Performing the Sign: Mathematics, democracy and the arts

Dalene M. Swanson, Special Editor
Universities of British Columbia and Alberta

"woman teaching geometry to monks" http://commons.wikimedia.org/wiki/Image:Woman_teaching_geometry.jpg

INTRODUCTION

In the contradiction lies the hope

Bertolt Brecht

Performing the call

In my original international call for papers for a special edition of Educational Insights, I wrote the following:

The title, Performing the Sign: mathematics, democracy and the arts, is intended to incite a range of responses to
themes created by the constitutive relationship between mathematics, democracy and the arts, broadly defined. The multiple significations and interpretations produced through the performance of the words in the title in relationship to each other and to discourses in the social domain open up and signal possibilities of engagement with critical theoretical ideas and innovative textual productions.

Our intention is to publish articles that readers may find evocative and provocative. It is hoped that these articles will elicit novel perspectives, thereby contributing to understandings within mathematics education, curriculum studies, cultural studies, and/or arts-based or infused inquiry, teaching and learning. The articles may employ ideas and tenets from semiotic theory, performance theory, critical theory, contemporary socio-cultural and political theories, to name a few, and may be interdisciplinary or integrated in approach. Possible focus areas and questions could be:

How might mathematics, with its “high symbolic content,” act as a discourse of power, oppression and/or possibility, and what might the role of the arts be(come) in providing a democratic face to mathematics? What assumptions might be troubled about mathematics, its relationship, or not, to democracy, and the alienation of the arts through the dominance of the mathematical sciences in schools and society? How might technology perpetuate or disrupt the status quo on this?

What role might the arts have in contesting and addressing some of the undemocratic and hegemonic mathematics education practices in schools, or might some of the advocacies of the arts in this role be simplistic? What significations and performances of the ‘body’ and/or of ‘place’ have metaphorical or literal significance for mathematics, science and arts practices in various contexts?

How might mathematics act as an over-determined signifier of how we have chosen to construct and live in society? How might that shape the way we value the arts, and how does this relate to our understandings or significations of democracy in Western society, or the global context, for example?

What historical or contemporary role does religion or spirituality play in the multiple relationships between mathematics, democracy and the arts? How might ecological or poetic ways of knowing provide insights into some of these relationships? What critical philosophical issues arise in the conceptual landscape of these various rationalities, particularly with regard to education and educational research?

These are only a very few suggestions intended to invite dialogue and provide some ideas that may be addressed in the articles, but there is scope to attend to many others. The editors at Educational Insights welcome novel articles that are thought-provoking, critical, and cutting-edge in theoretical approach and design.

I could never have imagined what a wonderful array of fascinating, unique, innovative, thought-provoking and timely contributions would show up in my computer’s inbox when I sent out the call for the special issue. I had kept the call purposefully open-ended. I was more than delighted when I realized the call had been taken up with enthusiasm and passionate commitment to an enlarged and complicated conversation. It was a conversation that delved deeply and creatively into the difficult interplay between mathematics, democracy and the arts. Ten articles in particular stood out. They did so in the brilliance with which they took on the themes and took up the challenges suggested in my call, and went much further. The arguments, ideas, associations and perspectives were diverse and refreshing, keeping in play the complexities, criticalities and multiplicities of thinking and feeling that such a focus could evoke. The challenge set in motion an intertextual discursive (dis)play of ideas and performances that were open, rich, informative and demanding of attention.

By opening the curtains to the performance of possible, albeit fluid and unstable, semiotic interconnections between mathematics, democracy, and the arts, however these terms were to be constituted and interpreted, was to invite the audience into the conversation about script(s), direction of multiple plots, and the production of a play that could have a myriad of endings, or more likely, no ending at all! This did not mean an ‘anything goes’ approach, but it did not foreclose on any possibilities while engaging with critical issues and debates that influence lives, impact society, and
Bakhtin (1981) reminds us that words carry the remnants of meanings from the places they have touched, like fragments of old cloth. And, where the wind has taken them, they carry with them the grit of the places where they have diasporically lived and the discursive ways they have been performed in context. Fragments of these meanings were evoked like gossamer ghosts in their playful intertextual dances between mathematics, democracy and the arts/aesthetics; the traces and threads of which formed reticular bonds of meaning with each other. Hermeneutic, phenomenological, ecological, philosophical, political threads... Threads of threads. Other dances broke the fragile filaments, but never for long as the weaving and dancing began again.

While somewhat playful at times, the issues were embraced with a seriousness and passion for (re)imagining something bolder, better, more worthy, more wholesome, more possible for education in particular, and society in general. For we cannot be naïve about the fact that to perform the words, “mathematics, democracy, and the arts” together, to gather them together in a phrase, is to evoke critical issues of power and knowledge that have helped create a vision of a world in which is embedded great epistemic injustice, vast inequalities, and serious issues of oppression, as much as it is to pose possibilities for viable, creative alternatives. There is no neutral or objective place to hide here. These discursive performances delve into critical ontological and epistemological tensions, so that we first need to understand how each of ‘mathematics,’ ‘democracy’ and the arts’ came/is coming to be as such, to exist, to be understood.

While it is the topic of this special issue, the often fractured, often mutualistic associations between mathematics, democracy and the arts are not arbitrary. As each has interpretive impact on how we see the world, so the discursive relationships between them are invested in agency and position. On the one hand, myths, stereotypes, homogeneities, reifications, binaries, hierarchies, divisions, antagonisms, pathologies, oppressions, are inevitably (re)produced, altering identities, changing subject positions and foreclosing on particular ‘realities.’ On the other hand, via shifting contexts, hope, innovation and possibility can arise. Critically and studiously focusing on these discursive relationships, tensions and interconnections helps prize open common assumptions, reinvent new ways of engaging, foster new meanings, perform new interpretations, and address troubling concerns that negatively affect lives and limit possibilities.

Studying these relationships from multiple positions and “posthuman” perspectives helps us understand how they come to constitute and are constituted by the world, even a world that might be conceived of as pluralistic or cosmopolitan. More important, such a focus on the performative play between mathematics, democracy and the arts draws attention to how the relationships, tensions and the significations between them might serve as moments of articulation that might aid in (re)imagining other ways of being and coming to know. However, it is critical to keep questions in constant play about how these are to be affirmed and affected, as well as in the name of what and whose ethical responsibilities and commitments.

Drawing on Noel Gough’s (2006, 2009) concept of “rhizosemiosis,” a neologism derived from the geophilosophy of Gilles Deleuze and Félix Guattari, we might begin to understand how the tensions and attractions, the repulsions and ramifications of the shifting reticular relationships between mathematics, democracy and the arts operate to try to settle and define the world, or disrupt dominant conceptions of/within it, while simultaneously keeping in play their complexity. It is in this critical rhizomatic complexity and the complicatedness of their relationships that a frond of hope may be unfurled, opening up other versions of a vision of the world, and offering new potentially liberating engagements and encounters.

**Invitation into the texts**

It is my honour to invite you into the worlds of each of the contributing authors as they delineate and perform their ideas on the intersections and relationships between mathematics, democracy and the arts. They do so in novel ways in both form and design. In each case, and with differing emphasis and from
different perspectives, they do so in ways that are intentionally evocative and provocative. In each case, experiencing their texts offers delight and insight.

As an enticement, I provide hints of the fascinating paths you might walk along with the authors as you journey into their texts and share in their narratives:

Nathalie Sinclair and David Pimm in their article, *The Many and the Few: Mathematics, Democracy and the Aesthetic*, invite you to consider the aesthetics in mathematics, mathematicians’ practices, and in the classroom, as a question of taste and judgment. Drawing on the political scientist Josia Ober’s exploration of the etymologies of the term ‘democracy,’ they provide a working definition of it as ‘the capacity to do things,’ which certainly helps to facilitate their arguments. The weakest connections, in general, are those made between mathematics in particular, and democracy. These arguments are not well-oiled in the mathematics education arena, although they are beginning to become more of a focus of attention. Engagement with democracy in this field has been somewhat superficial at best, but deeper engagement is beginning to emerge. This is somewhat ironic for a subject area that has proved to be amongst the most divisive on the school curriculum, and whose social impact on societal structures and individual lives is enormous. It is therefore a great pleasure to follow David Pimm and Nathalie Sinclair’s careful attention to what they mean by democracy, which gives their arguments definite clarity and impact. It is an aesthetically beautiful and masterly written piece! In the earlier part of their essay, they pose the question: “… in what sense mathematics is or should be seen as a ‘public good’”? It is a question that could keep us pondering for a long while.

Steven Khan, in *Performing Oneself Differently: A Math aesthethician’s Responsibility*, weaves personal narrative of an assault by a group of youths to give an account of the ethics of encounter with the Other. He asks: “What if we began thinking about mathematics education starting with ethics?” And explores this question in the relationships between mathematics and art/aesthetics while probing the possibilities for creating more responsible global societies. He asks whether we might do mathematics education differently, by using what we might call a “mathemaesthethetic disposition,” one that might provide opportunities for the transformation and healing of the glocal pathologies in which mathematics and mathematics education is implicated. Just as David Pimm and Nathalie Sinclair ask if mathematics should be a ‘public good,’ so similarly does Steven Khan ask what the purposes of mathematics and mathematics education are and, drawing on the work of Emmanuel Levinas here, whether they might speak to an ethical responsibility to the Other that goes deeper and might be more personally meaningful. Be prepared to enjoy the literary beauty and feeling in Steven’s writing here! Stirring stuff indeed!

Iben Maj Christiansen, in *Using Art in Teaching Philosophy of Mathematics and why it has Nothing and Everything to do with Democracy*, engages with a personal narrative of teaching a philosophy of mathematics course at a South African university. By bringing in an art activity with which the students engage, Iben explores the emotions of students in gauging their perceptions of mathematics. She uses as a working idea of democracy, ‘perspective pluralism,’ to ask questions about student perceptions of mathematics, their personal philosophy of mathematics, and by extrapolation, their own personal philosophy of life. Her thinking takes on the broader political context of post-apartheid South Africa, asking difficult questions about the purposes of teaching mathematics, mathematics philosophy, and teaching in general. In this context, the importance of a democracy that invites and gives permission to ‘perspective pluralism’ can, for Iben, never be overrated. In the end, she asks: “Did we contribute to the rainbow nation? I do not know. I only hope.” A captivating, moving piece!

In my own article, *Genu(re)flections: mathematics, democracy and the arts*, I explore how mathematics, as a discourse of power, is implicated in neoliberal economic globalization, and in this sense its “intrinsic dissonance with democracy,” (Skovsmose and Valero’s, 2001). I delve into the performance of democracy through the performance of rhizosemiotic (Gough, 2006, 2009) relationships between and within mathematics, democracy and the arts. Drawing on Louise Richardson’s (2009) quote, and applying it more broadly to education and society, I ask whether our current dominant world view is not a form of human stupidity for forgetting what we were trying to do—to generate understandings of where we have been, where we are, where we might go, and what it might mean to be human. A
critical forum for such an exploration can be provided by the Arts (including Social Sciences & Humanities). This is in consideration of the many manifestations of science in the social domain. Often caught up in the pull of technoscientific/industrial utilitarianism operationalized through economic globalization, much science in this structural condition more often than not contributes to failed democracy. The mass devotional genuflecting to mathematics, technology and the sciences’ promise to foster economic development, societal ‘advancement’ and to ‘save the world’ comes at a price. The contradictions, ruptures, falsities of logic and failed promises demand an examination of the dominant vision, the meta-narratives, the ideologies to which we pay homage. Inverting the power relations, a more reflexive science is advocated. The Arts promise a supportive critical forum for this work and an opportunity to reclaim the public, the political, and the human, leached by neoliberalism. It is here that we may thoughtfully and creatively generate pluralist (posthuman) understandings of what it might mean to be human; human understandings that include witnessing and remembering, despite the complicatedness and tenuousness of such endeavours. The article ends with a narrative of my involvement with a collaborative integrated Visual Art-Mathematics project, a Sierpinski installation, similar to the one Darren and Wayne describe in their article. It has a surprising and evocative embodied outcome. Understandings generated from this experience speak to critical relationships and everyday social injustice. The narrative experience draws together the political and the epistemological in exemplifying the need for critical public fora on education and society.

Peter Appelbaum, in *Against Sense & Representation: Researchers as Undetectives*, uses Cantor’s proof that the cardinality (number of elements in a set) of the power set (set of all subsets) of a set is greater than the original set. Cantor uses a *reductio ad absurdum* argument. Such an argument proves a contradiction by starting out with the assumption that something is true that the mathematician believes to be false and therefore tries to convince her/his audience that it is indeed false through the contradiction produced: a somewhat odd logic that has been used for centuries. Peter moves from this oddity to the fantasy and (non) fiction of a fascinating collage of stories—ones that encompass mathematics, mathematicians, students, politicians, representations, and communities. They are stories in which he “finds solace in post-modern ‘undetectives,’ whose mysteries are not quite solved in the sense of a resolution grounded in truth.” In the (non-)end, his stories are of deception, intrigue, parody and misrepresentation. They tell much about so many things—art, mathematics, schools, curriculum work, life. Masterfully-written, his article will delight and intrigue you too!

In Susan Gerofsky’s article, *Performance Mathematics and Democracy*, she deploys arguments for a pedagogy of school mathematics based on the concept of participatory performance art for social change. Drawing on theories of technology and cultural / historical change, and that of space and liminality grounded in embodiment and performance, Susan offers examples of initiatives in developing a pedagogy of school mathematics as democratic performance art. Amongst other suggestions, she advocates for a move from the visual, which has dominated mathematics pedagogy for decades, to include more of the auditory and musical. Her work is timely and insightful in offering an alternate vision of school mathematics pedagogy that pulls us out of both traditionalist and (some of the more stale) progressive ruts. Drawing on her vast experience in media, theatre, movement, the creative arts, and secondary school and university teaching, Susan’s democratic vision and ethical consciousness of sustainable living and justice-oriented learning opens up possibilities for innovation and a greater promise for living and learning well. I have no doubt that her article will be thoroughly appreciated and enjoyed!

Elizabeth de Freitas, in *Making mathematics public: Aesthetics as the distribution of the sensible*, takes a bold step into the philosophy of Jacques Rancière and his political reading of aesthetics as a way of rethinking the relationship between aesthetics and mathematics. Aesthetics regulatory role in constituting “the sensible” in the public domain has another side to it. Art that has troubled the rules of representation has also disturbed what is taken to be commonly held as a shared public reality by a particular community. Elizabeth de Freitas takes an unusual approach. She uses this thinking to try to make sense of the semiotic ‘written-ness’ of mathematics and the important role of surfaces in doing mathematics. This moves beyond the historical Euclidean space of mathematics to the tactile textu(r)al gritty reality of writing and doing mathematics by focusing on the sign-making forms that operate on surfaces. As one reads her work, art and mathematics find approximations, and one feels and appreciates the surfaces touched—philosophical, conceptual, and material surfaces, in the signing and
significations of mathematics and art making. Quite the cerebral-aesthetic experience! Elizabeth de Freitas traces this thinking in relation to historical participation in mathematics practices and the subject positions produced. A truly novel approach!

In their article, *On the Primordiality and Potesis of a Complexified Performance*, Darren Stanley and Wayne Tousignant draw on Complexity Science to capture the “patterns of patterns” that might bring into focus understandings of the complex phenomenological meanings that emerge from a collaborative art–mathematics project done with university students. The collaborators describe the design and construction of a mathematical sculpture created for a fire sculpture festival. The Sierpinski tetrahedron structure is full of the joyously aesthetic principles of self-similarity and fractal geometrical delight. They use it to narrate and reflect back upon their own learning, conversations, and final resulting mathematical installation in (a)light of what is currently known about complex dynamical systems. The experience gives rise to considering the phenomena of the experience in terms of what may constitute democracy and what may be understood by democratic phenomena, which for Darren and Wayne are phenomena that are inherently healthy learning organizations. These are ideas that are healthily provocative! I can assure you that you will be delighted and transfixed by Darren and Wayne’s descriptions and images, and the novelty and aestheticism of their arguments!

Graham Giles offers a very unusual, densely philosophical article suggested by the novelty of his title: *Pigs, Stars, Gods, and Alain Badiou’s Mathematical Language of Being*. It requires careful reading, but is immensely stimulating and provocative. His objective is to offer some key elements of Badiou’s philosophical thought as new points of departure for the thinking of mathematics in education, and, more broadly, in education newly of being, truth and the subject—Badiou’s foremost preoccupations. One enters into glades and forests filled with dim and brightly lit lanterns of ideas, concepts and thoughts as you journey with Graham. In this article, following from the thinking of Alain Badiou, Graham develops some of the central ideas of Badiou’s mathematical (set theory) “metaontology” toward a critique of the cant of democratically authoritative concepts of the Other, Difference and Plurality. Drawing on Badiou’s incisive distinction among the “grand style” and “little style” thinking of mathematics, Graham argues that the reconstitution of philosophy via Badiou’s mathematical metaontology opens a place to consider the “possibility of possibility itself” and thus reconsider the ethical in education in ways that have implications also for politics, art, science and love. A truly magnificent, insightful read!

Patti Pente and Gladys Sterenberg invite us into an engaging visual, philosophical, aesthetic experience with *Signs of Zero*. The artistic is imbricated in the reading / seeing experience, the image and the word merge. The message is the medium, and the medium is the message. Drawing together the experience of the artist in her community and the mathematician in hers, they attend to the assumptions within the hierarchy produced in the social domain that has set up the mathematics / art binary, and that of actual experiences of mathematics and art as a contradiction. They note that, “Throughout history, mathematicians (like artists) have […] been part of the community. Interpretations of mathematicians or artists as contemporary social critics, and as participants in the creation of social imaginaries that can inform public spheres, firmly place them within community.” They play on spaces and concepts of “zero,” historical, conceptual and paradoxical, to debunk myths about mathematics and the arts, and they offer us an engaging and deeply aesthetic and imaginal experience of their experiences along the way. A delightful, evocative and sensate experience!

Margaret Walshaw’s, *The Performance of Self in the Art of Research*, offers insight into the tensions, mental-emotional negotiations and experiences in doing and living research. Her article focuses on the performance of the self as researcher, both within the ‘data gathering process’ and the construction of research reports. Drawing on understandings of ethical practice, it grapples with what it is that structures a democratic narrative experience. There is a dual objective here: one to better understand the workings of subjectivity and the intersubjective, the other to scrutinize the researcher’s ‘self.’ This necessitates an authentic delving into uncomfortable places—places beyond sociological constructs of subjectivity, discourse and power, although it includes a careful study of these as well, but to human emotions, desires and aspirations, to uncover the layers of self and selves to explore the unconscious in the way it interferes with and informs the performance of the art of research. Margaret Walshaw
provides a personal account of doing mathematics education research with young women in schools in
Australia to explicate her arguments and ideas, using the writing to explore the unconscious self. While
making an important contribution to reflexive inquiry, it is a careful, thoughtful and not-to-be-missed
reading!

The performance begins

There is a hush, anticipation in the air, the curtain sweeps aside, the first note has sounded … the
performance has begun! …

I wish to thank all the authors for their remarkable contributions, for the discussions we have engaged
in and the humanity we have shared. I wish to thank them for the excellence of their work and of the
passion with which they have embraced the objectives of the call to this special issue. In particular, I
would like to thank Lynn Fels for her ethical presence, remarkable support and unbending humanity. I
wish to thank Graham Giles for much the same: his editorial and personal support, insight and
humanity. I also thank Martin Elliott and Marshall Fels Elliott for their creative genius, wonderful
support and dedicated efforts, as well as Michael Boyce for his incredible and supportive editorial
work. Without the remarkable support of all these people, this special issue would not have been
possible.

Dedication

I dedicate this special issue to all those who have suffered under the tyranny and ignorance of our
forgetting what we were trying to do—to “generate (pluralist) understanding of where we have been,
where we are, where we might go, and what it means to be human” (Richardson, 2009).

References

U.S.A: University of Texas Press.


Gough, N. (2009). Becoming Transnational: Rhizosemiosis, Complicated Conversations, and
Curriculum Inquiry. In M. McKenzie, P. Hart, H. Bai, & B. Jickling (Eds.), Fields of Green: Restorying

Richardson, L. (2009). Vice-Chancellor Address at the November 2009 Graduation Ceremony of the

Mathematics Education with Democracy. In B. Atweh, H.Forgasz & B. Nebres (Eds.), Sociocultural
Research on Mathematics Education: An International Perspective (37-55). New Jersey: Lawrence
 Erlbaum Associates.