

Appendix A

TEAM-Math Project Professional Development

Since the beginning of the TEAM-Math project in 2004, our goal was to provide professional development that was aligned with *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics (NCTM), 2000), other NCTM Standards documents (1989, 1991, & 1995), and best practices from the research. The goals of these documents are to effect change in mathematics teaching and learning, especially around the inclusion of all students, the use of technologies, alternative forms of assessment, and need for increased professional development and other key issues of practice. Thus, when we talked about change with teachers our focus was on moving them away from more traditional approaches to more reform approaches as advocated by NCTM. The principles (Equity, Teaching, Curriculum, Learning, Assessment, and Technology) from *Principles and Standards for School Mathematics* were foundational to what we did.

Equity was a central construct in our professional development. According to NCTM (2000), “Excellence in mathematics education requires equity—high expectations and strong support for all students (p. 11).” We believe that teachers should be aware of equitable and inequitable practices. Below are some of the articles that we have used to help teachers examine their beliefs about groups of students and their interactions with the students.

Berry, R. Q. III. (2004). The equity principle through the voices of African American males. *Mathematics Teaching in the Middle School*, 10(2), 100 – 103.

Ford, D.Y. (2005). Welcoming all students to room 202: Creating culturally responsive classrooms. *Gifted Child Today*, 28, 28-30, 65.

Oakes, J. (1992). Can tracking research inform practice? Technical, normative, and political considerations. *Educational Researcher*, 12-21.

Weissglass, J. (2002). Inequity in mathematics education: Questions for educators. *The Mathematics Educator*, 12(2), 34-39.

The **teaching** principle was also important to our work. NCTM (2000) states that “effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well (p.11).” We encouraged our teachers to read articles related to the teaching and learning of mathematics focusing on their particular grade levels and those that come before and after. We focused on teaching practices that are in alignment with reform practices such as questioning, meaningful discourse, cooperative learning, using worthwhile tasks, and others. Below are articles and resources that we have used to help teachers to develop pedagogical content knowledge.

Clements, D.H., Sarama, J. (2000). The earliest geometry. *Teaching Children Mathematics*, 82-86.

Cloke, G., Ewing, N., Stevens, D. (2002). Calculating capers. *Teaching Children Mathematics*, 344-346.

Empson, S.B. (1995). Using sharing situations to help children learn fractions. *Teaching Children Mathematics*, 110-114.

- Flores, A. and Klein, E. (May 2005). From students' problem-solving strategies to connections in fractions. *Teaching Children Mathematics*, 452-457.
- Hankes, J.E. (1996). An alternative to basic-skills remediation. *Teaching Children Mathematics*, 452-458.
- Hannibal, M.A. (1999). Young children's developing understanding of geometric shapes. *Teaching Children Mathematics*, 353-357.
- Hendrickson, S., Siebert, D., Smith, S. Z., Kunzler, H., & Christensen, S. (2004, August). Addressing parents' concerns about mathematics reform. *Teaching Children Mathematics*, 18-23.
- Heuser, D. (2000). Mathematics workshop: Mathematics class becomes learner centered. *Teaching Children Mathematics*, 288-295.
- Huinker, D. (2002). Calculators as learning tools for young children's explorations of numbers. *Teaching Children Mathematics*, 316-346.
- Jones, D. (March 1995). Making the transition: Tensions in Becoming a (Better) Mathematics Teacher. *The Mathematics Teacher*, 88.3, 230-234.
- Kabiri, M. S., & Smith, N. L. (2003, November). Turning traditional textbook problems into open-ended problems. *Mathematics Teaching in the Middle School*, 9, 186-192.
- Kari, A.R., Anderson, C.B. (2003). Opportunities to develop place value through student dialogue. *Teaching Children Mathematics*, 78-82.
- Langrall, C. W., and Swafford, J. (December 2000). Three balloons for two dollars: Developing proportional reasoning. *Mathematics Teaching in the Middle School*, 254-261.
- Martinie, S. (2003, October). Cooperative groups. *Mathematics Teaching in the Middle School*, 106-107.
- National Council of Teachers of Mathematics. (1989). *Curriculum and Evaluation Standards for School Mathematics*. Reston, VA: NCTM.
- National Council of Teachers of Mathematics (1991). *Professional Standards for Teaching Mathematics*. Reston, VA: NCTM.
- National Council of Teachers of Mathematics. (1995). *Assessment standards for school mathematics*. Reston, VA: NCTM.
- National Council of Teachers of Mathematics. (2000). *Principles and Standards for School Mathematics*. Reston, VA: NCTM.
- Nitabach, E., Lehrer, R. (1996). Developing special sense through area measurement. *Teaching Children Mathematics*, 473-476.

Ritchhart, R. (April 1999). Generative topic: Building a curriculum around big ideas. *Teaching Children Mathematics*, 462-468.

Pierce, R. L. and Adams, C. (October 2005). Building a curriculum around big ideas. *Teaching Mathematics in the Middle School*, 144-149.

Reys, B. J., & Arbaugh, F. (2001, October). Clearing up the confusion over calculator use in grades K-5. *Teaching Children Mathematics*, 90-94.

Schroeder, T. L., & Lester, F. K. (1989). Developing understanding in mathematics via problem solving. In A. P. Shulte & P. R. Trafton (Eds.), *New directions for elementary school mathematics: 1989 yearbook*, (pp. 31-42). Reston, Virginia: NCTM.

Skemp, R. R. (1978). Relational understanding and instrumental understanding. *Arithmetic Teacher*, 9-15.

Strutchens, M. E. (2002, April). Multicultural literature as a context for problem solving: Children and parents learning together. *Teaching Children Mathematics*, 448-454.

Many of the articles mentioned above can also be used in helping teachers understand the **learning** principle. NCTM (2000) asserts “students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge (p.11).” We also used videos that focus on teaching mathematics through inquiry and investigations, including Kay Toliver series, Annenberg Tapes, Cognitively Guided Instruction videos, and IMAP videos from San Diego State University.

Again, many of the resources mentioned above can be used to help teachers implement ideas related to the **assessment** principle as stated by NCTM (2000): “Assessment should support the learning of important mathematics and furnish useful information to both teachers and students (p. 11).” We focused on the fact that assessment and instruction should be “seamless”. Thus, we advocate using a variety of assessments to determine what students know and can do.

As stated by NCTM (2000): A **curriculum** is more than a collection of activities: “It must be coherent, focused on important mathematics, and well-articulated across the grades (p. 11).” Since the beginning of the project, we have placed much emphasis on curriculum. We have a curriculum guide that helps teachers across the districts to know what they should be teaching when, and how the curriculum is in alignment with state assessments. During our professional development meetings, we placed a large emphasis on tying what we did back to the curriculum. At each grade band the emphasis during the professional development was on the use of reform mathematics curricula (*Investigations* [K-5], *Connected Mathematics* [6-8], and *Interactive Mathematics Program* [9-12]). Moreover, we encouraged teachers to change the problems in their basic textbooks to become more process oriented.

Finally, according to NCTM (2000), “**technology** is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning (p. 11).” We encouraged our teachers to utilize technology as much as possible. We also encouraged them to use technology in appropriate and meaningful ways.

The Math-Science Partnership grant ended in 2008, however we received funding to support two teacher leader academies that ran from 2008-2016. One was for secondary teacher leaders and the

other for elementary teacher leaders. During that time, we provided professional development related to the *Common Core State Standards* (National Governors Association [NGA] and Council of Chief State School Officers [CCSO], 2010). We focused specifically on the Standards for Mathematical Practice (NGA & CCSO, 2010) and the Mathematics Teaching Practices (NCTM, 2014). We also continued our emphasis on equity and access and leadership.

National Council of Teachers of Mathematics (2014). *Principle to Action: Ensuring Mathematical Success for All*. Reston, VA: NCTM.

National Governors Association Center for Best Practices, & Council of Chief State School Officers. (2010). *Common Core State Standards for Mathematics*. Author.