National Center for Improving Student Learning & Achievement in Mathematics & Science (NCISLA)

Wisconsin Center for Education Research
University of Wisconsin-Madison
1025 W. Johnson Street • Madison, WI 53706

P: 608.263.3605 • F: 608.263.3406
ncisla@education.wisc.edu • www.wcer.wisc.edu/ncisla

Center for Research on Education, Diversity & Excellence (CREDE)

University of California
1156 High Street
Santa Cruz, CA 95064

P: 831.459.3500 • F: 831.459.3502
crede@cats.ucsc.edu • www.crede.ucsc.edu • www.cal.org/crede