SCIENCE EDUCATION AT THE CROSSROADS

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Abstract

Science education seeks to change society, but does little to produce change in itself. Our initial effort into changing ourselves and our discipline resulted in *Science Education at the Crossroads*. This conference brought together stakeholders in science education to present their problems, rather than research results, and discuss methods of addressing these. In this paper, we describe this conference, its development, and its future.

Introduction

As the previous century came to a close and the present one began, science education made great strides to propose goals for "all Americans" and suggest that our citizenry must attain a level of scientific literacy in order to build a society that is truly democratic and equitable (AAAS, 1990; AAAS, 1993; NRC, 1995). Many modes exist for imagining how this transformation of our society can take place, but all involve large-scale change for each individual learner (Posner & Strike, 1982; Driver et al., 1994). We adamantly agree that such change is necessary within individuals as they learn, and in order to create such changes the entire system of science education must be reconsidered.

Generally, this sentiment is agreed upon by individuals within our community. We all will consider how it may be possible to change an individual's thinking; we will consider how to effect a change in a teacher's teaching philosophy; we will consider how we could change a classroom setting; we will ponder how policy or the greater "system" could be reworked to manifest improved outcomes. We consider all the possibilities, except for one: We forgot to consider ourselves.

In our own "science teaching methods" courses, we chastise students for using a *PowerPoint* presentation as a science "lesson." We advocate interaction in classrooms and

among peers. We push our students to discover and construct knowledge in new ways. And yet, when we ourselves get together in a research conference setting, the normal mode is to talk to one another for fixed intervals of time in the medium of a poster or a flashy piece of software. Some questions are asked, we defend our methodology, and the next presenter takes the stage. If we are fortunate, someone asks us more about our work after the presentation, and the interaction lasts an extra five minutes.

We posit that we are ironically trying to create a solution to the problem of national science literacy when we ourselves are part of this problem. We "present," but we do not create new avenues of research when we are sharing a rare opportunity to gather with colleagues from around the world. As individuals, we are great teachers and researchers, no doubt. But, as a collective, we do a shoddy job of advancing science education. We could use a bit of conceptual change ourselves, as the year 2061 is coming along sooner than we might think.

At annual science education conferences, the two of us (and often others) have frequently wondered what we, the big "we" of our discipline, were really getting out of listening to each other's presentations, reading each other's papers, and sharing in a plenary address or two every year. It often seemed that the best, most productive and most energizing interactions we experienced at a national conference took place at a hotel bar or during dinner or over coffee. A few people with a few beginnings of an idea could change the world, if only they kept figuring it out over that cup of coffee. On the other hand, we'd never heard of anyone changing the world after experiencing a *PowerPoint* slide.

This isn't to say that there isn't value in the traditional dissemination of research in science education; however, we still felt as though there was something missing. And, so, we talked about this over the period of a couple of years in hotel bars, during dinner, or over coffee.

And, as often is the case when the two of us talk for a while, something eventually happens. In our case, it was the creation of an altogether new conference, *Science Education at the Crossroads*. What we document here is the description of what we did, how it turned out, and where we believe it may be headed in the future. At the heart of all of this, we want to expose the fact that we never once really knew what it was that we were doing. This, we believe, should be some inspiration for others who wish to enact their own version of change.

We begin by reflecting upon what it is that we, as science education faculty and researchers, do in order to call ourselves professionals and to grow in this arena.

Professional Growth

The professional development provided to teachers compared with that supplied to professors differs in many ways. First, professional development for teachers is imposed from the outside, often couched within a reform effort such as the implementation of a new educational program (e.g., Davis, 2003); professional development for professors is almost exclusively self-initiated. Second, external research teams tend to publish reports about teachers' professional development (van Driel, Douwe & Verloop, 2001) while professional development of professors often takes the form of self reports (e.g., Cochran-Smith, Albert, Dimattia, Freedman, Jackson, Mooney, Neisler, Peck, & Zollers, 1999). Finally, while there are models for supporting professional development of teachers (e.g., Loucks-Horsley, Love, Stiles, Mundry & Hewson, 2003; Norma, Golian, & Hooker, 2005) there is very little available about formal mechanisms for supporting professors' ongoing professional growth. In summary, professional development of teachers is typically mandated and based upon some formal model (everything from one-shot workshops to teacher study groups) and described to others from an outsider's

perspective; meanwhile, professional development of professors seems to not be mandated, structured, or even disseminated to a wider audience.

It came as no surprise that the major textbook publishers have stepped into the area of professional development of teachers, creating whole new divisions focused upon professional development (Hoff, 2002). The forms of professional development, even those that exploit educational technology, continue to emphasize workshop models and leading to graduate credit if not advanced degrees. In contrast, professional development for professors by and large continues in the form of occasion-based situations in which presenting one's research, hearing about the research of others, and perhaps participating in a mini-course are viewed as the way to expand one's professional knowledge. This occurs within the context of a time-honored forum: the professional conference.

The functions and value of the professional conference is open not only to deliberation but also seems ripe for parody. For those who have attended more than just a handful of professional conferences, the narrative by David Lodge may sound more like an actual account rather than the fiction within which this account occurs:

> "The modern conference resembles the pilgrimage of medieval times in that it allows the participants to indulge themselves in all the pleasures and diversions of travel while appearing to be austerely bent on self-improvement. To be sure, there are certain penitential exercises to be performed — the presentation of a paper, perhaps, and certainly listening to the papers of others. But with this excuse you journey to new and interesting places, meet new and interesting people, eat drink and make merry in their company every evening; and yet, at the end of it all, return with an enhanced reputation for seriousness of mind" (Lodge, 1985, p. 4).

As accurate as this depiction might seem, we feel it insufficiently acknowledges the community dimensions of a conference. Indeed, the notion of a community of learners, learning organizations, and thinking systematically is a rich topic of ongoing discussions within education

as well as the business world (Senge, 1994, 200). While we acknowledge the diverse meaning associated with "community" (Grossman, Wineburg, & Woolworth, 2001) we contend that the professional development can and does occur within a community of peers. Just as within several emerging hard sciences where chaos promotes novel interpretive frameworks, the notion of a community of learners bears very similar markers: dynamic, non-linear, and complex, features which Urry (2004) uses in his examinations of "small worlds" such as represented within professional conferences.

Professional conferences become necessary components of the networks that constitute a professional development community. In order to maintain one's membership within such a community, individuals must sustain a certain burden in which they must travel to a meeting site. Urry (2004) claims, "there are less formally prescribed social obligations that often involve strong normative expectations of presence ***and*** of attention. Such mobility burdens involve seeing "the other" face-to-face" (p. 118). To us this implies there may not be a substitute to the conference as an opportunity to sustain one's professional development. The challenge seems to reside within the norm of "presence ***and*** attention" in which a professor must not only attend in a physical sense but to also attend in an intellectual (if not moral) sense.

Some have raised legitimate concerns about the environmental load created through the physical act of traveling great distances to attend a conference (e.g., Høyer & Næss, 2001). However, counterbalancing such stewardship issues is the need for professionals to come together, at the same time and location, in order to nurture the community that sustains their professional development. Highly interactive technologies notwithstanding, it is likely that direct human contact is a cultural, if not genetically hard-wired, aspect of community viability: "Social life thus involves intermittent, rich, face-to-face co-presence where trust is an accomplishment of

those present. Such co-presence facilitates the otherwise extensive weak ties often sustained across significant distances" (Urry, 2004, p. 120). Consequently, if professional development of professors is to occur and if we align ourselves with the precepts of social constructivist theories of meaning making (Wertsch, 1991), then we may be obligated to preserve the practice of professional meetings. What remains open to modification is what occurs in preparation for, during, and following those events. The only constraints are the limits of our collective imaginations and ambitions.

Finding the Crossroads

An equally compelling instigator for change in our practice has been the lack of coordination between various stakeholders in science education. Although a great number of researchers in the field attend research conferences (e.g., NARST), and a great number of science teachers attend teaching conferences (e.g., NSTA) our feeling was that it was the exception, rather than the norm, for members of these two groups to meet on common ground. Further, many other stakeholders in science education, such as state and district level personnel, represent another camp that may or may not coordinate efforts with other camps. To be fair, we are sure that there are many great examples of researchers and teachers and policy makers coordinating their efforts, yet we had yet to see examples of this occurring in any systematic manner. If we are to expect an interaction between all of the variety of stakeholders in science education, can we simply expect the interaction to take place on its own, or must there be an explicit method to facilitate such interaction?

This current state of affairs in which teachers, researchers, and policy makers operate and develop their ideas in separate arenas is not necessarily a bad thing. To be sure, there are

research related issues that can be presented at a research conference and teaching specific issues to be tossed about at a teaching conference. However, the landscape for science education has changed enough in recent decades that our status quo may not only keep us from advancing our discipline and practice, but may in fact cause us to fall short. This is our fear for several reasons.

First, reform efforts at the national level are just that: national. It is easy for the individual to see "change" or "reform" as an issue that must be dealt with at a larger level than the individual. This is a call to the individual for inaction, rather than an inspiration for change or reform. Even state and district level programs for invigorating science education can be viewed as something that the individual teacher is disconnected from and has little control over or interaction with. Second, federal legislation, such as "No Child Left Behind," may have important consequences for the shaping of science education. Such consequences could easily contradict reform efforts or even research findings. Individuals who care deeply about the landscape of science education may feel powerless regarding how to help shape it, especially if they see themselves as only a single member of a national organization, or only a single teacher within a sea of district personnel. Finally, we should always be attentive to the growth of all members of the science education community, both researchers and teachers. In order to create a community that has the vision to shape our own landscape, we must find a means to bring a variety of stakeholders together. This should be done in a fashion that not only works to improve our colleagues, but also ourselves.

The question, then, is how to instigate and coordinate an effort in which multiple groups of science education specialists can present to each other and find solutions to various problems. At the same time we have had to consider our own contention that the professional development of professors requires a preservation of some kind of professional meeting that is both inspiring

for the senses and productive for practice. Uniting these parallel aims, in our view, should be an orientation and attitude created within the conference. "[In order for professionals] to accomplish good work consistently, they must acquire a special orientation, a commitment to use their mastery to fulfill a mission that goes beyond the self. It is the pursuit of a mission that inspires passion" (Damon, Colby, Bronk & Ehrlich, 2005, p. 28). We desired to create a social venue to support individual and group missions and subsequent passions towards improving science education.

One place to look for direction for reforming the manner in which we do things are our own set of reform standards for science education. After all, the "typical classroom" that one might envision prior to some kind of innovative reform would look very similar to the rooms in which we present our research to one another. At the front would be a lecturer, delivering in a poised and precise manner and set of bulleted points on a chalkboard/overhead/projector. Forward facing and sitting while taking notes would be a class/audience. At the end of the presentation there may be, time permitting, an allotted time for questions. The information presented would be regarding completed research, disseminating what has become known.

Reform minded individuals might be horrified by this kind of a presentation if they were observing a student teacher in a classroom. But, this scenario may be the exact expectation at a traditional research conference. We can imagine, though, taking the components of "Effective Teaching and Learning" from *Project 2061* (AAAS, 1990, pp. 197-207) that many of us would advocate for our classrooms, and imagine what these could look like in a professional conference. Some of these components include:

- Start With Questions
- Engage Students Actively

- Concentrate on the Collection and Use of Evidence
- Provide Historical Perspectives
- Insist on Clear Expression
- Use a Team Approach
- Do Not Separate Knowing From Finding Out
- Welcome Curiosity
- Reward Creativity
- Encourage a Spirit of Healthy Questioning
- Avoid Dogmatism
- Promote Aesthetic Responses
- Build on Success
- Emphasize Group Learning

The challenge we imagined for ourselves was to create a meeting in which multiple audiences were equally encouraged to participate, have their ideas validated, and their problems acknowledged. Moreover, we imagined that we could take tenets like those suggested above for reforming science education and apply them to our own disciplinary ways. What if, instead of presenting our finished research, we instead proposed new questions? What if, instead of presenting our results as individuals or individual research groups, we worked together with colleagues on new directions? What could we do to foster a spirit of new, creative thinking? How do we not simply report to one another, but appeal to each others' senses of aesthetics, curiosity, and wonder? We could imagine that all of this could take many different forms with any of a variety of details, but at a foundational level its conception lay in a mix of our simple imagination and ambition to make science education reform extend beyond the classroom and

into the practice of how research, practice, and policy intersect.

Science Education At The Crossroads

What our imagination and ambition produced was the 2005 meeting of *Science Education at the Crossroads* (see http://conferences.uconn.edu/crossroads). As described by the conference website:

> **Science Education at the Crossroads** is a national conference to be held at the University of Connecticut October 9-11, 2005. The purpose of this conference is to bring together stakeholders in science education to assess progress in science teaching and learning over the past decades and established areas where renewed attention should be invested.
>
> The "crossroads" metaphor is used to signify the intersection of pathways: educational research, curriculum design, policymaking, classroom practices, assessment initiatives, and so on. The most pressing crossroad is the pending extension of NCLB to encompass science – the latest example of policy intersecting with science education. This conference will include formal presentations by nationally recognized science educators as well as small group work sessions in which those participants with similarly aligned research and policy concerns collaborate to establish fresh lines of inquiry and new means for shaping decision-making.

Our first task as coordinators was to find a way by which all attendees would be active and involved at this crossroads, while at the same time trying to maintain an atmosphere where all productive discussion was welcomed. It was important to us that a wide variety of issues and voices could be heard. This kind of thinking is what led to our call for papers:

> Everyone who attends the Crossroads Conference must make a presentation. If you wish to be a part of this venture, then you will need to submit a paper proposal to us by Friday, August 19, 2005. Your final paper will appear in the Proceedings which will be posted to our website. As a result, others can preview your paper before arriving at the conference. This process will promote two types of mental preparation: clarifying your own thoughts along with becoming aware of other attendees' thinking.
>
> Typically professional conference presentations emphasize end-products in the form of completed research. However, this conference is decidedly different. Rather than having people share work they have finished, our intent is to create an

> environment wherein conversations emphasize improving science education. In short, presentations are to deliberately seek input, recommendations and suggestions from others in attendance. Our vision is that each attendee will be a source of expertise on at least one topic as well as engage in advice-seeking on another topic. Here is how we would like for you to represent those two sides in your proposal.
>
> What would you consider to be one of the "successes" in science education over the past few decades? Describe one aspect of science education, especially one with which you have considerable experience, that you would hold up as evidence of a success. We envision successes as including innovative research methodologies, important theoretical perspectives, powerful organizational structures, or any of a host of other tools that have played a role in improving science education.
>
> In contrast, what is it that "vexes" you about some aspect of science education and what information or approaches do you seek to help to resolve this vexation? This is your opportunity to solicit input from others about a challenge you feel needs to be resolved so you can become more effective in your role within science education. The expectation is for others at the conference to supply you with resources and recommendations to resolve this vexation. The issue you identify should represent a practical concern for you and one for which you think others might provide guidance.

These papers were limited to 1500 words, and were all reviewed and commented upon by each of us. This was, in our view, the beginning of the discussion process. Our comments were sent back to each author, along with a draft of the overall formatting of the paper for the proceedings. Authors were then asked to make final edits and send electronic copies back to us three weeks before the conference was to begin. By doing this, we were able to assemble all contributions and create a proceedings that individuals could read (on the web site) before the conference began. Additionally, hard copies of the proceedings were available to all participants upon arrival at the conference. (The table of contents for these proceedings is shown in Appendix A; and all proceedings are still available on the conference website.)

The conference itself (see Appendix B for the program) was centered about "incubator sessions." Multiple incubator sessions were run in parallel so that attendees were required to choose between different vexations to attend to during a given time period, but this allowed for

small group interactions. In each session, individuals were scheduled to present their vexations in a conversational format, with one caveat: These conversations were moderated with an individual trained in counseling psychology. It turned out that graduate students in such a program are eager to try out their skills, and it seemed that their moderating abilities could help us greatly. Their role was to allow the presenter to speak his or her vexation to a small group for a set amount of time (a few minutes) without any interruption from the group. Then, a small amount of time was dedicated for clarifying questions. After that, the presenter of the vexation was required to remain silent, allowing them the opportunity to soak in comments and suggestions from the rest of the participants in the session. After this part of the session, the moderator allowed for some debriefing before allowing time for the next vexation in the session.

Interwoven throughout the conference were plenary sessions. These took the form of traditional keynote addresses, but also panel discussions. Our two panel discussions focused a bit upon the historical aspects of science education research by considering the process of publication, and a bit upon how individuals working as researchers, district-level administrators, and classroom teachers interrelate. Although these episodes had appeal to many of the participants and useful dialogue, we found is that our two other plenary sessions affected participants the most profoundly (based on written conference evaluations and other comments).

The first of these was the presentation of a teacher-turned-poet, Taylor Mali (see http://www.taylormali.com and Appendix C for a sample of Taylor's work). Taylor's poetry addressed many issues, but continually came back to teaching, students, and his mission for introducing and inspiring others to the call of the teaching profession. Although re-describing the atmosphere produced by a performance poet requires something much more dynamic than this paper, we can safely say that there was an inspirational note to this performance. We cannot

give adequate explanation, but it seemed that we all delighted in having something that was beyond informative and interacted with us at a deeper level. Many participants reflected that they realized an intrinsic need in us to have something that makes us see the world and our practice differently than we are already used to.

The other plenary session that especially impacted participants (again, based upon their evaluations) was a presentation by Dr. David Moss of the University of Connecticut. David's topic, "scholar activism," was one which he had thought about deeply, but had never before had an arena to present it. (It was for this very reason that we had invited him to contribute this presentation.) This theme, though introduced on the last day, struck a chord with participants due to the manner in which in described their roles at the conference. Seeing ourselves as not simply teachers, researchers, etc., but as "activists" was an empowering notion. Indeed, this very concept has continued to fuel our own ambitions for *Crossroads,* as described in the last section.

Evaluation

A full evaluation of *Crossroads* was based upon the questionnaire displayed in Appendix D. Additionally, we spent a large amount of our time as conference organizers to assess the needs of participants (before and after the conference) through informal conversations. At the conference itself, a "town hall meeting" was used to debrief the conference and openly discuss the future.

Although we cannot pretend to have a thorough, controlled study of the needs addressed by and the long term impacts of *Crossroads*, we have been encouraged by much of the positive response to the conference in evaluation forms. These include:

- Perhaps the most enduring evidence of success was my personal sensation of genuine intellectual engagement. During my vexation and while participating in others', I was

deeply immersed in ways that reminded me of the better seminars I had as a doctoral student.

- Very satisfied but not everything resolved; Interested what happens next
- Exceeded my expectations. The meeting didn't feel rushed or too drawn out. Had ample opportunity to air my thoughts - of course giving the talk on activism helped - I wonder if others felt they had enough time…
- This was one of the best things I have done in terms of my profession. I have been preaching to my 8th grade students as well as my pre-service teachers about 'critical thinking vs. rote memorization for years, and I have been saying "those in business and universities are screaming that there are not enough critical thinkers out there. It was so refreshing to hear others who too share that same vexation.
- My experiences revealed to me the need for a more direct link between research and practice - the strengthening of the translator role. This in turn, has given me a purpose for continuing my own studies: I want to be a part of that link to help bridge these two worlds. Thank you! You have made an incredible impact on me - I feel as though I have reached an important turning point.

Although we cannot point to any negatively themed responses to the concept of *Crossroads* from any participant, it was interesting how many different ideas are suggested for its future.

These include suggestions such as:

- Graduate students being facilitators; broader representation
- Square dancing or folk dancing
- A day following of on-sight writing - or a day to look for finding opportunities… something to get the "ball rolling."
- You may want to expand the program into the next round to include (a few, selected) reports of completed studies or on-going studies. Either/both would provide a great opportunity to go beyond the hypothetical and philosophical. This is not a criticism, but rather a suggestion for the next phase!
- Inviting classroom teachers not associated (directly) with a university. I enjoyed this, and feel it would positively impact a teacher's involvement and relationship with research.
- Talk about successes also - arrange sessions with topics that are similar so people can discuss possible new lines to pursue in research from successes.
- I hope we expand it a bit to include people who do science -- the balance between science and education is very important -- we need the views of real scientists. A presentation (key-note) from some science geek who also things about education. That might be good. We know science education very well (too well?) -- we need more science.

What is encouraging to us in all of these comments is the sense that there *is* a future (or futures) to *Crossroads*. The individuals participating in this social experiment of ours were not

only willing to take on this endeavor, but willing to suggest how it could continue to move forward. And so we will.

The Future Of Crossroads?

An empowering notion of activism is what we, the instigators of *Crossroads*, have been left with. Moved by the poetry of Taylor, inspired by the vision of David, and (most importantly) impressed with the contributions and interactions of those attending *Crossroads*, we are looking to the future. We have learned many important lessons already. To begin with, we found that doing something like putting together a conference was not as daunting as we had often imagined it. Apparently, activism is easier than it might seem. Second, the interaction of a variety of stakeholders did create new ideas and enthusiasm that attendees commented they do not receive at larger, more product oriented (in the form of research) conferences. Many reflected that this filled a professional void for them. Finally, we found that there was a desire for this format of a conference to continue.

What we are currently asking ourselves is how to implement this. Is a conference valuable because it takes a specific form, or because it is inherently different? Is activism something that we can direct, or is it only something that can be determined by individuals? How do we maintain a conversational conference, yet at the same time welcome larger numbers of participants? We are actively trying to address these and other questions as we look forward to another *Crossroads* in the fall of 2006.

Our second iteration of *Crossroads* will take place in Ogden, UT; September 28-30, 2006. Information regarding this second event can be found on http://conferences.weber.edu/crossroads as it continues to develop. For now, our plans are to

allow the format of the conference to remain largely the same, with one explicit change of gears. Although the "success" versus "vexation" of contributions offered by participants was a good start for us, we also want to continue to push ourselves forward towards reform. That is, we want to be at the crossroads looking for new directions to turn, rather than simply looking backwards down the road that got us here. Our next call for papers, then, will suggest of format of "vexation" versus "venture." Participants will offer their problems and questions for discussion in the form of this vexation, but they will also be asked to consider what they should do to solve a problem or pursue a question. This "venture" will be a first step towards a new direction that participants can bring to the table to discuss with colleagues from across the country, from other disciplines, and from other arenas within science education.

This next step and revised format is our own new "venture," and we look forward to seeing how it turns out next fall.

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APPENDIX A: Conference Proceedings Table of Contents

Proposals Accepted For Discussion at Science Education at the Crossroads
University of Connecticut
October 9-11, 2005

APPENDIX B: Conference Program

Sunday, October 9	
12:00pm – 6:00pm	Shuttles from Bradley Airport
3:00pm – 7:00pm	Conference Registration
5:30pm–7:00pm	Welcome Reception
7:00pm – 8:30pm	Keynote Session **Dr. Ted Sergi** CEO & President, Connecticut Center for Science & Exploration
Monday, October 10	
8:00am – 9:00am	Continental Breakfast
9:00am – 9:15am	Orientation to the Incubator Forums
9:15am – 10:00am	Incubator Forum A
10:00am – 10:30am	Break
10:30am – 11:45am	Science Education Research: Voices from Journals. Panel + Q&A
11:45am – noon	Debriefing of Incubator Forum Structure
noon – 1:15pm	Lunch
1:15pm – 2:30pm	Incubator Forum B
2:45pm – 4:00pm	Incubator Forum C
4:00pm – 5:30pm	Campus Tours: Labs, Barns, Carillon, etc.
5:30pm – 7:00pm	Dinner on your own
7:00pm – 8:30pm	Keynote Presentation **Taylor Mali** *Performance Poet and Teacher Advocate*
Tuesday, October 11	
8:00am – 9:00am	Continental Breakfast
9:00am – 10:15am	Keynote Presentation by **David Moss**
10:15am – 10:45am	Break
10:45am – noon	Incubator Forum D
noon – 1:30pm	Lunch
1:30pm – 2:30pm	Stakeholder Perspectives about Science Education. Panel + Q&A
2:30pm – 3:30pm	Contemplative Break
3:30pm – 5:30pm	Town Hall Meeting
5:30 and beyond	Dinner on your own
Wednesday, October 12	
8:00am – 9:00am	Breakfast on your own
9:00am – 1:00pm	Shuttles to Bradley Airport

Appendix C: A poetic sample

Undivided Attention
by Taylor Mali
www.taylormali.com

A grand piano wrapped in quilted pads by movers,
tied up with canvas straps - like classical music's
birthday gift to the insane -
is gently nudged without its legs
out an eighth-floor window on 62nd street.

It dangles in April air from the neck of the movers' crane,
Chopin-shiny black lacquer squares
and dirty white crisscross patterns hanging like the second-to-last
note of a concerto played on the edge of the seat,
the edge of tears, the edge of eight stories up going over, and
I'm trying to teach math in the building across the street.

Who can teach when there are such lessons to be learned?
All the greatest common factors are delivered by
long-necked cranes and flatbed trucks
or come through everything, even air.
Like snow.

See, snow falls for the first time every year, and every year
my students rush to the window
as if snow were more interesting than math,
which, of course, it is.

So please.

Let me teach like a Steinway,
spinning slowly in April air,
so almost-falling, so hinderingly
dangling from the neck of the movers' crane.
So on the edge of losing everything.

Let me teach like the first snow, falling.

Appendix D: Evaluation form

As you make your way home, please spend a few moments to share with us your thoughts about *Crossroads* and its future. We appreciate your candidness and wisdom. When completed, please return this form by mailing it in the enclosed envelope:

IMMEDIATE AND SPECIFIC ISSUES

Consider your impressions of *Science Education at the Crossroads* as you answer the following:

1. What needs, issues and expectations brought you to *Crossroads* in the first place?

2. To what extent did *Crossroads* meet your expectations and fulfill your needs, issues, and expectations?

3. In what ways did *Crossroads* fall short of your expectations or perhaps miss important opportunities?

4. Please provide any other comments about your experience at *Crossroads* this year.

FUTURE AND BROADER CONCERNS

Now that we've implemented this "experiment" we wonder how we might proceed from here.

5. What features of *Crossroads* would you recommend being preserved or adapted for next time?

6. What novel and innovative components of a future *Crossroads* conference would you suggest that we consider?

7. What recommendations could you supply about the TIMING of *Crossroads*. When should a future Crossroads occur in terms of the time of year? What are your thoughts about *Crossroads'* frequency: annually, biennially, etc.?

8. What suggestion could you provide about the LOCATION of *Crossroads*. Where should we consider holding a future *Crossroads* (feel free to be specific, e.g.: Park City, Utah)? What kind of place should be considered (e.g., a culturally-rich setting, an isolated retreat, etc.) and what sorts of places should we deliberately avoid?

9. What insights could you provide about the PARTICIPANTS at *Crossroads*. How could we encourage the participation of others who might also benefit from this event? Who would you recommend (in general) be involved in *Crossroads*: veteran teachers, novice researchers, policy-makers, etc.?