Does the research reported in mathematics education journals have any relevance for practicing teachers? [1]

(In Pursuit of Practical Wisdom in Mathematics Education Research)

Frank K. Lester, Jr.

Dear Professor Rapoport:

> *I guess we are not getting anywhere. Your use of evidence and assumptions, inferences and innuendo, are so foreign to my own standards that I doubt if we can gain much by pursuing our correspondence further.*
>
> *McGeorge Bundy*

Dear Mr. Bundy:

> *We agree on one point, namely, that we are not getting anywhere. I wonder, however, if some thought should not be given to our failure to establish communication. I am able to communicate with thousands of my colleagues, presumably because we have similar standards of evidence, assumptions, and inference. If by innuendo you mean the connotative use of language, then we also use "innuendo" as an aid to communication.*
>
> *Anatol Rapoport*

From *Teach-Ins: U.S.A.*, Louis Menashe & Ronald Radosh (Eds.), 1967, p. 150 (New York: Praeger)

---

1. This paper is a revised and abbreviated version of a paper presented by Frank Lester at the plenary session at the research presession of the annual meeting of the National Council of Teachers of Mathematics in San Diego on April 23, 1996. It is the result of numerous discussions among the author, Gudmundur Birgisson and Paul Kehle over a period of several months beginning in November, 1995. During that time Birgisson and Kehle were doctoral students in the Mathematics Education Program at Indiana University. It has also been presented at the annual conference of the National Association for Research on Teaching Mathematics and Science, Vaasa, Finland in 1998.

Frank K. Lester, Jr. *is professor at School of Education, Indiana University, Bloomington, Indiana, USA. and visiting professor at Matematikavdelningen, Institutionen för Ämnesdidaktik, Göteborgs Universitet, Göteborg, Sweden.*

During my term (1992-96) as editor of the *Journal for Research in Mathematics Education (JRME),* I observed numerous instances of an apparent "failure to establish communication." Many of these instances were due in large part to the lack of shared principles among researchers regarding such fundamental matters as what counts as research, the role of justification, what counts as evidence, and the place of background assumptions and beliefs in the research process. I found this condition worrisome and I endeavored in various ways to reduce, if not eliminate, it. However, as serious as the lack of communication among researchers was, I believed then—and still do today—that an even more serious communication gap exists between researchers and teachers, teacher educators, and other educational practitioners. In this paper I take a look at the breakdown in communication between researchers and educational practitioners and make a few suggestions about how to change this unfortunate and unnecessary state of affairs.

Lack of Communication Between Researchers and Educational Practitioners

> *The* Journal for Research in Mathematics Education, *an official journal of the National Council of Teachers of Mathematics, is devoted to the interests of teachers of mathematics and mathematics education at all levels—preschool through adult.* (Inside front cover of every issue).

I think teachers and teacher educators do not pay much attention to the research so carefully and thoughtfully reported in the journal. But, this is not a new development. Writing on the occasion of the publication of the inaugural issue in 1970 of *JRME*, then-president of the National of Teachers of Mathematics (NCTM), Julius Hlavaty, nicely summed up his view of the purpose the new journal was to serve:

> *We must—and will—strive mightily through the* Journal For Research In Mathematics Education *to give the teacher in the classroom, the administrator and curriculum consultant at the planning level, and even the man in the street, the information, guidance, and help that research can provide. (p. 7)*

Despite Hlavaty's vision, opinions about the relevance of *JRME* for teachers remained mixed for several years after the establishment of journal. For example, in the May 1978 issue of the journal, then NCTM president John Egsgard stated:

> *Until the mathematics-education research community can come up with results that will affect the classroom teacher, be it an elementary school teacher, a junior high teacher, a secondary school teacher, a community college teacher, or a teacher of mathematics education, I do not believe that the Council would be justified in providing additional resources for research. (p. 241)*

I suspect that the sentiment among many educational practitioners is not so different today than it was 20 years ago. Among the many explanations proposed for the failure of our research to resonate with teachers, one that has not been given adequate attention by mathematics educators is that researchers and teachers have accepted different ways to frame their discourse about what they know and believe about mathematics teaching and learning. Typically, researchers tend to communicate their ideas in terms of what Schwandt (1995) refers to as (*monological*) scientific rationalism. By contrast, teachers—and a few researchers—tend to communicate their ideas through, "the lens of *dialogical*, communicative rationalism" (Schwandt, 1995, p. 1; emphasis added). Let me briefly discuss each approach.

(Monological) Scientific Rationalism

For Schwandt, a research methodologist and educational evaluation specialist, scientific rationalism is a style of inquiry shaped by six principles:

1. True knowledge begins in doubt and distrust.
2. Engaging in this process of methodical doubting is a solitary, monological activity.
3. Proper knowledge is found by following rules and method (rules permit the systematic extension of knowledge and ensure that nothing will be admitted as knowledge unless it satisfies the requirements of specified rules).
4. Proper (i.e., scientifically respectable) knowledge depends upon justification, or proof.
5. Knowledge is a possession and an individual knower is in an ownership relation to that knowledge.
6. In justifying claims to knowledge there can be no appeal other than to reason. (Schwandt, 1995, pp. 1-2).

Of special concern for scientific rationalists are the nature of the claims that are made and how these claims should be justified. Furthermore, all the ways deemed acceptable for justifying a claim are regarded uncertain or unreliable in one way or another. Schwandt identifies four basic methods of justification:

(a) *argument by example* to arrive at some sort of generalization,

(b) *argument by analogy* (The argument goes something like this: because phenomenon A is like phenomenon B in certain ways, they are also alike in another specific way of interest to the researcher.),

(c) *argument from authority* (the use of existing literature to support a position or help make a case); and

(d) *arguments from statistical inference.*

(Examples of the use of each of these methods of justification would be easy to identify in nearly any issue of the journal.) Finally, any of these methods of justification is readily subject to the error of reaching a conclusion with insufficient evidence or to the error of overlooking alternative explanations.

For most of the history of research in mathematics education, the predominant way of learning about and understanding educational phenomena has been based in the tradition of scientific rationalism—we have wanted to emulate the successes of the physical sciences (Lester & Lambdin, in press). Only recently have we come to realize that the methods found so successful in the physical sciences are much more difficult to apply in our research; indeed, even when it has been possible to apply such methods, their success has been very limited (Wiliam, 1996). Today, educational researchers in general and mathematics education researchers in particular tend to agree that educational phenomena are simply too complex to allow the field to ever become a "science."

I am not suggesting that scientific rationalism has no place in educational inquiry, but I am claiming it is not the only way to think about the important concerns surrounding our inquiry. I now turn to an outline of a discussion of an alternative—dialogical, communicative rationalism—and attempt to apply it to the practice of mathematics education research.[2]

(Dialogical) Communicative Rationalism

As explained by Shotter (1993, p. 166), communicative rationalism opposes scientific rationalism in three fundamental ways. First, rather than regarding the social world as "simply out there waiting to be discovered," the dialogical rationalist insists that the world can only be studied from a position of involvement within it. Second, "knowledge of [the] world is practical-moral knowledge and does not depend upon justification or proof for its practical efficacy." Third, "we are not in an 'ownership' relation to such knowledge, but we embody it as part of who and what we are." Thus, dialogical rationalism provides a different way to consider what it means to know. "Instead of simple observational claims about objects, knowing other people is offered as a paradigm for knowledge" (Schwandt, 1995, p. 7). When we adopt a dialogical rationalistic approach to research, "we come to understand that the apparently orderly, accountable, self-evidently knowable and controllable characteristics of both ourselves and our social forms of life are constructed upon a set of disorderly, contested, conversational forms of interaction" (Schwandt, 1996, p. 14). And, these "conversational forms of interaction" help us develop knowledge of our practices and ourselves. Shotter suggests that to Ryle's (1949) two kinds of knowledge—*knowing that* and *knowing how*—we should add a third type: *knowing from*. This type is characterized as knowledge "one has from within a situation, a group, a social institution, or society" (Shotter, 1993, p. 19).

To accept dialogical rationalism involves accepting that reason is communicative: "It is concerned with the construction and maintenance of conversational reality in terms of which people influence each other not just in their ideas but in their being" (Schwandt, 1995, p. 7). Thus, dialogical rationalism is intended to actually *move people to action*, in addition to giving them good ideas. That is, it aims to cause people (including educational practitioners) to sit up and take notice; to do something as a result of the dialogue in which they have engaged.

---

2. Wiliam (1996) discusses two ways research methodologists have tended to polarize educational research: qualitative vs. quantitative and analytic vs. systemic. To this list one might add experimental vs. naturalistic. My goal in this paper is not to identify ways to classify research, but rather to propose a reason why the research, however characterized, has had so little impact upon educational practice.

The implications of dialogical rationalism for mathematics education research may not be immediately apparent, but for me the implications that come readily to mind have to do with how we make and justify claims in our research, how we go about convincing others of the claims we make as a result of our research, and how we defend our claims on both ethical and practical grounds. In particular, dialogical rationalism attempts to avoid treating students and teachers as objects of thought in order to make claims about them that will guide future deliberative actions. Instead, it aims to include teachers (and students) in dialogical conversations in order to generate practical knowledge in specific situations. Thus, claims are made only after the various perspectives (or world views, background assumptions and beliefs, etc.) of all those engaged in the dialogue have been openly considered and negotiated. Schwandt and Shotter believe that it is this process of open negotiation of claims (and of what is regarded as evidence) among all participants in the discourse that leads ultimately to *practical wisdom*.[3]

In Pursuit of Practical Wisdom

Schwandt and Shotter do not advocate, nor do I, abandoning concern for careful argument and evidence in favor of some sort of fiery, political rhetoric devoid of reason. Instead, what I am promoting is a renewal of a sense of purpose for our research activity that seems to be disappearing: namely, a concern for making real, positive, lasting changes in what goes on in classrooms. This is essentially what I mean by the pursuit of practical wisdom.

The pursuit of practical wisdom entails identifying both regularity across, and uniqueness within, the micro-domains (e.g., schools, classrooms, and student-teacher relationships) in which we seek wisdom. As researchers, in order to move others to action the claims we argue for must involve careful attention to what we share with our intended audience and what distinguishes us from them. By so doing we become more familiar with other ways of thinking about our data (i.e., we are able to consider how defensible our claims are

3. My notion of practical wisdom is much the same as Aristotle's notion of *phronesis* (cf. Kessels & Korthagen, 1996).

in comparison with other's claims) and we become better prepared to consider the ethical and practical consequences of our claims.

In this decade, at least three carefully researched, comprehensive, English-language compendia have been written on the state of the field's knowledge about mathematics teaching and learning (viz., Bishop, Clements, Keitel, Kilpatrick, & Laborde, 1996; Grouws, 1992; and Sierpinska & Kilpatrick, 1998). Are any of these volumes likely to have even the slightest impact on the classroom practices of teachers? I think not; at least not in the short term! I would argue that the failure of publications such as these to resonate with the interests, needs, and concerns of practitioners is that the authors were preoccupied as researchers with the pursuit of "knowledge" (i.e., collections of bits and pieces of generally agreed upon information) and developing theories, rather than being interested in actually moving people (teachers, teacher educators, school administrators, policy makers, etc.) to action. In my mind, I can move people to action only if I can answer three key questions:

1. Are the claims I wish to make about my research based on inferences that are warranted on the basis of the evidence I have assembled?
2. Are my claims based on convincing arguments that are more warranted than plausible rival claims? and
3. Are the consequences of my claims ethically and practically defensible? (cf. Wiliam, 1996)

Only rarely has any of the published research I have read included any attention to question 2, and I know of no published research that includes discussion of ethical issues.

I admit to the open-endedness of the preceding discussion, as well as to its monological nature — I had to begin the conversation somehow! To make clearer the implications of the pursuit of practical wisdom for our research activities I speculate about the applicability of such pursuit to a specific research question.

A Case in Point: Research on Mathematics Curriculum Reform

To illustrate how a dialogical approach would be undertaken in mathematics education, let's look at a specific research question that has begun to receive quite a lot of attention in the United States: What are the effects on student learning of the recently-developed mathematics reform curricula?[4]

In order to investigate this question, suppose a group of teachers and I decide after considerable discussion and reflection to design a study in which grade 9 students are randomly assigned either to classrooms that will use a particular reform curriculum or to those that will use the traditional curriculum. Our goal is to investigate over the course of the entire school year, the effectiveness of the two curricula. Suppose further that the research design we developed is appropriate for the sort of research we are intending to conduct.[5]

From the data we would gather, I would hope to be able to develop a reasonable account of the effectiveness of the two curricula and this account could lead me to draw certain conclusions. Were I to stop here and write a report, in spite of my collaboration with the teachers, I would essentially be adopting a scientific rationalistic stance; a stance that would be essentially monological in nature. But, if I were guided by an interest in practical wisdom, I would not stop here. Instead, I would consider as many alternative perspectives as possible (and reasonable) about both my underlying assumptions and my data. I might, for example, challenge one or more of my assumptions and construct competing explanations on the basis of the same set of data. These perspectives would result in part from my engagement in serious reflection about my underlying assumptions, and in part from submitting my data to the scrutiny of other persons who might have a stake in the research—for example, the teachers who participated in the study. An even better approach would be to consider two or more rival perspectives (or theories) while designing the study, thereby possibly leading to the generation of different sets of data. For example, a study designed with a social

4. Wiliam (1996) discusses similar issues by considering the question: "Should students be taught [mathematics and science] in mixed-ability groups?"

5. Of course, this is a big assumption to make. I realize that any design is open to criticism on various fronts. But, rather than debate the merits of the design, I wish to assume that the design is "ideal" for the question we wish to study.

constructivism perspective in mind might result in a very different set of data being collected than a study based on a contemporary cognitive theory. These two different perspectives would also probably lead me to very different explanations for the results. For example, the social constructivist might attribute results favoring the reform curriculum to certain aspects of the social interactions that took place in the small groups (an important feature of the reform curriculum), whereas the cognitivist might claim that it was the increased level of individual reflection afforded by the new curriculum materials, not the social interaction, that caused the higher performance among students who were in the reform classrooms.

But simply adopting different theories or perspectives to design and make sense of data are not what makes the approach dialogical in nature. Instead, what would make it dialogical is my attempt to answer two questions:

1. What would have to be true about the instruction that took place for the opposite of my social constructivist explanation to be plausible? and
2. What would have to be true about the instruction that took place for the opposite of my cognitivist explanation to be plausible?

As Wiliam (1996) notes, the tension that results from the confrontation between competing explanations forces me to question the assumptions of each perspective and, thereby, to arrive at a possible synthesis of the rival positions.

The benefits of adopting a dialogical stance to research becomes even more apparent when I attempt to answer the third of the three key questions—Are the consequence of my claims ethically and practically defensible? Consider the following scenario.

After studying the evidence obtained from my study, I have concluded that the reform curriculum is more effective for grade 9 students. Furthermore, this conclusion has resulted from a consideration of various rival perspectives. However, there is a sizable group of parents who strongly oppose the new curriculum. Their concerns stem from beliefs that the new curriculum engenders low expectations among students, de-emphasizes "basic skills," encourages the use of calculators, and places little attention on getting correct answers to problems. The views of this group of parents, who happen to be very active in school-related affairs, have been

influenced by newspaper and news magazine reports raising questions about the new curricula, called "fuzzy math" by some pundits. To complicate matters further, although the teachers in the study were "true believers" in the new curriculum, many of the other mathematics teachers in the school district have little or no enthusiasm about changing their traditional instructional practices or using different materials, and only a few teachers have had any professional development training in the implementation of the new curriculum. Can they be expected to implement this new curriculum in a manner consistent with reform principles?

Before I "go public" with my claims, I am obliged to consider both the ethical and practical issues raised by concerns and realities such as these. Is it right to ask teachers to implement an instructional approach that will be challenged vigorously by some parents and perhaps others? Can I really claim, as the school district superintendent desires, that student performance on state mathematics tests will improve if the new curriculum is adopted? Am I confident enough in my conclusions about the merits of the new curriculum to recommend its use to inexperienced teachers? Should I encourage reluctant or resistant teachers to use this approach in their own classrooms if they may do so half-heartedly or superficially? These sorts of ethical and practical questions should be addressed if I really care about moving teachers to act on my conclusions. Answers to questions such as these will necessitate prolonged dialogue with various groups, among them teachers, school administrators, parents, and students.

Related Perspectives on Practical Wisdom

Philosopher Richard Rorty (1979) offers one point of departure for conceptualizing the dialogues that take place (a) within the research community, (b) within the community of practitioners, and (c) between these two groups. Specifically, Rorty embraces postmodern philosophy as one voice in the ongoing conversation about what it means to be human. Within this conversation he distinguishes between analytical philosophy and hermeneutic philosophy. In an analytic endeavor, the participants are seeking to extend a (monological) scientific rationalistic account of some phenomenon and may indeed conceive of themselves as producing eternal knowledge. In hermeneutic activity, the conversants seek only to steer the conversation in ways that enable people to better cope with some phenomenon in the present (practical wisdom)—not to establish

an eternal body of knowledge. This form of discourse is essential to the development of practical wisdom; that is, discourse that is ethically informed, reasoned conversation between researchers and practitioners (and among researchers) about issues that are fundamental to teaching and learning mathematics in contemporary society.

Also, anthropologist Mary Catherine Bateson (1994) presents a moving vision of learning to which we might turn for inspiration in our pursuit of practical wisdom. No single objective framework anchors learning in her account. She finds discourse based solely on abstract concepts inadequate to the challenge of understanding specific lived experience. Drawing upon several cases in which multiple diverse perspectives on shared experiences led her to deeper insights, she argues convincingly that "[i]nsight. . .refers to that depth of understanding that comes by setting experiences, yours and mine, familiar and exotic, new and old, side by side, learning by letting them speak to one another" (p.14; emphasis in original). For Bateson it is in the boundaries between what two or more people have to say about a common experience that real learning takes place.

Returning to whence I began, I have attempted to outline one possible way in which to enhance communication among researchers and teachers and consequently to develop practical wisdom. Practical wisdom is enhanced when the conversation about its focus is expanded in a rich and complete manner paying attention to the multiple meanings and interpretations (including beliefs and assumptions) brought to the discussion by each participant in the conversation. That conversation is the means to enhanced practical wisdom should not surprise us since ours is a practical wisdom concerning human beings. After all, why shouldn't the process of developing research-based knowledge be more like getting to know a person than coming to formulate a premise?

References

Bateson, M. C. (1994). *Peripheral visions: Learning along the way.* New York, NY: Harper Collins.

Bishop, A. J., Clements, K., Keitel, C., Kilpatrick, J., & Laborde, C. (Eds.). (1996). *International handbook of mathematics education* (2 volumes). Dordrecht, The Netherlands: Kluwer.

Grouws, D. A. (Ed.) (1992). *Handbook of research on mathematics teaching and learning.* New York: Macmillan.

Kessels, J. P. A. M & Korthagen, F. A. J. (1996). The relationship between theory and practice: Back to the classics. *Educational Researcher, 25*(3), 17-22.

Lester F. K. & Lambdin D. V. (in press). The emergence and professionalization of mathematics education research in the United States. In G. M. A. Stanic & J. Kilpatrick (Eds.), *The history of mathematics education in the United States and Canada* (tentative title). Reston, VA: National Council of Teachers of Mathematics.

Rorty, R. (1979). *Philosophy and the mirror of nature.* Princeton, NJ: Princeton University Press.

Ryle, G. (1949). *The concept of mind.* New York: Barnes & Noble.

Schwandt, T. A. (1995, November). *Justifying claims in evaluation: Something old, something new?* Paper prepared as a response to the panel, "Justifying Claims in Evaluation," at the annual meeting of the American Evaluation Association and the first International Evaluation Conference, Vancouver, British Columbia.

Schwandt, T. A. (1996). *Indexing the practice of "reasoning in evaluation."* Unpublished manuscript. Available from the author, School of Education, Indiana University, Bloomington, Indiana.

Shotter, J. (1993). *Conversational realities: Constructing life through language.* Thousand Oaks, CA: Sage Publications.

Sierpinska, A. & Kilpatrick, J, (Eds.) (1998). *Mathematics education as a research domain: A search for identity* (2 volumes). Dordrecht, The Netherlands: Kluwer.

Wiliam, D. (1996). *Types of research in mathematics and science education.* Unpublished manuscript. A revised version may possibly be obtained from the author at the School of Education, Kings College, University of London.

Author

Frank Lester Jr. is professor at School of Education, Indiana University, Bloomington, Indiana, USA.

Address

Frank Lester Jr.
School of Education, Indiana University, Bloomington
IN 47405-1006
USA
Phone: +1 812 856-8152
E-mail: lester@indiana.edu
