

Research and Teaching: Closing the Divide?¹
Policy Implications at the National Level in the United States

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We have entered a new era in the United States in which the demands on the education research community have escalated while distrust of that same community is evident in the expectations articulated in recent U.S. Federal legislation³ about the need for research-based practice and accountability and new Federal requirements included in the No Child Left Behind Act⁴ that define what constitutes valid education research. This paper explores the reaction of the education research community to the new policy environment and the urgency it imparts. Although the Federal policy environment is currently focused on K-12 education, it has significant implications for higher education in several ways. It affects what is considered valid research methodology and expectations about who should conduct educational experiments and how the results should be interpreted. The concern about the basis upon which educational decisions are made is also spreading into the policy environment for higher education as well, in the form of discussions about the reauthorization of the Higher Education Act, a package of Federal policies that affect the nations postsecondary institutions.

To relate the experience in the United States to the changes going on in other parts of the world, it is important to consider the unusual features of higher education and K-12 education in this country. The U.S. "system" is a mixture of over 3600 accredited public and independent colleges and universities and over 15,000 K-12 school districts supported by a complex blend of public and private funding. We lack a national ministry of education and the major decisions affecting the governance of our colleges and

¹ Some of the material in this document is taken from Ramaley, J.A. (2003)

² The ideas in this paper are those of the author and do not necessarily represent the official views of the National Science Foundation

³ such as the No Child Left Behind Act

⁴ the name now attached to the Elementary and Secondary Education Act that defines the Federal role in K-12 education.

universities are in the hands of voluntary lay governing boards assembled by various forms of elective, self-perpetuating and appointive processes. These institutions are, in general, very responsive to the expectations, interests and needs of their constituencies including local communities, business and the citizenry (Johnstone 2003). Approximately seventy percent of high school graduates now obtain some additional postsecondary education. While national policy and priorities have certainly shaped U.S. education, the mechanism for this is complex and filtered through an extraordinary number of local jurisdictions.

Policy Directions Set by the U.S. Department of Education

In response to deep concerns about the performance of our young people on reading, mathematics and science tests, both the National Assessment of Educational Progress (NAEP) and international tests and guided by a general sense that the state of education research is "awful"⁵, the U.S. has launched the largest social experiment conducted at a national level in recent years, a piece of legislation addressing K-12 education called *No Child Left Behind (NCLB)*. NCLB makes over 110 references to the concept of "scientifically-based research" and includes a formal definition of what constitutes research quality. To support this legislation, which calls for fundamental changes in the working relationship between the Federal government and local educational jurisdictions, the U.S. Department of Education has funded the development of a *What Works Clearinghouse* "to provide educators, policymakers, and the public with a trusted source of scientific evidence on what works in education."⁶

The foci of the content of the Clearing House are to (a) provide high quality information on evidence of effects of interventions; (b) promote the use of research in educational decision making; and (c) involve key constituents in the process, products and strategy for educational improvement. To guide the selection of material for the Clearing House, which emphasizes methodologies "that can determine the degree to which an intervention or approach has an impact on or affects educational outcomes, the Department has set a "gold standard" for educational research, the randomized clinical

⁵ As an example of an early formulation of this idea, see *The Awful Reputation of Education Research* by Carl Kaestle. *Educational Researcher*. January/February 1993 p, 23-31

⁶ from the website that introduces the *What Works Clearing House* www.w-w-c.org

trial since other methodologies “do not rule out alternative explanations with reasonable confidence.” The Department also uses this standard in developing requests for proposals through its Institute for Education Sciences (IES).

In December 2003, the U.S. Department of Education issued a document entitled “Identifying and Implementing Educational Practices Supported by Rigorous Evidence: A User Friendly Guide.” The document provides tools to identify evidence-based interventions that may be able to “spark major improvements” in the schools; in other words, a research “gold standard.” The underlying mental model is a somewhat simplistic interpretation of the use of evidence in medical practice. In the guide, “strong evidence” is defined as the results of randomized clinical trials (RCTs) and “possible evidence” can be obtained from either RCTs whose quality or quantity fall short of “strong” evidence or from quasi-experimental studies. These definitions are followed by a long list of methods that do not comprise “possible evidence,” such as pre-post studies, comparison group studies and meta-analyses of such “lower quality studies.” The Department’s narrow definition of what constitutes valid research methodology has had the salutary effect of generating a great deal of reflection, self-analysis and concern on the part of the research and evaluation communities, as well as much more attention to why we have a research-practice gap and how to address this serious problem.

Another Perspective: Scientific Research in Education

Last year, the National Research Council issued a report entitled Scientific Research in Education⁷. In his Foreword, Bruce Alberts, President of the National Academy of Sciences, expressed his hope that the report would advance the debate about what constitutes quality and rigor in scientific education research. The report offers a comprehensive perspective on what scientifically based research means and explores how research can be used in policy debates. As Bruce Alberts says it, “The report shows that, within the diverse field of education, researchers who often disagree along philosophical and methodological lines nonetheless share much common ground about the definition and pursuit of quality.”

⁷ Richard J. Shavelson and Lisa Towne, Editors.(2002) Scientific Research in Education. National Academy Press, Washington DC.

The prescription is straightforward and deeply familiar to anyone who has pursued a scientific career. The report defines principles of inquiry that underlie any scientific inquiry.

1. Pose significant questions that can be investigated empirically.
2. Link research to relevant theory so that, over the long term, scientific inquiry can generate theories that can offer stable explanations of phenomena that generalize beyond the particular.
3. Use methods that permit direct investigation of the question since methods can only be judged in terms of their appropriateness and effectiveness in addressing a particular research question. Furthermore, scientific claims are significantly strengthened when they are subject to testing by multiple methods.
4. Provide a coherent and explicit chain of reasoning based on what is known and what is observed that leads from evidence to theory and back to the evidence again.
5. Replicate and generalize across studies in order to check and validate individual findings and results and to determine to what extent individual findings can generalize over broader populations and contexts.
6. Disclose research to encourage professional scrutiny and critique. This ongoing, collaborative and public discussion and evaluation is a sign of a healthy scientific enterprise.

In contrast to the position taken by the U.S. Department of Education, the National Research Council does not set a single standard, but instead makes clear that the appropriateness of research methodology can only be assessed in the context of the research question and the context in which research will be conducted.

Approaches to research methodology and the research-practice gap at the National Science Foundation

The mission of the Education and Human Resources Directorate of the National Science Foundation is to strengthen *science, technology, engineering and mathematics education (STEM)* at all levels and in all settings (both *formal and informal*) in order to support the development of a diverse and well-prepared *workforce* of scientists, engineers and educators and a well-informed *citizenry*

that have access to *the ideas and tools* of science and engineering to enhance their quality of life and the health, prosperity, welfare and security of the Nation.

In developing its education and evaluation research portfolio in support of this mission, EHR has taken the NRC study as its basis for defining the characteristics of appropriate scientifically-based education research and is in the process of a self-examination of our own role in enhancing the capacity and capability of the research and evaluation community. This review, designed and implemented with the help of Alan Schoenfeld who has studied the condition of education research and offered some sage reflections on its direction and possible future (Shoenfeld 1999), is progressing through a series of workshops led by leading education researchers that will explore *what we know and how we know it* (an assessment of the state of education research today) and internal working group sessions to interpret what we learn in the workshops and use that knowledge to enhance our programs in order to increase their impact on the field. We are, in effect, developing our own design research experiment (Biurkhardt and Schoenfeld 2003). Both of these components are shaped by the framework developed by the NRC Scientific Research in Education panel. To ensure that we understand and explore the thinking of the panel, our first workshop speaker was the chair of the panel, Richard Shavelson.

The questions posed in each workshop, all of which will occur this spring, are

- Should questions or methods drive the enterprise?
- How can we identify "what's happening" in a given intervention?
- How can we identify if there is a systematic effect in a given intervention?
- What is the explanatory value associated with different experimental methods and interventions? ⁸

The NRC principles represent "norms of behavior that reflect expectations about how any scientific research will be conducted"⁹. "This set of principles

⁸ In other words, what can different approaches to both theory, methodology and action, either individually or as a package of efforts over time, actually tell us that might influence both policy and practice in education at all levels?

defines a culture of evidence and inquiry but each field or discipline interprets these in field-specific ways. A discipline is bounded by

- What questions are asked.
- How research is designed.
- How work is carried out.
- How the results are interpreted and generalized.
- How people talk about their work.

These same elements must shape how the EHR Directorate interprets its mission, writes its solicitations (i.e. calls for proposals), selects reviewers, interacts with its investigators and the field in general, and manages and assesses its portfolio of awards.

As Feuer and his colleagues point out, education research is not the same as astronomy or economics. It is hard to describe the education research community succinctly. Is it made up of single investigators, like much of the social science community with which most education researchers identify, or is a multidisciplinary community drawing its norms and modes of inquiry and style of arguments from many fields? Whichever it is, we cannot transfer the norms and culture of one field of study to another without adaptation. Educational research is being challenged to show that it can produce its own form of the Salk vaccine (image from Feuer et al 2002) that can protect our young people from educational failure, to be as rigorous as the medical model. Some are asking that it adopt the medical model in the hope of increasing our level of certainty about "what works."

"As accountability for results became the clarion call in education reform, and as the stakes associated with measurable outcomes were raised quickly and dramatically, new incentives developed for educators to seek guidance from the research community on strategies proven effective in boosting student achievement." (Feuer et al 2002).

There are, nor surprisingly, demands for a level of certainty that no research community can provide. Even the clinical gold standard has its

⁹ Feuer et al 2002. *Scientific Culture and Educational Research*, *Educational Researcher* 31 (8): 4-14.

limitations. Although analogies between medicine and education are of modest value, the comparison is often made, so it is worth noting that evidence-based medicine is a fairly recent phenomenon and that even the most sophisticated medical research often generates uncertain or conflicting results. (Feuer et al 2002). In most areas, in both medicine and education, the most rigorous quantitative methods can rarely be applied. One recent study showed that in the pediatric surgical literature, less than 3% of the peer-reviewed studies employed the randomized clinical trial¹⁰.

The call for evidenced-based practice at the Federal policy level troubles many observers since it asks for a level of certainty that is more than research can deliver and suggests a lack of understanding about the role that research can play in decision making about education. The NRC report as well as the model IES legislation that defines scientific rigor will help bring clarity to a complex field but not everyone will agree with the formulation or even with the underlying epistemology that shapes the conception of science within these documents. Furthermore, these efforts at definition will not, by themselves, create a culture of scientific inquiry. The field itself must do that, aided and abetted by Federal support. By adopting a medical or scientific paradigm, what might we be missing? Let us consider both the contributions of the humanities and the emerging concepts of the application of engineering research and design strategies to education.

The Humanities Approach: "Questions of Research and Methodology"

During the past forty years, the answers to the core questions of who is doing research and for whom and for what purposes have continued to shift. Scientific approaches are not the only model. According to Kezar and Talburt (2003) the research community has swung back and forth between quantitative and qualitative approaches. The emphasis in the 1960s was on small-scale quantitative studies on phenomena such as faculty mobility or student persistence. This period was followed by a strong emphasis on qualitative studies, guided by the methods and assumptions of the various social sciences. According to Eisenmann (Eisenmann, 2003), quoting the work

¹⁰ R. Lawrence Moss, Marion C.W. Henry, Reed A Dimmitt, Shawn Rangel, Nora Geraghty and Erik D. Skarsgard (2001) The Role of Prospective Randomized Clinical Trials in Pediatric Surgery: State of the Art? J. of Pediatric Surgery (36) No. 8. : 1182-1186

of John C. Smart in the 1998 edition of *Higher Education: Handbook of Theory and Research*, the field of higher education research formed from the convergence of ideas and modes of inquiry of a number of social science fields as scholars began to work on educational questions, usually as special cases of interest to them from their own disciplinary perspective.

As a counterweight to the growing national emphasis on scientific and quantitative methods, the authors in a recent issue of J. of Higher Education issue on Questions of Research and Methodology focus upon the insights and approaches of the social sciences rather than the sciences, in an effort as Kezar (2003) puts it "to create thoughtful research that is grounded in the history of ideas and philosophical conversations about what it means to be human, to learn, to be different, or to live in social organizations." (p. 3)

Marshall Smith, in his remarks on "Education Reform: A Report Card" (Smith, 2003), discusses the possibility that the current policy objectives of No Child Left Behind with its emphasis on accountability through testing and assessment may be drawing us away from "the breadth of knowledge and understanding that needs to be developed by all students if they are to be productive citizens of our increasingly complex society."(p. 48) It may also be drawing us away from the richness and insight that multiple approaches to education research can offer us and, in Kezar and Talburt's view, we may be narrowing our options, rather than broadening them at a time when we are in need of fresh integrations and insights if we are to generate the research that can have real consequences for educational policy and practice.

Design Research: The application of engineering concepts to education

Burkhardt and Schoenfeld (2003) divide the field of educational research into three domains based on the humanities, science and engineering. The humanities approach is judged by its internal consistency, its fit with prevailing wisdom and its plausibility. There is no requirement that the assertions be subject to empirical test. In contrast, the scientific approach does require empirical observations and testing of assertions. However, neither approach can close the gap between research and practice unless it becomes linked functionally to the practical experiences and needs of the

education system. This is what design research seeks to do, based on an engineering design paradigm.

In 1992, Ann L. Brown wrote about her research "in the blooming, buzzing confusion of inner-city classrooms." (Brown 1992, p. 141). She described her attempt "to engineer innovative educational environments and simultaneously conduct experimental studies of those innovations (p. 141.)" The resulting *design research* model seeks to contribute simultaneously to the advancement of theory and practice through an iterative process in which the starting theory and interpretation of research findings become design elements for an intervention, the results of which test the starting design and the theory that underlies it and advance a growing body of knowledge in what Burkhardt and Schoenfeld (2003) call a process of "cumulativity." The result of this linkage of research and practice is "key products...tools and/or processes that work well for their intended uses and users, with evidence-based evaluation (Burkhardt and Schoenfeld 2003, p. 5)" The conceptual model is comparable to the approach taken in engineering design research, where research is directed toward knowledge that will have a practical impact, combining "imaginative design and empirical testing of the products and processes during development (Burkhardt and Schoenfeld 2003 p. 5).

Why do we have so little relevant research and why is the influence of the research we do have so indirect at all levels of education?

The lack of usable material in the research literature is a serious challenge. In a report on the literature addressing teacher preparation, Wilson et al (2001) examined over 300 published research reports and found only 57 that met their standards for inclusion in their analysis. To be included, a study had to be *empirical* (offering qualitative or quantitative evidence or both in support of the conclusions reached, rather than an opinion, theory or first principles) and *rigorous* (meeting generally accepted standards for research¹¹). The authors concluded that "overall, the research case concerning teacher preparation is relatively thin...Good research can be done, but it will take the development of more refined databases, measures and methods, as well as complementary research designs that collect both

¹¹ similar to the standards developed by the NRC in its volume on Scientific Research in Education

qualitative and quantitative data." This argument can be made with respect to many other educational questions, both K-12 and postsecondary.

What is the condition of the education research community and why is so vulnerable to criticism? We can gain some insight into this by examining the shortcomings of many of the proposals submitted to our education research programs at NSF (Dietz, Anderson, & Katzenmeyer, 2002). This analysis offers guidance on how we must strengthen the capacity and effectiveness of the education research community. Many proposals we receive and do not fund are characterized by

- Poor formulation of research questions
- Poor articulation of program design and theory
- Failure to draw upon prior work or place the potential results in the context of prior work or prior theory
- Weak links between the research goals and the proposed methodology
- A tendency to load too many questions into one study instead of considering multiple studies by multiple performers to allow a variety of ways to compensate for the limitations of any particular method

We clearly have a complex set of issues to address. Do our researchers really know how to select an appropriate methodology to examine the questions they wish to explore? Are they asking questions that are worth asking in the first place? What must we do to build a strong foundation of scholarly inquiry under our efforts to address the challenges of education in the 21st century? At the very least, we must pay attention to the following six issues.

1. Change the attitudes and culture of education researchers and practitioners.

The education research community has failed to keep pace with the changing research needs of either K-12 or higher education, in part due to the nature of the culture of education research and in part due to the absence of consistent research support.

Policy questions like "How should we prepare and certify teachers?" do not lend themselves to traditional scholarly analyses by individual scholarly disciplines, even though they can be approached in a genuinely scholarly way. Donald Schön (1987) once wrote that " In the varied topography of professional practice, there is a high, hard ground overlooking a swamp. On the hard ground, manageable problems lend themselves to solution through the application of research-based theory and techniques. In the swampy lowlands, messy, confusing problems defy technical solutions." ¹² As Schön pointed out, the problems of greatest interest to us are in the swamp, and not on high ground. Yet most researchers prefer to view the world from high ground and assiduously avoid the swamp.

It would help if, in selecting topics for investigation, researchers would: (1) emphasize issues of interest to policy makers and practitioners; (2) focus on the big picture and avoid "small studies of small questions;" (3) encompass more comparative studies so that a particular institutional experience could be studied in a larger context; and (4) provide a clear interpretation that would allow practitioners to see how broadly the results might be applied to other, similar circumstances. Researchers could do this by spending time with practitioners and finding out what their challenges are as well as by spending time learning how to communicate across disciplines. Even better, researchers could invite policymakers and practitioners to work with them to define and pursue questions of mutual interest, which leads to issue number two.

2.Change how research is done and address the gap between research and practice.

As Shavelson and Towne (2002) point out, "There is a long-standing debate among scholars, policy-makers and others about the nature and value of scientific research in education and the extent to which it has produced the kind of cumulative knowledge expected of scientific endeavors." (p. 1)

Whatever your own particular views about what kind of research is credible and under what conditions a particular approach or mix of methodologies is most appropriate, there remains the question of what influence *any* research

¹² Donald a. Schoen. Educating the Reflective Practitioner. (1987) Jossey-Bass Publishers, San Francisco. P. 3

may have on educational practice. As the NRC puts it, "Educators generally do not look to research for guidance. The concern of researchers for the validity and robustness of their work, as well as their focus on underlying constructs that explain learning, often differ from the focus of educators on the application of those constructs in real classroom settings with many students, restricted time, and a variety of demands." (p. 6)

To close this gap, the cultures of both the schools and higher education will have to be radically altered in order to bring researchers and practitioners to work together for the continuous improvement of both research and professional practice. Only in rare cases are universities and schools able to work in this collaborative fashion today. Even such worthy goals as the formation of a What Works Clearing House will have limited impact unless we combine the information that the Clearing House will provide (i.e. the tool) with the knowledge of how to use the tool. Knowing something is not enough to change behavior unless that knowing addresses both what is known and how to use it (the "know how" of a seasoned practitioner).

3. Change how we prepare our future faculty

Because neither faculty in higher education programs nor faculty in the core disciplines of the Arts and Sciences often consider it their responsibility to train teachers or to contribute to the improvement of educational practice, either in K-12 or in higher education, their graduate students do not see their mentors applying rigorous analysis and experimentation to educational issues affecting undergraduate study or K-12. Students and new faculty quickly learn that regardless of their personal motivations or prior experiences, they must now adopt the habits of higher education researchers, scientists and engineers. Their role models rarely place an emphasis on contribution to the enhancement of K-12 or undergraduate education. (Colbeck, 2000). As Colbeck puts it

" Research on the process of professionalization in other fields helps explain why some [faculty] distance themselves from practitioners. One of the hallmarks of achieving professional status is the general perception that certified members of the profession have developed expertise in a body of knowledge and a set of skills obtained only through long and intensive education." This expertise is expressed through the use of a highly

specialized jargon that allows its speakers to claim an esoteric and very special privilege.

The development of quality research in any field requires a supporting institutional network of positions, publications, funds to support research and an interested audience that sets the norms, values and expectations of scholarly discourse. If this work is to inform public policy or educational practice, there must also be a recognized need and a corresponding sense of priority among administrators and faculty leaders, civil servants and politicians.

Although in recent years, the audience for education research has grown, it is still very insular. Most disciplinary faculty in the arts and sciences and engineering are simply not interested in thinking about education in their disciplines or in K-12 or in general education at the undergraduate level. Even if they know some of the literature on education, they cannot judge the validity of the work because the underlying methodologies and superficial vocabularies are different from their own. They assume it is not really scientific, and hence, not trustworthy and they are often put off by technical language that they do not understand. Even if they make it past all of these hurdles, they are not encouraged to work with colleagues in education research on issues of K-12 or undergraduate learning. This is now more of a problem than ever as the demands of policy in the United States require faculty in the arts and sciences to be significant players in collaborations directed at the improvement of science and mathematics education in the schools.

4. Rethink how we prepare teachers and their own expectations of themselves as learners and as professionals

During teacher education, students must first learn how to learn before they can learn how to teach. This can be built into their curriculum by ensuring that they learn to think in the style of the discipline they select for their major and that they are introduced to modes of thinking and inquiry in all the fields relevant to their future teaching responsibilities. This can often best be conveyed by engaging students in research in the fields in which they will be teaching and by bringing the habits of research

into the classroom, as well as by building a sense of teaching as a genuine profession with its own defining characteristics and, as Schön says, *artistry*.

Terry Anderson (2001) has recently written about the "hidden curriculum," the process of socialization into the ways of a profession or discipline, the dues that must be paid in order to be accepted as an expert, the messages sent implicitly by the profession to its supplicants and the unstated rules about how one must think and act in order to be an authentic scholar or practitioner. According to Paul Hirst each discipline is more than a simple grouping of related topics (Wineburg, p. 40-41). It is also a way of thinking about the world.

Schön argues that the relationship between practice competence and professional knowledge is usually approached from the wrong direction. The problem is not how to make better use of research-based knowledge but rather how we can learn from a careful examination of the artistry of superb teachers. In his description of the *reflective practitioner*, Schön suggests (p. 13) that artistry is an exercise of intelligence, a kind of knowing that is different in crucial respects from our standard model of professional or disciplinary knowledge. It is rigorous in its own terms. It is professional knowledge adapted to the circumstances in which the teacher works. The most competent practitioners know how to frame a problem, how to act on what they know, how to improvise when information is limited. They do not fall into the decision traps that novices are more prone to step into. They have something that in medical practice is called "clinical judgment." Many aspects of this artistry can be taught, but much will come from experience and reflection and from close observation of the circumstances of students' lives and what they know and do not know.

What is the hidden curriculum in the teaching profession? Like other professions, preparation for teaching must be based on an approach to generating and interpreting knowledge, not confined to the mastery of a body of information to be memorized and faithfully transmitted and applied. It is rare to find an expectation that teachers will also be scholars, contributors to their profession and participants in a culture of scientific inquiry. This must change.

5. We must address the lack of a scholarly community within our nation's schools that could promote continuous learning by teachers as well as by students and the lack of an expectation that teachers will contribute to the improvement of professional practice.

The key shift in thinking required to move from the usual professional development program for teachers to an effective model of knowledge generation and use in practice is to recognize that changes in practice are unlikely to be generated from new information alone, either content knowledge or pedagogical strategies. Both the core experiences during the preparation for teaching and the design and goals of professional development and the practice of teaching within a school setting must change to reflect the concepts of the scholar/practitioner.

6. Federal funding agencies must apply the same expectations to themselves that they apply to their investigators and develop strategies to bring researchers and practitioners together to collaborate.

The experiences and interests of program officers at Federal agencies guide the research agenda, although at least in the case of federal agencies like NSF, peer review determines the merit of the proposals and what will be funded and programs are designed with significant input from the field. This, however, can create its own set of problems, since the proposed work is more likely to be judged according to the frame of reference and tests of a higher education research community than by a group that includes practitioners whose views might recalibrate the priorities and emphases of the research portfolio being built by the agency.

At NSF we are trying to meet the demand for more research directly by infusing a research culture into all of our programs, into our interactions with our PIs and in the way we approach the design of new programs and the revision of old ones. We are setting up a cycle of **discovery, innovation and application** that will promote the introduction of a scientific culture into all of our work, not just the parts that are labeled *research*. We are, in fact, establishing our own form of design research (Brown 1992) at the heart of our portfolio of awards. We are starting to think of our awards as elements in a portfolio that will, in a balanced and productive way, address all of the elements of the cycle of discovery as follows:

- Synthesize and interpret findings and identify new insights and questions
- Conduct research on problems of learning and teaching, implementation and policy
- Develop and test theory and knowledge about learning and teaching
- Design and develop tools, materials and methods based on a sound research foundation and empirical evaluation of their efficacy in various settings and conditions.

The problem of bridging the gap between research in practice involves figuring out how to present research findings both according to the expectations of the academic community and also according to the tests of **relevance**, **truth** (i.e. quality) and **utility** that would be applied by a policymaker or practitioner. This adds a new dimension to how we judge the effectiveness of presentation of scholarly work, who will be involved in defining the focus of the work, who participates in the interpretation of the findings and who will take part in the application of the results. In support of educational reform, education research must meet *both* sets of criteria for validity and usefulness. This can be facilitated by linking the priorities of researchers and practitioners in such a way that both communities will share in the identification of the most significant questions and contribute to the conduct and interpretation of the research. Federal agencies can model this behavior in their selection of program officers, their design of requests for proposals, their choice of external reviewers, the development of their criteria for intellectual merit, their expectations regarding broader societal impact and their interactions with their investigators. We must practice what we preach.

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