Beyond CROSSROADS

Chapter 2

Guiding Principles

Embracing Change

Implementing the standards of *Beyond Crossroads* includes making a commitment to continuous improvement and professional development. It may also involve changing actions and philosophies of faculty, departments, and institutions. These changes may involve a relatively small, piecemeal change, or may be a large-scale, systemic change. "Systemic change is a cyclical process in which the impact of change on all parts of the whole and their relationship to one another are taken into consideration...it is not so much a detailed prescription for improving education as a philosophy advocating reflecting, rethinking, and restructuring."[1] Systemic change may be incremental (small operational changes), substantial (key functions are overhauled), or transformational (changing the entity irreversibly).[2]

Indeed, the challenges of making and embracing change are numerous. *Beyond Crossroads* advocates developing goals and objectives based on input from all stakeholders, so that all students can be successful learners of ambitious learning outcomes in mathematics. A small, piecemeal change might be appropriate in a particular activity. In another situation, large-scale systemic change might be necessary to completely define new goals, objectives, and strategies, and essentially start over.

Educational excellence has become a moving target. While basic skills such as reading, writing and math will likely remain at the core of the curriculum, the abilities built on this foundation continue to change with our society.

National School Boards Foundation, *Education Leadership Toolkit: Change and Technology in America's Schools,* 2005, p. 1.

For some professionals, embracing and implementing change is natural or even intuitive. They look for ways to improve and revise instructional strategies and curricula on a regular basis. For them, this process is comfortable. For others, *any* change can be challenging. They feel most comfortable and confident when they can predict what will happen in their classroom and are familiar with student responses and difficulties. Regardless of whether the process of change is natural or challenging, continuous improvement in mathematics instruction is essential to improving student learning.

Embracing the challenge of continuously improving student learning is a component of professional growth. To continue to grow professionally, faculty need to look inward and engage in a process that assesses their own teaching practice regularly. Then they need to use that information to redesign goals, objectives, and student learning activities. Implementing standards may involve stepping outside of one's comfort zone, experimenting with new methods, and building confidence. Embracing change and continuous improvement are reflective processes of planning, implementing, evaluating, and documenting, followed by redefining, implementing again, and refining the action in the future to improve student learning in mathematics.

Basic Principles of *Beyond Crossroads*

Addressing the issues and challenges facing mathematics education in the first two years of college begins by adopting a set of basic principles. These principles are the foundation upon which all of the *Crossroads* standards are built. The Basic Principles outlined in *Crossroads in Mathematics* in 1995 have been revisited, updated, and expanded to form the philosophical underpinnings of *Beyond Crossroads* and are presented here in alphabetical order.

- ***Assessment.*** *The assessment of student learning in mathematics should be a fundamental tool for the improvement of instruction and student learning*.

  Assessment should support mathematics learning and instruction. An effective assessment program includes assessment of learning outcomes at the class, course, and program levels of instruction.

- ***Broadening.*** *Mathematics courses and programs in the first two years of college should broaden students' options in educational and career choices*.

  The mathematical content, reasoning skills, and communication skills developed in mathematics courses should open doors for students to pursue future work in a variety of fields.

- ***Equity and access.*** *All students should have equitable access to high-quality, challenging, effective mathematics instruction and support services*.

  The mathematics education community must reach out to all students. Active participation of all students in mathematics and the pursuit of mathematics-intensive careers by many are critical goals of our society.

- ***Innovation.*** *Mathematics programs should be thoughtfully constructed to approach content and instruction with appropriate use of traditional and innovative methods*.

  Mathematics content and instruction should include opportunities for students to engage in inquiry, problem solving, modeling, and collaborative learning, using appropriate technology. Thoughtfully crafted interactive lectures can highlight meaningful mathematics and inspire students to learn.

- ***Inquiry.*** *Effective mathematics instruction should require students to be active participants*.

  Students learn through investigation. Advances in neuroscience confirm that students' active involvement in learning mathematics is important in the process of building understanding and modifying the structure of the mind.[3]

- ***Quantitative literacy.*** *Quantitative literacy should be integrated throughout the mathematics program and the college curricula*.

  Quantitative literacy is "the capacity to identify, understand and engage in mathematics as well as make well-founded mathematical judgments about the role that mathematics plays in individual's current and future life as a constructive, concerned and reflective citizen."[4] Students' insight and skills for solving quantitative problems in context should be developed throughout the entire college curricula.

- ***Relevance.*** *The mathematics that students study should be meaningful and foster their appreciation of the discipline*.

  Mathematics should be presented in the context of realistic, understandable, applied problems that help students develop an appreciation of the nature, history, and usefulness of the discipline.

- ***Research into practice.*** *The practice of mathematics teaching should be guided by research on teaching and learning*.

  Faculty are best prepared to design effective mathematics instructional strategies and assessment tools when they have an understanding of the results of pertinent educational research, particularly in cognitive science and learning theory, and when they use those results to make informed decisions about their teaching.

- ***Technology.*** *Technology should be integral to the teaching and learning of mathematics*.

  Technology continues to change the face of mathematics and affect the relative importance of various concepts and topics of the discipline. Advancements in technology have changed not only *how* faculty teach, but also *what* is taught and *when* it is taught. Using some of the many types of technologies can deepen students' learning of mathematics and prepare them for the workplace.

Conclusion

To address the challenges facing mathematics education in the first two years of college, *Beyond Crossroads* focuses on implementation of the *Crossroads in Mathematics* Standards and advocates for informed decision-making. Faculty need to embrace change and use a multifaceted approach to instruction, not only to address a variety of student learning styles, but also to reveal the richness and interconnectedness of mathematics. *Beyond Crossroads* introduces five Implementation Standards in the next chapter, extending the Principles and Standards for Intellectual Development, Content, and Pedagogy presented in *Crossroads in Mathematics*. These standards, collectively, call for all faculty to challenge themselves professionally and to empower students quantitatively to be successful in their lives and careers.

---

1 National School Boards Foundation. (2005). *Education Leadership Toolkit: Change and Technology in America's Schools, What Is Systemic Change?* Retrieved 3/30/2006 from http://www.nsba.org/sbot/toolkit/whatsc.html, p. 1.

2 Foster, R. N. & Kaplan, S. (2001). *Creative Destruction*. McKinsey & Company: Currency Publishing.

3 National Research Council. (1999). Bransford, J. D., Brown, A. L. & Cocking, R. R. (Eds.). *How People Learn: Brain, Mind, Experience, and School*. Washington, DC: National Research Council. National Academy Press, pp. 102–115.

4 Organization for Economic Cooperation and Development, UNESCO Institute for Statistics (2003). *Literacy Skills for the World of Tomorrow—Further Results from PISA 2000*. Paris, France: Organization for Economic Cooperation and Development Publishing, p. 20.