A Checklist for a New Millennium School Science Department

Ed Hessler
Minnesota Environmental Foundation, Inc., USA

My focus is both narrow and incomplete, for it is limited to a single area of learning: science, and it is in the form of a working list, a beginning of things one might write down, not in any particular order—so that they might be remembered and edited over time, with colleagues.

Improving schools, teacher preparation, and professional development are important national priorities as we enter a new millennium. Past emphasis on targeted innovations in the short term are now conceptualized into the idea of continuous improvements that are connected in the long term. Today, the idea of improvement itself is being challenged. "Improvement," the term of the technocrat, is being recast in the context of student learning—that is, how can we educate our young or learners of any age?

I see at bottom but two alternatives between which education must choose if it is not to drift aimlessly. One of them is expressed by the attempt to induce educators to return to the intellectual methods and ideals that arose centuries before scientific method was developed. The appeal may be temporarily successful in a period when general insecurity, emotional and intellectual as well as economic, is rife. For under these conditions the desire to lean on fixed authority is active. Nevertheless, it is so out of touch with all the conditions of modern life that I believe it is folly to seek salvation in this direction. The other alternative is systematic utilization of scientific method as the pattern and ideal of intelligent exploration and exploitation of the potentialities inherent in experience. (John Dewey, Experience and Education)

Dewey's use of scientific method in the epigraph is as a vision of the "school as a center of inquiry" (Schaefer, 1967), and in that sense, similar to experimental and field science inquiries. It is not science with a capital "S." My list for a science education department—limited here to the classic baker's dozen—would contain the following:

- Clear, agreed-upon, limited, intelligible standards linked to, or based on, science education reform documents.
- A standards-driven department in which essential skills and knowledge that should be learned are known; all members of the department are teaching to the same manageable standards with an understanding that agreeing on the substance of science reform is neither simple nor straightforward.
- Alignment of curriculum, instruction, and assessment.
- Teaching for conceptual change.
- A shared sense about what the science program is trying to accomplish.
- (Maintaining) fidelity between the intended curriculum, the implemented curriculum, and the attained curriculum (cf. Travers & Westberry, 1989, in NSF, 1992).
- Content conceived as pedagogical, that is, an understanding of science that is most likely to contribute to a teacher's ability to help students learn scientific ideas and processes (Hiebert & Stigler, 1999; Lewis 2002; Shulman, 1986).
- Career-long professional development (Spector, 1989).
- Open discussion among faculty members about their beliefs about learning, learners, and their role as teachers.
- Systematic investigations of constructivism to understand its principles, possibilities, and limitations.
- Improvement of formative assessment such as self-assessment by students, feedback (tests, seatwork, and homework), and using assessments to improve instruction.
- Communities of learning throughout the school system, for example, within departments, between and among grade levels, K-12.
- The fostering of a stance of critique and inquiry toward practice (Ball, 1996).

REFERENCES

Ball, D.L. (1996). Teacher learning and the mathematics reforms: What we think we know and what we need to learn. *Phi Delta Kappan,* (March), 500-508.

Lewis, C.C. (2002). *Lesson study: A handbook of teacher-led instructional change.* Philadelphia: Research for Better Schools.

National Science Foundation (NSF). (1992). *Indicators of science and mathematics education.* Washington, DC: NSF.

Schaefer, R.J. (1967). *The school as a center of inquiry.* New York: Harper and Row.

Shulman, L.S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14.

Spector, B.S. (1989). What research says…about stages of professional development. *Science & Children,* (September), 62-65.

Stigler, J.W. & Hiebert, J. (1999). *The teaching gap.* New York: The Free Press.

This work was previously published in the Encyclopedia of Distance Learning, Volume 1, edited by C. Howard, J. Boettcher, L. Justice, K. Schenk, P. Rogers, and G. Berg, pp. 231-232, copyright 2005 by Information Science Reference, formerly known as Idea Group Reference (an imprint of IGI Global).