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A New Beginning”

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Prediction or Retrodiction? The Coming Together of Research and Teaching

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Abstract

Teaching and research are often thought to be different enterprises, conducted by different agents. In contrast, when arguments are made for teaching and research to be more aligned, usually it is for the purpose of encouraging teachers to make use of what researchers have to offer teachers by way of insights into language or its learning. This article argues, however, that researchers would benefit from viewing learning the way that teachers do. Indeed, newer research methodologies are now being adopted that feature teachers’ retrodictions rather than researchers’ predictions as standard practice. In a true relationship, there is reciprocity. Therefore, the article concludes with a call for teachers to cultivate researchers’ “attitudes of inquiry.”

Introduction

This article begins by surveying five differences between teaching and research. It then briefly discusses findings from a research study that I have conducted (Larsen-Freeman, 2006). The article continues with the observation that there is a need for new research methods, ones that have more in common with teaching, in particular with regard to their shared retrodictive perspective. By way of examples, I discuss four such methods. I believe that the call for teachers and researchers to share a perspective is consonant with the theme of this fall’s MITESOL conference—“Focus on Research—A New Beginning.” I conclude this paper by urging teachers to adopt “attitudes of inquiry” (Larsen-Freeman, 2000) as a demonstration of a (possibly) new commitment to a relationship with researchers.

The Differences between Teaching and Research

There are at least five ways that teaching and research can be contrasted.

*Teachers and researchers are different agents who are engaged in different processes.*

Teachers do what they do so that others can learn. Researchers investigate how learning takes place and why sometimes it does, and sometimes it does not, occur.

*Researchers generalize, teachers particularize.*
Researchers seek to generalize. They often propose unified explanations for diverse phenomena. The resulting explanations can be quite abstract. For researchers, the quest is to uncover generalizable truths that endure. Teachers know that there are few generalizations that hold up across learners or across time. Teachers, therefore, particularize. They realize that students learn in different ways and that they need to learn about their students as individuals so that they can respond to each appropriately, perhaps uniquely.

**Teachers’ and researchers’ ways of knowing differ.**

Researchers who use classical experimental designs adopt research methods that require random assignment of subjects to control and experimental groups, with each group receiving minimally different instruction. The intent of the design is to isolate one particular pedagogical procedure from other practices in order to determine its effect on research subjects’ learning.

Teachers’ ways of knowing are more nuanced. Teachers know that the effect a particular procedure has on their students varies according to the day of the week (things work differently on Friday afternoons), the week of the year (things work differently right before or after vacation), the time of the day (things work differently at 10 a.m. than at 6 p.m.), let alone with whom it is practiced, how it is practiced, and for what purpose. Teachers do not share researchers’ enthusiasm for the value of studying teaching practices apart from the normal context in which they are implemented.

**The social conditions that affect researchers and teachers differ.**

Teachers and researchers are trained differently, they work in different contexts, and their work has different rhythms. Researchers usually enjoy more autonomy over what they do and when they do it. Teachers’ schedules are frequently determined by others and by the constraints of the school day and demands of teaching.

On the other hand, researchers face pressures of a different sort—the pressure to conduct research with valid designs in order to obtain reliable results that will stand up under the scrutiny of peer review and that will contribute to the knowledge base of the field, as well as add to their own list of publications, on which much of their professional success depends.

**Researchers see teachers’ behavior as atheoretical; teachers see researchers’ writing as obtuse.**

Teachers and researchers have been known to be critical of each other. Teachers say that researchers write obtusely. Researchers say that teachers need to learn to read what they write. Teachers say that researchers demonstrate the obvious; researchers complain that teachers are merely interested in implementing, not understanding, researchers’ ideas. Teachers find researchers arrogant. Researchers counter that
teachers do not care about the theoretical perspectives that are so important to researchers.

These five differences are not inconsequential. They make beginning a new relationship (what I interpret to be MITESOL’s conference theme) seem difficult to imagine.

Before going any further, it is important to point out that the way that I have approached contrasting teaching and research for rhetorical effect has the consequence of potentially reinforcing stereotypes and exaggerating differences. In actual fact, the differences are not always so stark. For one thing, some of us wear both hats, or we have worn them at some point in our careers. In fact, many of us are concurrently teachers, and we are researchers. In addition, within our field, we are all educators. My rhetorical device also hides the fact that one can make the case for a growing similarity between the two practices—that of teaching and of research. In fact, from what I can see of developments in the field, there is the potential for congruence as never before between teaching and research. One element of this congruence is shared retrodiction. Before I elaborate on this concept, I want to suggest how traditional research paradigms are inadequate when it comes to educational research.

**Traditional Classroom-Based Research**

In traditional classroom-based research, causality has been assumed to exist between teaching and learning. Moreover, teaching has usually been seen to have an immediate, proximal effect. What I mean is that teaching has been assumed to cause learning. It also has been thought to operate unilaterally from the teacher to the students (Bolster, 1983).

It follows then that, until recently, in traditional classroom-based research teaching is viewed exclusively in terms of the influence instructors have on pupils; the reciprocal effects of students on teachers or of students on students and then on teachers are thought to be nonexistent or not of central consequence. (Bolster, 1983, p. 302)

Anyone who has ever taught, however, knows this not to be the case. Teachers teach and students do not necessarily learn, at least not what the teachers are teaching. This happens for all sorts of good reasons. A dramatic illustration of this is a research study of 5 Chinese learners of English that was conducted at the English Language Institute, University of Michigan.

**A Research Study of Five Chinese Learners of English**

A course was created for five Chinese speakers of English at the University of Michigan. All the students were women from the Peoples Republic of China (PRC), who had at least temporarily left professional positions in the PRC to accompany their
partners to this country so that their partners could complete graduate degrees. All five did not want to sit idly at home during their stay in the U.S. We agreed to offer them a six-month intermediate-level English course (from June-December) at the English Language Institute, in return for which they would allow us to study their developing English.

The way we chose to do this was to ask the participants to narrate a story of their own choosing at four different time intervals, six weeks apart: the end of June, mid-August, the beginning of October, and mid-November. The women were to write the story without consulting a dictionary or a grammar book. Three days after writing their stories, they were tape-recorded telling the same story. The tapes were transcribed, and the transcripts and written stories were divided into idea units—usually, one clause in length. Each sample was then analyzed both qualitatively and quantitatively. The quantitative measures consisted of accuracy (the percentage of error-free t-units as compared with the total number of t-units\(^2\)), fluency (the number of words per t-unit), vocabulary complexity (a sophisticated type-token ratio that takes length of production into account), and grammatical complexity (the number of clauses per t-unit). Although one could find fault with the operational definitions of these features of students’ writing and speech, each of these indices is considered among the best that have been used in other studies (Wolfe-Quintero, et al., 1998).

The scores for the five participants were averaged and then plotted on a graph over time. Figure 1 shows what this procedure yielded.\(^3\) In fact, we were pleased to see that collectively the students were making progress. In almost each case, performance at a later time improved over an earlier time, and this was nearly always true of all the performance features that we looked at.

Figure 1: Group averages over time on four indices using written data

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\(^2\) A t-unit is an independent clause and any subordinate clauses attached to it. It differs from a sentence, which might contain several linked independent clauses.

\(^3\) The three figures in this article first appeared in Larsen-Freeman (2006), an article in *Applied Linguistics* 27(4), published by Oxford University Press.
However, it is well-known that averages can conceal a great deal of variability. What was interesting was when we plotted the same four indices over time for each individual student, a different picture emerged. As is clear from Figure 2, there was no smooth linear progression as there appeared to be when the students’ scores were averaged.

Figure 2: Interindividual variation over time for five participants on four indices using written data

In fact, what can be seen is a great deal of progress and regress from a target language-centric perspective. In some cases, the students conclude their course worse off on some of these measures than when they started! This is not to say that no learning took place nor that the picture was hopelessly chaotic. In fact, when we compared two of the indices against each other, we could begin to see a pattern. As Figure 3 demonstrates, Learner U appears to put a great deal of stock in improving her grammatical complexity. Learner L on the other hand seems to be concentrating on improving her fluency. The other learners go back and forth between the two types of proficiency.

Figure 3: Change of fluency compared with grammatical complexity for five participants using written data

I am not claiming that these students were consciously motivated to direct their learning to a particular feature, although they may have been. Nevertheless, they were all experiencing the same instruction, but clearly achieving differentially. Of course, there
is much more to be said for these students and their language development (for a fuller treatment, see Larsen-Freeman, 2006), but my point for displaying even these few data here is to underscore the nonlinearity of the learning process.

These findings do not bode well for an experimental approach to research that assumes causality between teaching and learning. Who can say, for example, on the basis of a pre-test/post-test design that a particular experimental treatment works or does not work? If the results are non-significant, the effects of the treatment may not yet be manifest; if the results are significant, they may have resulted from an experience that learners have had prior to the pre-test, but which are not evidenced in the pre-test.

Indeed, conventional experiments are problematic for they can only, at best, lead to claims about proximate, linear causes, while not allowing for multiple or reciprocally interacting and non-linear variables, which change over time. While I would not wish to discount experimental claims, I think that we do need to problematize them in light of the fact that any cause and effect link that is “found” might actually occlude fundamental non-linearity (Larsen-Freeman, 1997).

Instead, what is needed, as Bolster had the prescience to observe, is a teacher’s particularistic perspective; that is, this knowledge arises from the need to comprehend the complexity of a particular context with sufficient accuracy to be able to act efficaciously in it. Such knowledge derives not so much from a systematic comparison of a number of similar situations as it does from intuitive analysis of a specific context in which many important qualities are assumed to be unique. Every teacher “knows” that although there are many similarities between classes, each group has its own special characteristics, and that successful teaching requires the recognition and acknowledgement of this uniqueness. (Bolster, 1983, p. 298)

In recognition that each class or individual in a class is unique and that teachers must therefore be open to novelty with each group, what teachers adopt is a retrodictive approach rather than a predictive one. Rather than predicting that a particular teaching activity will cause learning, as is done in classic experimental research, a retrodictive approach seeks an after-the-fact explanation for learning. Retrodiction acknowledges that due to the complexity of classroom teaching and learning, the only satisfactory approach to research is to take note when someone learns something and then to look back to see how this was accomplished. Such a process is retrodiction (or retrocasting), explaining the next state by the preceding one, rather than prediction (or forecasting).

Larsen-Freeman and Cameron (2008) adopt a complex systems approach to research. They point out that in traditional experimental research explanation produces prediction in the form of testable hypotheses. In contrast, in complex systems approaches, once a system or the behavior of agents in it has changed or evolved, the process can be explained, but new predictions are not necessarily a consequence. Of course, we humans can learn from our experience, and thus, we may have expectations of how a process will
unfold, or even of its outcomes, based on prior experience; however, a complex systems approach, as Larsen-Freeman and Cameron write, brings about a separation of explanation and prediction.

As Stewart (1998, p. 17) puts it, “We can tell where the system cannot be, and we can identify the states that the system is most likely to be, but we cannot tell exactly where the system will be.” It is highly unlikely that a single cause will give rise to a complex event. Rather, there are likely multiple and interconnected causes underlying any shift or outcome. Gaddis (2002, p. 65) adds that “We may rank their relative significance, but we’d think it irresponsible to seek to isolate—or ‘tease out’—single causes for complex events.”

Thus, it is increasingly recognized by researchers that new ways of studying phenomena are needed. As Atkinson (2002, p. 539) acknowledges, we need “…methodologies that do not denature phenomena by removing them from their natural environments and breaking them down into countable component parts.”

One further important advantage of such methodologies is that they are less likely to reproduce the researcher-teacher divide—the asymmetrical division of labor between (classroom) teachers and researchers. This is because, as I said before, teachers have long realized that teaching and learning are not simple enterprises, explicable by simple causes. Many factors may contribute to any learning that takes place or does not take place, and the best hope for explaining the results comes from after-the-fact reflection.

If we are to accept that research, like teaching, needs to be retrodictive rather than predictive, what methodological options do we have? Here I will list four—two that originated in research and two that are grounded in teaching practice.

**Formative Experiments**

In addition to what I have already pointed out, another limitation of conventional experiments occurs when researchers attempt to control context and situation, rather than investigating adaptation to the unique particularities of context. Researchers “try to ensure that an intervention is implemented uniformly despite different circumstances; and they focus on post-intervention outcomes instead of what happens while the intervention is implemented” (Reinking & Watkins, 2000, p. 384).

A different type of experiment, called a “formative experiment” (Jacob, 1992, described by Reinking & Watkins, 2000), focuses on the dynamics of implementation and might thus be capable of overcoming these limitations. Using Newman’s words, Reinking and Watkins define it as follows: “In a formative experiment, the researcher sets a pedagogical goal and finds out what it takes in terms of materials, organization, or changes in the intervention in order to reach the goal” (Newman, 1990, in Reinking & Watkins, 2000, p. 388). In other words, once the goal is reached, the researcher can
reconstruct what it took to get there. This requires the researcher adopting a retrospective view.

Not only is this a retrospective approach to research, but it also sounds a lot like reflective teaching practice, to me at least.

**Design-based Research**

Another similar approach is design-based research, a method that is getting a lot of attention in educational research these days. In fact, an entire issue of the American Educational Research Association’s publication, *Educational Researcher* January/February, 2003—Volume 32(1), was devoted to it.

Design-based research seeks to counter the problem that educational research is often divorced from issues of everyday teaching. This problem points to the need for research that directly addresses the problems of classroom practice. Thus, a goal of design-based research is to advance “theory in practice.” In other words, the research is situated in natural contexts of instruction and what is observed is made sense of in terms of the local particulars. Furthermore, design-based research responds to the emergent features in the situation. It is not as though a particular research angle is adopted once and for all.

As Confrey (2006, p. 139) writes “Such studies support views of the classroom not as deterministic, but as complex and conditional. In these settings, instructional guidance is based on affecting the likelihood of certain events and outcomes by adjusting the conditions of instruction.”

By adjusting the conditions of instruction, design-based researchers concern themselves with the process of teaching and learning as much as the product. They shift their attention from being teacher-centered to being learner-centered. Rather than creating research designs that isolate a single variable, design-based researchers examine multiple dependent variables in order to develop a qualitative account that links different instructional conditions with different effects on learning, all the while acknowledging the complex social context of the classroom. Researchers adopt a retrodictive view, looking for the influence of prior activity on current activity. In fact, Shavelson et al. (2003, p. 26) quite explicitly state that any documentation during the research project “serves as the basis for a retrospective analysis of what happened during the design study.”

There are other forms of research that are retrodictive as well. The following two have originated in teaching practice. The first one, in fact, is not new.

**Action Research**

Action research is concerned with possibility rather than prediction (Wadsworth, 1998). Like complex systems research, action research considers change and facilitates
an examination of the emergent nature of change. Cook (1998, p. 99), for instance, writes of “trying to describe practice without fixing it and making it static.”

The action of action research is the action that a teacher takes to disrupt the equilibrium of the teaching and learning situation. Teachers are encouraged to challenge their assumptions by acting differently from their customary way of being in the classroom. In other words, teachers who practice action research are encouraged to introduce “noise” into the system—to actively promote non-equilibrium. Then, after introducing noise, they watch what happens. They may take further actions, but notice from the perspective I am advancing here, action research is essentially retrospective. After teachers introduce noise, they watch what happens—taking a retrospective view on the effect of the introduction of the different way of operating.

**Exploratory Practice**

In Allwright’s (2003) exploratory practice, teachers identify a puzzle—something puzzling in a teaching/learning situation. (Allwright rejects the use of “problem” for its negative connotations.) Teachers reflect on the puzzle, monitor it in a focused way, and, then, take direct action to do something about it. The doing-something-about-it generates data, which allow teachers to consider the outcomes reached so far and decide what to do next. They might move on, or take new action, or even “go public,” in which case they share their experience and observations with others.

The principles of Exploratory Practice are expected to guide specific practices that are ever-evolving. These practices are aimed at helping teachers (and potentially learners too) to investigate the areas of learning and teaching they wish to explore by using familiar classroom activities as the investigative tools (Kumaravadivelu, 2006, p. 196).

Notice once again, that this approach is retrodictive. Teachers identify a puzzle, do something with it, and, then, watch what happens. What I think all four of these approaches are telling us is that for the sake of educational research and for educational practice, we need to adopt a retrodictive approach to teaching and research, not a predictive one. We need to “explain after by before” (as van Geert & Steenbeek, 2005, p. 408, put it).

In other words, we need to apply some sort of pressure or to make some sort of intervention to the system, and then watch what happens. This is what formative experiments, design-based research, action research, and exploratory practice have in common. Do something/take some action and watch what emerges (an approach reminiscent of Fanselow’s (1987) injunction to teachers to do things differently).

**Attitude of Inquiry**

It seems to me, though, that teachers, too, have to demonstrate that they are willing to participate in a new beginning with researchers. A little over a decade ago, I
participated in a debate at a closing plenary session for a TESOL Convention in Chicago. We debaters were supposed to address the question “Is teaching a science or an art?” I was assigned to defend the proposition that teaching was a science. Now, I worried a great deal about this position. It seemed that it was easier to make the case for teaching being an art. Besides, I had a formidable debate opponent in the articulate Henry Widdowson, who chose to assert the proposition that teaching was an art.

One day, while driving to work, I heard a radio interview of a scientist—an entomologist from Montana State University. The entomologist specialized in the study of beetles. He said that beetles were a very common species. The interviewer asked him how they could be so common since beetles are not all that visible to the average person. The entomologist replied, “Ah, but you have to learn to look.”

It seemed to me that this was the answer to my dilemma. Good research and good teaching both involve learning to look—educating our awareness, as Caleb Gattegno, the originator of the Silent Way teaching approach, might put it.

What I said on that occasion of the debate was:

Much is mysterious about the teaching/learning process, and those who approach it as a mystery to be solved (recognizing that some things about teaching and learning may be forever beyond explanation) will see their teaching and their research as a continuing adventure. (Larsen-Freeman 2000, p. 15)

Ultimately, therefore, if teaching and research are to have a new beginning, we each need to begin by refraining from criticizing each other. Then, researchers need to consider adopting the retrodictive views of teachers, and teachers, if they do not do so already, need to cultivate attitudes of inquiry about their teaching practice the way that researchers do. We all need to develop the habit of mind of retrospective reflectivity. And we need to be passionate enough about what we do to risk sharing with others our understandings and our retrospective explanations—for these are, in fact, the only ones that we really have. After all, “The future is made, not predicted” (Wadsworth, 1998).

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