New Science Education Researchers in Dialogue:
Impressions of our Field

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Abstract

Dialogue forms an important tool for two early career researchers concerned with science education and making sense of what they see as driving forces in research. Tensions between theory and practice, induction of the individual into educational research cultures, issues of equity, and the purposes and pitfalls of educational research become the structure of a reflective dialogue. The process of meta-reflection hurtles the authors into a better understanding of their current positions in relation to science education and thereby becomes an empowering way for the authors to begin to gain insight and understanding into their place(s) in the research community.

> Knowledge emerges only through invention and re-invention, through the restless, impatient, continuing, hopeful inquiry human beings pursue in the world, with the world, and with each other. Freire (1970, p.72)

Introduction

This paper is a collaborative reflection piece by two doctoral students on their experiences, thus far, in becoming qualitative science education researchers. It is intended to elucidate our experiences concerning the act of research, the theorizing of research, the space of research, and the individual in research. We have organized these different but overlapping concepts under the subheadings: Researcher as Identity; Research within the Academy; Exploring the Tools of the Trade; Writing the Self - Writing the Collective; and Meta-Reflections on Dialogue, Collaboration, and Power.

We came to the idea of co-writing a paper on research methodology having both encountered specific personal challenges with research process and theory; and while we discovered similarities in our struggles, we also found meaning in sharing conflicts and concerns. What began as casual conversations evolved into more meaningful dialogue as we wrestled with larger ideas and concerns and encountered other researchers in practice at the annual conference of the *Federal Association of Research in Science Education* (*FARSE*). Dialogue then became our method of coming to know what we discuss herein. At the outset of our discussions, what became apparent was the

unique context we shared as educational researchers in the sub-field of science education. In a very real sense, we found ourselves 'sandwiched' between research perspectives, such as post-structuralism and postmodernism and a more traditional positivistic research culture of science and science education as outlined by Cobern (1994). Employing dialogue in regards to the contradictions and tensions arising from these divergent approaches to research revealed areas of commonality, but it also revealed areas of difference regarding issues of social justice, relating theory to practice, and fundamental questions of epistemology. This co-written article is an attempt to make sense of the complex relationships between the initial research experiences, ideas, and methodologies to which we have been exposed, both formally and informally.

Researcher as Identity

We recognize that the concept of identity is a contested one. Is identity something that an individual or group "is," or is it the way an individual or group has been constituted, from the outside, in reflection of the other, or at intersections of subjectivities, or moments of being? How do we come to know ourselves as researchers? For the purposes of this paper, we accept a fluid conception of identity as researchers entering a process of enculturation into research communities, and at the same time attempting to 'actively' take up particular stances in research.

> Erin: I am a first-year doctoral student with an undergraduate degree in Science, a Bachelor of Education, and a Master's of Education. I initially felt a disjunction between the ideas presented in my undergraduate studies and what I began to explore in my Master's studies, but eventually I found a way to fuse ideas of social justice and equity studies with science education through the lens of using scientific literacy for social action. I really feel like I have found my research, career, and passions after a long exploration.
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> Jesse: Like Erin, I also have a science background and am a first-year doctoral student. As a teacher, I met harsh resistance when trying to infuse more post-structural and 'postmodern' conceptions of science and science education in my practice. These epistemic conflicts resulted not only in my alienation from colleagues I respected, but also from close friends.
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> Erin: Before I could articulate the source, I found myself thinking and speaking from a post-modern voice, asking questions, such as "Whose knowledge is being counted?", "What is the purpose of this research?" and "What is my role in asking this question?" I came to see that the formal education I had received up to a point had been one-sided and exclusive, and I found myself questioning how that was possible, and what I might do to change that inequity.
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> Jesse: What makes me angry is the way discourses of truth, objectivity, and essentialization work to promote inequity and make banal certain oppressive formations of power. Exposure of the situated nature of truth through critical, historical, and post-structural research approaches has driven my studies so far.

The relationship between knowledge and science to politics, culture, society, and economy is impossibly complex (Foucault, 1975, as cited in Rabinow, 1984, p. 51) and therefore this is precisely where more research should focus. Therefore, science education researchers must contend with the tensions between rationalist/realist approaches to knowledge versus more constructivist, situated, and cultural approaches. Science has purported to be neutral when it is not, and it has been implicated in producing and perpetuating numerous inequalities (see, for example, Harding, 2006). Particularly in our capacity as educators, we must always consider the politicized dimensions that pertain to what we teach, the ways we interact with students, and what values we perpetuate and challenge.

> Erin: I met Jesse on the way to our first class in Research Methodologies. We had heard about each other from our shared supervisor. One of the first things he said to me was, "You must have read all of Hodson", which caught me off guard. It made me think that, so early, I was being defined by my emerging research interests and my supervisor's work.
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> Jesse: For me, trying to connect with Erin meant using the institutional signals and ideas that mark our shared space. For better or for worse, the appeal to 'Hodson,' a retired professor of science education from the University of Toronto, whom none of us has met or read in any deep way, significantly defined the beginning of our relationship as colleagues.

By evoking the name "Hodson" (i.e. 1999), a proponent of more critical and multicultural views on the nature of science and scientific literacy, we began to stake out a space for our understanding of each other as researchers. According to Cobern (1994), science education research, like other research areas, has undergone a transformation

away from quantitative and positivistic approaches. However, due to the historically powerful structures that are in place, such as journal editors, funding bodies, and conference committees, research may still be pulled between traditional approaches, and within qualitative research where we would like to go with our research. This concern is not only pressing from a theoretical perspective, but pragmatically as well. As doctoral students, we are currently making choices about where to invest our time and energy.

The theoretical grounding one uses, the referenced arguments one makes, the epistemology one supports, all defines who that person is to people in the research community. These basic aspects of the research process seem overtly political and may affect the rest of our careers. Questions then arise, such as: "Do we (want to) exemplify a cause-effect (the use of dependent and independent variables) approach to data analysis?", "With whom do we align our research priorities?", "Who and what do we read?", "How do we get funding and who will fund us?" In short, we are concerned with our identities as researchers. In order to not reproduce the violence, injustice, and inequity we want to address and change, methodologies must be reflective of our social justice or critical theory frameworks.

Research within the Academy

Erin: You and I are both former teachers, science teachers, even. Do you see yourself doing research in the field with science teachers?

Jesse: Emphatically no.

Erin: Why is that?

Jesse: It's not that I won't, but I am wary of research that is too practical or focused on technicalities of teaching. I find that I like more theoretical research better, such as the history of science education. I think that almost all the "how" questions we ask are contingent on the "why" questions. My aim seems to be that science educators not be overly concerned about what the best way to portray and do science is, but that we become aware of the many socially constructed ways to portray and do science, which can change if we need/want them to.

Erin: I like that you are thinking that way. On the other hand, I want to "get my hands dirty in the trenches," and work with teachers who are negotiating a complex curriculum in a complex social situation. I want to see where the gaps are for teachers and help them to fill them in. I sort of wish I had someone doing that for me when I was a teacher, but now I may have the opportunity to affect change for many teachers, which will trickle down to many more students. I think that is why I am drawn to action research.

At the *FARSE* conference, we were both aware of the tensions between more poststructuralist schools of thought and their positivist counterparts. A positivist culture, often signified by large scale quantitative studies, seemed to dominate the conference even within strands that seem to more often delineate along more critical approaches to education research. For Erin, one question that arose at the conference was, "How could quantitative research address issues of equity in science education, as they pertain to specific contexts?" For Jesse, a pertinent question was: "How could good scholarship about the nature of science in science education proceed through quantification?" It was not so much our mutual excitement that led us to begin talking intimately about research and methodology, but disillusionment. From this negative standpoint we began to talk about what matters most to us as researchers, and what we saw as barriers to meaningful research. Other people were eventually drawn into our conversations, such as Dr. Michael Bowen, a professor of science education entering a sabbatical year at the time of the conference. Michael commented that as young researchers, part of our job is to know why the field of research is the way it is (Bowen, personal communication, March 23, 2010). He was referring to understanding the control mechanisms and power structures in place that funnel the research outcomes, such as funding bodies, academic genealogies, and governance politics. Foley and Valenzuela (2005) similarly stress that, "senior scholars who control the machinery of academic production and promotion maintain a tight grip on the conventions of social scientific writing" (p. 224).

Jesse: After the first day at *FARSE* I found myself disillusioned and questioning why I was there at all. However during the second day, something happened. After one particular presentation, which seemed to me a useless quantification of teachers' views about science, I asked a difficult question to the team of researchers. I remember it went something like: "Regarding the nature of science, do you not find it problematic to work with a view of science that is so limited?" What followed was silence, except for one who took it upon herself to mediate this excruciatingly awkward moment and refocus the question to something like: "Does not the nature of science mean different things to different people?" Once the ice was broken a meaningful

discussion ensued, and afterwards, I was able to meet up with the researcher who supported the essence of my question. Before that same session ended, another researcher sitting beside me slipped me a note as she left, stating that she had the same frustrations (but felt intimidated to speak up). From discomfort and disappointment came the discovery of like minded people.

Erin: I had been to *FARSE* before, and it was the first place where I had found a critical pedagogy community within science education, within one of the conference strands. I was really struck by a sense of artificiality and the separation of ideas and actions; theory and embodiment in other conference strands. For example, the theme for the following year's conference, highlighting 'Issues of Sustainability,' is being held at a grand resort hotel in Florida, likely built on swamp-land, with an incredible carbon footprint. I find it hard to reconcile these gross differences between the message and the medium. And this can be projected to any element of research, without critical engagement every step along the way. I am trying to navigate, in a sense, my personal value system within the juggernaut of the research enterprise.

Exploring the Tools of the Trade

Erin and Jesse took a qualitative research methodologies course as a requirement for their program. Topics ranged from situating the research within qualitative methodologies, how to analyse and interpret data, and the technicalities of data collection. Since the initiation of our intimate dialogues about research, we have examined, and rethought, many more aspects of qualitative research than appears here.

Erin: I find observation to be a challenging exercise. In the past, I had co-observed with a fellow researcher, and we were able to collaborate on the "reality" we chose to record from that observation. As well, in the past, my experience had been in the role of participant-as-observer, as part of an action research project. This meant that I was able to help facilitate some of the activities that were happening in a classroom or a research group. I found that that role matched my identity as a researcher, coming out of the teaching profession, as someone who is used to working with people, and helping to enable them through moments of challenge. When we were asked to work in the role of observer-as-participant, I felt confined, both personally and professionally. The scenario felt artificial to me. It was as if I was asking the teacher and the students to ignore my presence in the room, and thus was putting energy into being unobtrusive, and assessing where it was appropriate to participate, which took efforts away from being focused on actually observing. I found it hard to capture the nuances of the classroom and my research participants, given the richness of activity happening there.

Jesse: To me, interviewing seemed similar to observation in that messy texts emerged, yet there was something much more agreeable about the technique. For a class assignment, I ended up, after several flat refusals, interviewing a fellow Ph.D. student from Cambodia, B. In the transcript of the interview I found the makings of a virtual literary text, practically fictional in a sense, only jointly created. Interviewing did not give me the permission to write or observe whatever my situated self wanted. I was in dialogue. After I had read the transcript of my interview I discovered something rather surprising. I was intricately woven throughout the text. Recognizing myself in the interview allowed me to construct my own literary, far-from objective interpretation of the text. Below is one of the poems that came to me upon reflection of the interview, the interviewee providing the images and I the fiction. In the end, the text stands on its own as a representation of B's lived experience of moving from Cambodia to Toronto, and also one Ontario native's entirely situated interpretation of such an experience:

> Zhom Lia Lia (Goodbye)
> Generations measured in months
> A bomb fell through mine
> Splintering the table tops of mother-father
> In a dream world with cracked roofs
> Dear friends hang on the walls
> Of girl justice and silly peace.

Erin: For me, the interview represents a particular space and moment that is created between the interviewer and the interviewee. There is an intimacy that is created between two complicit people in the act of bringing forth a voice and collective language. I struggle through the interview process to contain my own politics from interrupting or influencing the responses of the interviewee. I have also experienced alliance building through

interviews for the same type of sharing that can take place. I find that I can get better collaboration with the interviewee when I expose part of myself, and cross some of the objectification barriers between the two roles within the complex social situation. As the interview context gets messier, inter-meshing the roles in knowledge production, the richness of the data often deepens, but requires a greater contextual analysis on the other end. I found solace in Alvesson in 2002 who clearly recognizes the messiness inherent to postmodernist interviewing.

With regard to the various frameworks for qualitative research methodologies outlined by Denzin and Lincoln (2005), how do we ensure which of these could be incorporated into science education research? Denzin's (2004) engagement with Richard's (1998) idea of the "vital text" articulates the essence of our tension as new science education researchers: "A vital text is not boring. It grips the reader and the writer. Many qualitative research texts are boring. Writers have been taught to write in a particular style that takes the 'omniscient voice of science, the view from everywhere'" (Richardson, p. 347, as cited in Denzin, p. 453; our emphasis in italics). Similar to Denzin's (2004) juxtaposition of the voice of science against the postmodern sensibility, Erin and Jesse feel caught in an interstitial space between divergent cultures. There is a dilemma expressed in Richardson's reflection, in that in our endeavour to write vital text in science education research, we are caught in the bind of objective "reality" of what science is (omniscient voice) and our attempts to deconstruct popular assumptions about the understandings of the knowledge production of science. Most pertinent for science educators is Foucault's (1980) famous contention that discourse shapes what is said to be true and that this 'truth' often maintained under the guise of common sense or 'scientific fact.' Again we want to ask: Whose truth? Whom do the facts serve? It is becoming increasingly apparent that these questions cannot be answered by isolating them from specific contexts and ourselves as researchers.

Writing the Self — Writing the Collective

Like the work of Foley and Valenzuela (2005) we have endeavoured to talk about qualitative research collaboratively despite our differences in perspectives, and we agree that there are in fact many ways to be collaborative. Furthermore, as science nerds, we entertain the idea that if we were to go back in time to the first moment of collaboration and start the process again, the results would mostly likely be very different. Such an idea comes from Stephen Jay Gould's (1989) hypothesizing that chance has much to do with the way life has evolved on earth. Specifically, that "any replay of life's tape would lead evolution down a pathway radically different from the road actually taken" (p. 51). In this manner, collaboration, the emergence, and the synthesis of ideas from two or more infinitely complex people or situations could potentially explode into trillions of possible permutations. That is not to say that the process, once carried out, is without coherence, but rather should be seen as one variant amongst a plethora of possibilities.

Our two perspectives of the relationship of researcher to theory, or researcher to methodology, while not entirely exclusive to either one of us, are actually quite different and propel our research interests in different ways. In this sense, we both support the idea of bricolage, and are ready to ask what Berry and Kincheloe (2004) call the bricoleur's impudent question: "Who said research has to be done this way?" (p. 4). In recognizing the tension between theory and practice, we found that the process and outcome of autoethnography is highly effective as a methodology. Autoethnography embodies the postmodern idea that there must be an ongoing revisitation by the researcher between the enactment of the research and the ideas behind the research, in order to come to the most cohesive blend of the personal, social and political (Wall, 2006). For us, autoethnography allowed us to explore ourselves as individuals as well as ourselves as a collective, as we imagined and engaged with different identities.

As we continued to meet, we utilized new techniques of collaborative writing. Literally, we were continually engaged in an organic heuristic for collaboration. These methods were not necessarily mutually exclusive as, for example, we would sometimes shift our form of writing collaboratively. We developed what Barab and Roth (2006) would argue is an affordance network, for our collaborations, either in person or virtually held "dynamic sociocultural configurations that [took] on particular shape as a result of material, social, political, economic, cultural, historical, and even personal factors but always in relation to particular functions" (p. 4). For instance, we would shape the form of our dialogical engagement around our time constraints and our personal obligations, with children, or health; we created the working document in a way that allowed each of us to contribute to any given moment or space, editing our self or each other as we went.

At the beginning, using a collective narrative voice seemed to be the most practical technique of writing the text. It meant that while one person was typing, the other person was reading what was written, discussing, and (dis)agreeing. In this way, we came up with a collective voice that was sanctioned by both of us as authors. However, unlike our previous conversations about qualitative research and writing about it, this way of writing did not really allow for the twists and turns taken in our oral conversations. Writing in a linear, conventional format is certainly not the same as open dialogue. The writing was slow, stunted by the strangeness of the other's word choice, and subjective position to research. A question that needs to be asked about such a collective voice is: Who is this collective person? Can the collective voice become one that develops into a more articulate and interpersonal voice of its constituents over time or through a prolonged collaborative process?

With the second method of writing, we wrote the collective voice for each other; one person typed while the other person spoke. We took turns doing this, with a few rotations, which meant that the majority of the ideas that were expressed at that time for our collective voice could have been attributed to either one or both of us. Through this we retained the independent spaces for Erin's and Jesse's voices. This represented a significant change from a more strict collective voice employed at the beginning our collaboration, as agreement was not needed in order for a thought to be expressed. The person who was typing was in the interesting (and dubious) position of being both the transcriber and the arbiter, because he or she could decide if particular ideas were attributable to a specific person or shared by both. Moreover, while the speaker initiated the flow of ideas, the transcriber controlled the language used to frame the meaning and flow of these ideas. A limitation we still faced was the difficulty of being the transcriber who was charged with listening, processing, and then having to represent ideas in written form. There was potential to lose meaning in the gaps between these actions.

We capitalized on the availability of Skype™, online free voice communication software, as well as online collaboration tools for co-constructing documents. This method of writing was appealing because we both had equal control over a shared space and we could simultaneously alter the document and see one another's additions or edits. Formatting changes were easily approved by the other as one could just verbally propose a change to the other using the Skype tool. Building the document became much easier, and after our initial online meeting, we continued in this way to co-write. Traditional ideas of essay writing and formats were now fused with the dialogue of both oral conversation and instant messenger (IM) chatting.

The last major development in the way we wrote this paper involved a kind of virtual incorporation of method two, writing each other, but with two keyboards for literal co-authorship, intertwining our voices and words into one paragraph or sentence. In other words, there were two screens, two cursors, two writers, and one document. In this way, one person could not only negotiate the common voice in the text, but had the power to make changes if they so wanted. Such a refinement to our method of writing helped to break down the power differential associated with who had the final arbitrary power to write and formulate ideas with language.

Meta-Reflections on Dialogue, Collaboration, and Power

In *Pedagogy of the Oppressed*, Paulo Freire (1970), asserts human beings ideally should be moving towards 'humanization.' This happens when human beings engage in authentic praxis through critical dialogue with others - where dialogue is no more a tactic but a way of knowing. Praxis that employs dialogue, to Freire, is more humanizing and liberatory as compared to the praxis of the dominant-elite who do not employ dialogue. According to Freire, the very act of naming things in the world does not come about in isolation but in an 'encounter' that comes through dialogue. It is this Freirian spirit of dialogue that we exercise throughout the paper and in the interactions that have/will come out of the collaborative process. It should be noted that we have not engaged and valued dialogue simply for the sake of conversation, on the contrary it has been employed precisely to better understand an object of study; in this case, qualitative research, self in research, and science education.

We found when dialoguing orally that ideas were readily there, free-flowing and comprehensible, but that producing a written text was sluggish and more difficult, which speaks to the possible need of alternative media for our network, such as a podcast or a video. Media that recognizes the performative nature of our discourse creates a text out of action(s) and could allow for a greater richness of the moment. In this medium of the written essay, we are following the modern convention of essay writing, prominent in journals, because we want to reach fellow researchers, and essay writing is essentially the legitimated form of communication within the Academy.

We recognize that we have not addressed other modes of disempowerment and privilege. For example, Erin and Jesse self-identify as white and heterosexual. However, Erin identifies as female and Jesse identifies as male. To push our critical reflection, a myriad of other hierarchies and oppressions need to be uncovered and confronted. For example, in our oral dialoguing process, and in the writing process, how do the dimensions and performances of gender play out in the co-constructed text? Are there moments when Erin's voice is tacitly subsumed within a dominant masculine narrative? Furthermore, are we aware that the language (what could be said to be language of the global north) we use in the paper itself assumes a privileged right to speak?

Co-writing about research has allowed us to cultivate our own relationships with qualitative research in several ways. Through engaging in dialogue, as opposed to a monologue, new meanings and unique ways of articulating ideas about research have emerged. It has also helped us each to solidify our understandings of qualitative research and science education, as well as poke holes in tenuous beliefs. We have learned that we can think about and modify the technical methods we used to write collaboratively along with our employment of online communication tools.

Moving forward together, both of us are picking away at new concerns, such as the political relationships between the sciences and social sciences/humanities within the academy. However, we are also still absorbed in seemingly infinite number of gaps left behind in our conversations about research (see Bazzul and Sperling, 2012). As ideas become more intertwined and co-articulated, we have even more to contemplate as we move forward and join the slightly-less-nebulous blob called qualitative research. Erin looks forward to getting messy with the methodologies to a point where her research work will organically embrace the connection between theoretical frameworks, methodologies, and analysis; adapting her current knowledge to create something new. Jesse hopes to employ many methodologies and conceptual approaches, in the way of the bricoleur, so that he may challenge and find new ways to think about science and science education. We both look forward to continuing the dialogue that we began here.

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