Empowering the Teacher-researcher: Adopting a Tool from Biochemist-Researcher Training

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Abstract

As teachers are probably the most invaluable source of field-based informants regarding (in)effective classroom practices, teacher-training should equip teachers with tools for classroom-based teacher-led research. More importantly, these tools should sustain trainees' research-eagerness as well as autonomous professional development beyond teacher-training courses. However, if research is not the raison d'être of teaching and with educational evaluators criticising small-scale teacher-friendly research findings for their non-generalisablility, how can teacher-educators instil their trainees with the research spirit? Here, I suggest that teacher-trainers examine a simple tool used to train biochemistry graduate students towards autonomous scientific research: The extensive reading of journal articles. It is in fact the simplicity of this suggestion which makes it worthy of consideration. Quantitative data is used to demonstrate that educators and scientists rely on dimensionally different sources of knowledge, which may influence how trainees of these disciplines come to envision research do-ability. I share why article-reading during my graduate school biochemistry training helped us perceive research as something do-able, facilitating the information-gathering process, developing our ability to critically evaluate research findings. If the educational establishment wishes to delineate the "good education puzzle", teachers must acquire these skills and gain the research confidence necessary for disseminating small-scale but high quality research findings, thus making public their knowledge, beliefs and practice.

Introduction

After fifteen plus years at the biochemistry laboratory bench, quietly performing well-controlled experiments with laboratory rats, I was, of course, unprepared for non-controllable English language learners in the lively language laboratory. If EFL learners, classrooms and contexts are idiosyncratic and not controllable, can good practice be defined through research and can classroom-based research be scientific? If *science* is defined as "knowledge attained through study or practice" (Webster's New Collegiate Dictionary, 1981), then the answer is yes. And as a science, all aspects of foreign language (FL) learning and teaching deserves to be researched. However, not through the traditional positivistic vision of science as "something that may be studied or learned like systematized knowledge" (Webster's) but through *post*-positivistic approaches which value non-generalisable and non-quantifiable, yet invaluable and transferable insights from *teacher knowledge*. Unlike knowledge sought from traditional scientific research, teachers' *beliefs*, *craft-knowledge* and *ways of knowing* are far from "systematized" and "systematizable." However, few would argue that the researching teacher is probably the most important researcher within the educational establishment, with direct access to "field-data" regarding both effective and ineffective FL teaching and learning.

FL research is probably at the forefront of implementing post-positivistic research (see Gao et al., 2001), with the merits of qualitative research discussed a decade ago in *TESOL Quarterly* (see for example, Davis, 1995; Lazaraton, 1995). Almost 15 years ago, Richards (1987) prompted TESOL teacher-educators to instil reflective practice in their trainees, and nowadays "teacher-reflection" is common practice in FL teacher-training programs (Farrell 1999, 2001, 2003; Ponte, 2002). In fact, post-positivistic approaches such as action research, reflective narrative inquiry or case-studies are now frequently used in teacher training and professional development programs (Freeman, 2002; Christenson et al., 2002; Pavlenko, 2001; Reichelt 2000; Block, 1998; Olshtain and Kupferberg, 1998; Feldman 1996) with journals such as *Educational Action Research* and *Qualitative Research in Education* dedicated to promoting such these new scholarships.

Despite this, successful FLT colleagues often appear quite intimidated about making their craft knowledge public: When asked why they don't share their successful practices or insights on (in)effective EFL practice, a common answer is, "Oh, I don't have time to write a book" or simply "Where?" Although the primary beneficiary of the reflection-research practice is undoubtedly the teacher, unpublished knowledge deprives the educational establishment of an invaluable trove of teacher-knowledge. Unfortunately, the entire research process actually appear just too overwhelming for teachers and, despite trainers' attempts to sensitise teachers to the *research act,* it never becomes an intricate component of a teacher's professional baggage (Liou, 2001; Ginns et al., 2001; Rainey, 2000). Research, the livelihood of biochemists, is certainly not what teachers are paid to do, but who is better positioned to provide us classroom-based learning/teaching "data", if not teachers? Successful teacher-training should help trainees understand that the research act is *do-able*.

In this contribution, I would like to share a tool from my graduate school training as a biochemist which, not only familiarized biochemist-trainees with the research cycle, but, more importantly, empowered us with the understanding that research is a very do-able professional necessity. This is the regular reading and collective critique of published journal *articles*. At first glance, this suggestion may seem too simplistic but I would argue that *that* is why it is worthy of consideration. While article-reading is already a part of some teacher-training programs (e.g., Counsell et al., 2000) I would like to elaborate on the systemic benefits this medium has in shaping a lifelong researching biochemist (Part II) and suggest some preparatory steps for the successful transposition of this quantitative-scientist training onto teacher-training (Part III) as education, being a more qualitative science, is governed by different principles. In fact, Part-I introduces quantitative data which demonstrates how scientists and educators seek dimensionally different sources of knowledge, journal articles versus books, respectively. As this preference may influence how respective trainees come to envision the grandness of *research*, teacher-educators wishing to potentiate the research spirit in their trainees might find the simple biochemist-researcher training tool of systematic article-reading useful.

I. The dimension of research: A difference between humanistic and scientific training.

The first assignment for any biochemist-aspirant is the reading of a list of published *articles* of their field. While some on the list may be review articles, few would be chapters from books and rare would be the assigned reading of a book. Why do science mentors direct their trainees to journal articles rather than books? Although I have no direct answer to that, a hypothesis may be forwarded from the empirical data shown in figure 1 which demonstrates that authors of teacher-education textbooks prefer to reference *books* while authors of science textbooks clearly favour *articles*. Of the randomly chosen textbooks, the books:article preference of education textbook scholars was from 36 to 68 times higher than that of the science textbook authors (see Table I). The data clearly supports the hypothesis that the humanities and the sciences *train* their followers to seek information from *dimensionally different* sources: books versus journal articles, respectively.

Figure 1. Preferred citation by authors of textbooks in the qualitative and quantitatively oriented disciplines, education and science, respectively. Black: reference to books; grey: reference to journal articles. The numbers represent percentage of cited articles. Bars 1 and 2 are the values obtained for in the handbooks regarding autobiographical research techniques ((1): Roberts, *Biographical Research*, 2002; and (2) Goodson and Sikes, *Life history research in educational settings: learning from lives*, 2001), and bar 3 represents the article/book reference ratios found in *Strategies*

of Qualitative Inquiry by Denzin and Lincoln (1998); Bars 4 and 5 represent values obtained in textbooks from the fields of neuroendocrinology and neurophysiology ((4): Pfaff, *Estrogens and brain function: neural analysis of hormone-controlled mammalian reproductive behaviour*, 1980 and (5): Hille, *Ionic channels of excitable membranes*, 1984); 6 represents the article/book reference ratio of chapter on Clinical Research within the qualitative handbook *Strategies* (text 3); 7 and 8 were the references under the letters M and H in a statistics textbook for Psychology majors (Millenson and Leslie, P*rinciples of behavioural analysis*, 1979).

Table I. book:article citation ratios

Source	Ratio of books/articles cited
'Educational research' textbooks	
1	5.67
2	6.14
3	4.00
Scientific textbooks	
4	0.09
5	0.11
Within-source comparisons	
6	1.27
7	0.49
8	0.30

Sources as in figure 1.

That training shapes *preference* for dimensionally different *sources* of knowledge is reinforced by data-source 6: While most of the authors in this popular handbook on qualitative research (source 3) hail from the humanities with an overall book:article citation ratio of 4.0, that of the medically trained professionals who authored the chapter entitled *Clinical Research* within this handbook was only 1.27. Likewise the statistics textbook for a graduate level psychology class (source 7 and 8) was more book-oriented than the textbooks in neurobiology but less so than the education textbooks.

These data of what humanities and science authors prefer to *cite* do not imply that the

respective scholars do not *publish* articles or comprehensive books, respectively. However, the important implication here is that preference may shape how *trainees* of each field come to perceive how do-able knowledge-generation - i.e. research - is.

That scientists prefer articles reflects the positivistic nature of scientific research which systematically tests hypotheses using *reproducible* methods to generate reproducible data which, being *quantifiable*, becomes undeniably *objective* and thus *generalisable*. This search for generalisable "truths" obliges science to proceed in small steps. In fact, a "science puzzle" metaphor emphasizes the communality of the science project which relies on individual research endeavours to produce small pieces of the puzzle - knowledge - to complete the big picture. As the shape of each small puzzle-pieces is defined by the borders of adjacent pieces, findings either fit snugly, or, if not, research data must be rigorous enough to re-shape adjacent borders to make room for new contributions, thus the importance of numbers and statistics. Likewise, as it is easier to elbow for spaces in small shoves, science researchers proceed in small steps through manageable and numerically sound aliquots of information which is obtained, as well as disseminated, through journal articles.

Education certainly does not provide teachers with reproducible learners and all teaching/learning contexts are idiosyncratic. This in no way implies that education is not *researchable*. On the contrary, educational research requires a much more agile yet rigorous researcher. In fact, in the absence of numbers and statistics to back us, teacher-researchers must be able to tightly argue their research process, data interpretation and research results. Post-positivistic research is often characterised by dense description to objectify the results, making it possible to transfer the *understanding* obtained from one idiosyncratic context onto another (Lincoln & Guba, 1985). Books are thus often necessary to contain the vast amounts of thick description characteristic of such *traditional* qualitative post-positivistic research.

Fortunately, the new era of qualitative research has introduced small-scale research methods such as case-studies, narrative inquiry and action research, particularly suitable for teacher-led classroom research. Reflecting on educational research, Donald Schön sees these as the obvious "next step":

> The new categories of scholarly activity must take the form of action research. What else could they be? They will not consist in laboratory experimentation or statistical analysis of variance, nor will they consist only or primarily in the reflective criticism and speculation familiar to the humanities (1995, p. 31; cf. Evans 200: 406).

Many education evaluators, however, debate the quality of such small-scale educational research which is void of statistics, categorising these as "second-rate educational research . . . the findings are oftentimes neither informative nor cumulative, unlike, say research in medicine or the sciences" (Hargreaves, 1996, p. 1). According to Tooley

(1998, p. 9) "new scholarships lacked a clear focus, employed sloppy methodology and displayed partisanship."

The challenge is thus to train teachers to use teacher-friendly research tools to generate findings which, although may be void of numbers, are nonetheless focussed, clean, informative and accumulate-able towards "the puzzle" of effective FL teaching/learning. The article-reading habits used to train biochemistry graduate students may simplify this complex task.

II. Acquiring the research spirit through regular article reading.

Avid article-reading develops the professional biochemist researcher in four ways.

1. *Facilitated information-gathering*

   Equipped with the incoming reading list, a biochemistry graduate student is expected to expand their understanding of the field through the iterative process of

   - Read an article
   - Note important references (probably another journal article), find them
   - Read new article(s) and repeat

   As scientific articles usually cite other articles the knowledge building process proceeds rapidly and independently towards the delineation of a "missing piece of the puzzle" - an interesting research question.

1. *Adopting a critical stance: demystifying research*

   In graduate school, weekly seminars, during which *already* published articles were critically evaluated, formed a vital aspect of biochemistry research training. At first I questioned the logic of critiquing an article which had already survived the scrutiny of referees of the best journals: who are we to judge? In time, I realised that our ability to criticise the *exceptional* work of others informed the criteria by which we measured our own endeavours, sharpening our ability to *critically evaluate* the research methods, findings and interpretation of others and our own - would my own research survive the criticism of others? Such collaborative discussions built *research confidence* and *de-mystified* the research process. In addition, while not even the best could account for everything, they always acknowledged the gaps in their findings since, being knowledgeable of the adjacent pieces of the puzzle, these researchers adroitly integrated their work with that of others. As the idiosyncratic nature of qualitative research often raises more questions than it answers, teacher-researchers must be especially aware of how small insights support or refute the work of others and be aware of how classroom observations might pose new and relevant research questions.

1. *Encouraging small-scale information-dissemination*

   Nourished on journal articles, these became the obvious *size* our research publications from biochemistry were expected to take. When FL colleagues express that they lack the time needed to research and publish a book, I questioned whether they sought books or articles to inform their practice and, corroborating the findings of Pendry and Husbands (2000) on history teachers, my FL-colleagues limited their knowledge-source to books:

   > "Oh, I prefer books because articles are so hard to find . . . so I prefer to get books which have articles in them anyway . . . "

   > "What do you mean? Aren't articles in books?"

   Books certainly provide a good introductory base for those new to the field but provide nonetheless the authors' interpretation of information. As biochemists must fit their small findings into the big puzzle, they usually go directly to the source, doing their own interpreting. Nurtured on articles, biochemistry students also become familiar with the type of information individual journals prefer to publish. Training teachers to access articles may also eliminate some of the following concerns expressed by FL colleagues:

   > "I don't know if what I am doing is interesting!"
   > "Do you think anyone would be interested in this data?"
   > "Where can I publish this great idea I have?"

   It is unfortunate that the straightforward process of publishing biochemistry research knowledge appears so complicated for teachers, as the field of FL teaching welcomes well-researched academic as well as professional knowledge. But how would teachers know this if they have not been nurtured on articles written by colleagues in FL classrooms throughout the world? Freeman (1996) suggests that if teachers are given more opportunities to tell their stories, research and teaching "knowledge" will begin to cohere into pragmatic professional practice - "the good education puzzle".

1. *Continuous autonomous education*

   In a case-study of three teachers who constructed their professional understanding of ESL writing through the collegial sharing of experience, Sengupta and Xiao (2002) initiated their teachers with a reading list of 24 articles, 19 of which were excerpts from eight books and five journal articles from three FL teaching journals. While the experience was positive for the teachers during the study, the authors were nonetheless concerned with how the teachers would continue to refurbish their professional knowledge once the course finished. Likewise, in

discussing the efficacy of teacher-training, Hagger and McIntyre (2000) quoted Pendry (1997) to remind us that training must equip teachers with durable professional tools:

> It would seem that a major task for teacher educators is to find ways in which those individual needs and individual concerns can be addressed not just at the onset but on a continuing basis. (p. 95)

For one familiar with the article-nurturing process, the first thing I did upon becoming an EFL teacher was to seek journal articles, gathering information to guide my new professional endeavours, i.e. I was empowered to expand my professional knowledge *autonomously*. Often, the disintegration of trainer-trainee networks created during teacher-training leads to a rapid dissipation of research, as well as professional enthusiasm, acquired during training programmes (Ginns et al., 2001): " . . . very few programmes have a focus on empowering beginning teachers to take control of their own professional growth" (p. 115). While accessing articles is certainly no replacement for professional socialisation, it does equip teachers with a tool for autonomous professional development even in the absence of trainer-networks.

III. Special considerations for teacher-training through journal articles

As the *raison d'être* of teaching is not research, the primary goal of article-based teacher-training is to sensitise teachers to their researcher potential and empower them with the tools to *choose* to perform research should *they* wish to. Developing the article-reading habit in teachers will not, therefore, be the mere handing over of a reading list to teacher-trainees but should direct the ontogeny of the teacher-researcher through the following phases:

Phase I: Notion of the researching-teacher. Teachers should be made aware that *they* are an invaluable source of field-based data on good teaching/learning practices and begin considering themselves as potential researchers. Therefore, as biochemist researchers keep laboratory journals, teachers should likewise be encouraged to keep teaching journals (Woodfield & Lazarus, 1998; Shin, 2003; Miller, 2004) and begin to sharpen their skills at collecting "field data" through observations and reflections.

Phase II: Qualitative methods. As most associate research with percentages and numbers, trainees should become familiar and comfortable with notions of *qualitative* research by understanding how post-positivistic methods emerged and became recognised as a valid approach for the social sciences. Excerpts from handbooks such as *Strategies of Qualitative Inquiry* (Denzin & Lincoln, 1998) or *Qualitative data analysis: a source book of new methods* (Miles & Huberman, 1994) could be introduced for explaining how the issues of validity, credibility and utility are dealt with in the absence of numbers. In this phase, teachers should be given a general introduction to

the new teacher-friendly scholarships such as narrative inquiry, case study and action research.

Phase III: Worthiness of new scholarships. In this important phase, trainees should be sensitised to the challenges facing new scholarships, criticised for the lack of numbers and thus non-generalisability (see above) and thus of questionable "utility" (Hammersley, 2000). Bullough & Pinnegar (2001) offer some criteria:

- do the personal testimonies "ring true";
- are findings epistemologically in harmony with the reader's own experience;
- how useful or interesting are the proposed "ways of looking at things"?

For these new forms of educational research to survive scrutinization "the 'so what' question must be vigorously pressed [as] the aim of self-study research is to provoke, challenge, and illuminate rather than confirm and settle" (Bullough & Pinnegar, 2001, p 20). Mayer (2000), in questioning the place of "science" in educational research, rightly suggests that regardless of whether data is numerical or not, "what characterises research as scientific is the way that data are used to support arguments" (p 39).

Phase IV: Adopting the habit

Once introduced to the place of post-positivism in education and alerted to the issue of research quality and validity, trainees can then begin to digest research-based articles more critically. As with biochemist-training, teacher-trainees should choose the articles themselves and should those which adopt research methods that they themselves are comfortable with. Shkedi (1998) found that "research literature is not part of the typical teacher's library" (p. 595) since teachers do not envision themselves as educational researchers who they feel must be positivistically inclined while they themselves see their professional world through qualitative notions. Shkedi goes on to suggest that, " . . . exposure of teachers to qualitative research literature during the course of their pre-service and in-service training could make this literature an indispensable part of the teachers professional world, could contribute to raising their professional levels, and could reinforce their status as professionals." Counsell et al. (2000) provided ten criteria by which *educational research*-based reports should be chosen for teacher-training programmes. Although the emphasis was not on the use of *journal* articles *per se*, the underlying purpose of the ten criteria echo why journal articles are chosen to train biochemistry graduate students: Research-based knowledge shapes a professional who, equipped with the lexis of the discipline, can critically evaluate the theories, practices, opinions and beliefs of the field to formulate and sustain their own opinions and define the needs and issues of their own circumscribed context. As in the training of professional biochemists, these authors recognise that only research-articulate trainees will be truly professionally active:

> Thus the cycle of practice-related reflection on others' professional
> knowledge construction is complete . . . Trainees need to learn a new

professional language, precisely so that they can challenge it in an informed way. (p. 480)

In addition, Counsell et al. (2000) emphasised the value of using articles written by *teachers*:

It is essential that trainees always build on research reading with further articles *written by teachers* who have understood and implemented the original work. They need to see how *teachers of history* have used and transformed a particular construct (p. 489: italics in original text).

Conclusions

Researching teachers are invaluable informants of effective and ineffective teaching practices. However, unlike biochemists, "research" is not necessarily on teachers' agendas, nor should it be as effective teachers may not be good researchers and prime researchers are not necessarily good teachers. Nonetheless, if training imparts teachers with the understanding that knowledge-generation, i.e. research, is *do-able*, teachers' voices may emerge to direct practice through teacher-knowledge. For the *research act* to become a more integral part of teachers' professional fabric, training should thus empower teachers with research confidence, introducing teachers to teacher-friendly research tools such as action research, narrative inquiry and case studies. This, however, leads to the second challenge: As these new scholarships are small-scale qualitative studies which offer understanding of idiosyncratic contexts, educational evaluators often question their validity and worthiness. How then, can teacher-training sustain a lifelong research spirit?

The simple solution I offer comes from my training as a biochemist and is the process whereby knowledge is founded on the systematic reading of research journal articles. Some considerations for adapting the article-reading habit of biochemists to the qualitative arena of education are given, beginning with the sensitisation of trainees to the challenges facing small-scale teacher-led qualitative research to the collaborative discussions of articles selected by trainees themselves. Encouraged to habitually read articles written by teachers who adopt research methods to study classroom contexts that trainees can identify with, trainees will gain a tool for lifelong autonomous professional development. As biochemists learn that they are members of the international scientific community, so too should teachers see themselves as members of the international professional community. With classroom research demystified and perceived as *do-able*, field-based teacher-researchers may begin to contribute to the "effective-foreign-language-learning-puzzle" transforming *teacher knowledge* into a form of *science* defined as "knowledge attained through study or practice" (Webster's).

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