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ARTICLE

A Leap of Faith: Aesthetic Education in the Mathematics Education Classroom

Edward S. Wall

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We speak only for having been called, called by what there is to say, and yet we learn and hear what there is to say only in speech itself.

Jean-Louis Chrétien (2004, p. 1)

For the past four years I have hosted Lincoln Center Teaching Artists in a graduate mathematics education course I teach for elementary school teachers and elementary school pre-service teachers. I find the hosting experience enjoyable and informative and my impression, gained from comments and short written reflections, is that many of my students find it likewise. Simultaneously, I believe in the pragmatic worth of this experience. For instance, I hold that education in the aesthetic has the potential to deepen teachers' awareness of how they intend—or grasp—the world they inhabit (Greene, 1973, p. 10).

However, such a stance—as illustrated in this short vignette adapted from Maxine Greene's *Teacher as Stranger* (1973, pp. 275-276)—evokes quandaries in my own teaching:

Christina Luces, a 6th grade teacher at P.S. 192, feels called out of personal convictions and commitments to have her students take part in a Peace Moratorium, a day on which they would stay away from classes in a symbolic protest against a war. She has, nonetheless, other convictions and commitments. The particular mathematics lessons she has been teaching are important to her. She does not believe learning ought to be whimsically or foolishly interrupted and she thinks classroom activity, because it brings her in contact with her students, contributes measurably to their education. A lost day, as she sees it, might mean a setback for some of her pupils and missed learning opportunities for others. She realizes that, in addition, observing the Moratorium might suggest to her less motivated students there are more worthwhile things to do than studying and to others it might seem an excuse for time off to observe minor holidays, to celebrate World Series victories, and so on.

I, somewhat unlike Christina, teach a mathematics methods course. However, somewhat like Christina, such a course traditionally has no place or time allotted for the content of art or literature. That my students and I find such aesthetic diversions enjoyable, informative, and potentially worthwhile, does little to address their acquisition of those skills and dispositions that underlie effective mathematics teaching. As Christina, I feel discomfort in excising one day from an already essentialized curriculum. It seems disrespectful to my students' (and their future students') developing needs and implicitly trivializes the discipline of mathematics. My choosing to host a Lincoln Center Teaching Artist puts me educationally between, so to speak, a rock and a hard place.

This essay takes up “not a mute face-to-face, but the murmuring, heavy with thousands of words” (Chrétien, 2003, p. 162) of my own struggles with both the theoretical and pragmatic aspects of such tension. It proceeds in two parts. I first sketch the story of my first experience of hosting a Lincoln Center Teaching Artist, and secondly, taking this experience as indicative of other such experiences, frame it and my response somewhat more theoretically. In a sense, I am attempting to take you, the reader, and myself deeper into the stories Maxine Greene and I tell. Hence, I will be less concerned in this essay with moving to some plausible synthesis of the underlying dialectic than in exploring what such tension makes visible.

Unpacking

In all, I have chosen to host five Teaching Artists straddling aesthetic experiences from photography to storytelling. Although my interactions (and those of my students) with the artist and the work of art were, in each instance, unique, there seem to be productive commonalities. Focusing on these, I sketch, as indicative, my first such experience. The work of art featured Mozart's *Trio for Clarinet, Viola, and Piano* (1786) and was performed by a trio—consisting of the same. The Teaching Artist was a young accomplished composer who, for the purposes of this essay, I will refer to as Don. As with all my Lincoln Center experiences, this experience had four stages: planning the aesthetic experience, the enactment of those plans within a workshop, the performance^[1], and reflection.

Making Plans

Planning is exciting work. When I take some care and thought, interactions with my students become infused with a supple openness. Somehow the work I do within planning prepares me to hear and respectfully respond to student queries and concerns. Sharing a classroom with Don and Mozart, however, had the possibility of being something strange, something irrepressibly different. Nonetheless, I had made an initial commitment. Thus, with a certain amount of trepidation in response to the call of that commitment, I made my way to the Lincoln Center Institute for our planning meeting.

As I had not heard the trio perform previously, Don requested that, prior to any discussion, I take some time to listen to a tape of the trio performing Mozart's *Trio for Clarinet, Viola, and Piano*. I did so, found it pleasant, and Don and I began our planning session. Then a most amazing thing happened. Don turned to me and said (I am paraphrasing here), 'What did you think?' I answered that I had enjoyed the music. He replied, 'Did you hear the tune?' and hummed a short melody. I was astounded, as, in a sense, I wasn't aware there was a particular tune to hear. I understand that music is tuneful and have seen and can awkwardly read *sheet* music, but somehow even the possibility of confronting music in such a manner within listening had not been thinkable. Don went on to note that this piece of music was constructed around variations of that simple hummed melody.

The design of our joint lesson went quickly from there. Don would put together a session that would focus on Mozart's melody and its variations so as to help students better engage in experiencing the performance. I would put together a parallel session that would focus on some simple variation of a mathematics problem my class had taken up just prior to his visit. I'm not sure how Don felt about all this. I know he felt confident in his ability to engage my class, but he may have thought that my session would be somewhat boring or, at the best, tedious. After all, one mathematics problem seems to many to be as blandly inscrutable as another.

I, however, was elated. It was as if several pieces of a puzzle had fallen into place. Perhaps, I thought, my students might be experiencing mathematics as I had Mozart. They recognized the mathematical and were, at times, interested in my explanations and demonstrations. However, that there might be a pulsating, thundering, simple melody underlying the mathematics was somehow, for them, not thinkable. All mathematics for them was, in a sense, *sheet* mathematics. They could *read* it, but they couldn't *hear* it. Don, I think, was intrigued by my response and we corresponded via email over the next few weeks. However, my remembrance is that he somewhat resisted a comparison between his understanding and my understanding of variation.

Enactment

The day arrived. I was to do the initial session, and then Don would follow-up with his. If time remained, we would have the students do some reflection. I think my students were somewhat taken aback about the entire possibility. At a prior class session, some indicated previous experiences with a Lincoln Center Teaching Artist; others did not. Most wondered what, if anything, this had to do with teaching mathematics and one openly resented the interruption. On such notes, this class came into being. So as to put into play the notion that mathematics might somehow, as beauty^[2], *call* and be *heard*, I began with a video clip of a second-grade classroom in which the children and the teacher are examining equations of the form

$$3 + 8 = 5 + 6$$

One of the children makes the comment that this is a true equation because (and I'm paraphrasing) 'You can take three from the eight making it five and add that three to the three already there, making it six.' The teacher then turns to the class and asks them to discuss what they have heard with a partner. Suddenly you see the quiet in the room erupt into a buzz of conversation. At this point I stopped the video, and turned to my class and said rhetorically 'I wonder what they heard? What is there to hear in a piece of mathematics?' Then, amid generally blank looks, I noted that we were going to explore this question in mathematics and Don was going to explore a similar question in music.

I briefly reviewed the mathematics we had done previously^[3]:

I have pennies, nickels, and dimes in my pocket and I pull out three coins. What would be the different amounts that I could have?

and set out the first *variation*:

I have nickels, quarters, and half-dollars in my pocket and I pull out three coins. What would be the different amounts that I could have?

Students were able to complete the problem, but few seemed to have noticed that it was a *variation* of what they had done previously. We discussed their solutions, the patterns they had noticed, and ways in which this was a variation. Then I set out the second *variation*:

I have pennies, nickels, and dimes in my pocket. I pull three coins from my pocket and double the value of one coin. How many different amounts could I have?

This time a number of students seemed to be *listening* for the variation. Moreover, serendipitously, Don, in graciously taking part in the discussion, mis-heard the tune—this was not a matter of finding combinations, but a matter of arranging amounts—and, to the delight of the class, forthrightly offered an incorrect solution which the class gently corrected.

Don began his workshop. After a short introduction, the class and myself were divided into trios and asked, as a trio, to navigate the length of the room while maneuvering a balloon. Creativity and laughter blossomed as my students rose to the challenge. I listened watchfully, since what I observed and heard were important aspects of themselves that many of my students had not had the opportunity to share with me or with one another. Facilitated by Don, we then spent some time discussing the musical possibilities of trios consisting of a clarinet, viola, and piano and practicing listening to certain of those variations that we would subsequently experience in performance.

Class came up against the hour of dismissal without any real opportunities for discussion and, in anticipation of such a possibility, I handed around a short assignment in which I asked students, in essence, to compare and/or contrast, within a page, their dual experiences. This was due the week after the performance.

Listening for Real

The concert was, for me, yet another experiential unknown. It is not so much that I am unfamiliar with such performances, but I had little sense in how and what would call out to my students. However, my apprehensions were to prove groundless as several of my students expressed their delight when they were able to identify that simple tune and its variations in Mozart's *Trio for Clarinet, Viola, and Piano*.

Early on, perhaps because of that initial activity in Don's workshop, my attention was captured by the interactions among members of the trio. The players of the clarinet and viola sat, listening watchfully, across from one another and the pianist seemed to have her ear focused on both. At the end of the concert, the trio remained for some questions. After my students had asked their questions, I asked mine about their watchful listening. My remembrance is that all three smiled and then began to describe their roles in the interaction. As I listened, I wondered, as I tend to do, whether what was described, to some first approximation, might usefully represent enacted mathematics instruction. That is, teacher and students sitting watchfully and discursively across from one another with the accompaniment of mathematics sounding all around.

Ever Afterwards

A week hence, class again met and students handed in their short reflections on the dual workshops intermingled with their experience of the performance. I read them through and my memory^[4] is that, for most, comparisons between the workshops were difficult,^[5] and their focus tended to be on Don's workshop and the performance. All students expressed their enjoyment of the concert and most, their enjoyment of the workshop. Some students remained bewildered as to possible connections to mathematics or its teaching. Some expressed their appreciation for the diversion. A number noted the creativity disclosed by normally reticent classmates. And several took in, as I had, the initial strangeness of the experience and constructed within that, connections to their own teaching of mathematics.

I marked over the names and, during the next class session, taped the reflections to the class walls and asked students to read and comment using sticky notes. At the end of that class, I gave students back their reflections with the sticky notes attached. Comments from peers included praise for an individual's synthesis of the experience and expressed agreement with claims that this experience had provided valuable insights into teaching across content areas. Although students seemed to have found the overall experience useful and enjoyable, it took some significant time, and I remember wondering whether it was time worthwhile spent^[6].

Re-packing

As I re-think and tentatively inscribe aspects of these past moments—moments of *kairos* (lived time) rather than *kronos* (clock time)—I am first struck by how doubt and discomfort enter and exit my story. I find myself literally dragged into

facing the stern visage of my choices, and, unaccountably, facing in *ta kaloun* (that which calls) *ta kala* (beautiful things). I find myself called to be a stranger in that most comfortable of places, my own classroom^[7]

Second, such moments in this methods course—again ones of *kairos*—gave me an insight into my students (and they into one another) that I am often unable to gain otherwise. I find that if I take heed of these insights—that is, cultivate a watchful listening—I may be able to structure and re-structure their experiences so that reticence in the face of mathematical certainties might—as in Don’s workshop—subsequently yield to taking risks. Insensitivity to another’s mathematics explanation might subsequently give way to active listening, and shared laughter at successes or failures might subsequently bridge traditional academic and professional isolations.

Third, the view of mathematics teaching I wish to foster in my students seems to find unlikely support in Maxine Greene’s conception of aesthetic education. In *Imagination and Learning: A Reply to Kieran Egan*, Maxine Greene (1985) writes of the power of imagination in learning; imagination opens “windows in the actual and the taken-for-granted toward what might be and is not yet” (p. 171). My students and I wonder, as we tried to make sense of all this in our reflections, what such openings might look like in their mathematics classrooms and in my mathematics education classroom? What mathematical and educational explorations might be most helpful in engendering an awareness of what it might mean, in a fundamental sense, to do and teach mathematics?

Nonetheless, there is, as I have initially noted, the dark side of the dialectic. Such indulgence as mine has its price. For example:

- Mozart, at his best, seems hardly to be the stuff of elementary school mathematics. Where do such tunes fit among schoolhouse topics of counting, fractions, or multiplication and division?
- Moments allocated to a Lincoln Center Teaching Artist and/or the subsequent performance significantly detract from a carefully planned and already congested curriculum. There were indications, and continue to be, that the quality of work of some of my students was, to a degree, negatively impacted.
- Mathematics and music are, if treated respectfully, fundamentally different disciplines. I might be, for instance, far better off in addressing my immediate concerns and those of my students by carefully planning more mathematically relevant activities

I am, in a sense, faced with an ugly ditch^[8] that, cutting across the landscape of my practice, separates the pragmatics of my discipline from the possibilities of some integration with the aesthetic. On the one side are skills, knowledge, and dispositions for teaching within the elementary mathematics classroom. On the other are windows into *strangeness*, windows into themselves and the teaching of mathematics that my students, without engaging in the aesthetic, might not (and, perhaps, cannot) open otherwise.

My continuing to host Lincoln Center Teaching Artists indicates that, in some sense, I have come to terms—albeit uneasy—with my ditch. While some personal chronicling of these terms might be of interest, I have chosen instead to invite you, the reader, to accompany me in wondering, within the context I have sketched and within a more general narrative, how one might better face such a ditch. My reasons for this tack are essentially two: (1) My own coming to terms is very much a work in progress and, hence, hardly finished; and (2) a recasting of my dilemma within a sort of narrative allows, as Martha Nussbaum (1990) puts it, for “perceiving where blunt terms of ordinary speech, or of abstract theoretical discourse, are blind” (p.5).

It is important for you, dear reader, to be aware that what I attempt here is not—although there is nothing necessarily problematic about such pursuits—some careful ordering of data points or some partially dichotomous coding of teaching or learning. I am trying to illuminate rather than settle some pragmatic concerns about teaching disciplinary content through, what I know best, the art and practice of teaching mathematics. The teacher whose work I will author here is not one particular teacher, but a composite of teachers I have known, including myself, who, out of choice, find themselves, to some degree, strangers^[9] within their discipline and profession. The other part? In authoring I find my Cartesian awareness taken, in Moebius fashion^[10], outside and inside myself. These stories become narratives of past, present, and future. What is, was, and *could be*^[11]. Consider this:

Tiffany LaPointe is a 6th - grade mathematics teacher at P.S. 192. She is drawn, as a number of mathematics teachers are, to the beautiful, a beautiful that lies not only in the artistic, but in the mathematical as well. Such, however, is

not the experience of all her students. When encountering the aesthetic, their faces alight and their voices animate; not necessarily so, when encountering the mathematical.

The call of the beautiful is no minor shout, as it can reverberate within one's life. It is there in the smile of a child, in music of Mozart, or in a proposition of Euclid. Tiffany is called by all these things and more. She is called to teach mathematics. She feels, one might say, an intellectual and moral duty to her students. Wherever one may place mathematics in the continuum of the beautiful, Tiffany's students, at a minimum, depend upon her to guide them within the skills and understanding of mathematics appropriate to sixth grade. These duties for her are, however, not dolorous, but joyful.

Tiffany has been given, as I have been given, the opportunity to integrate aspects of aesthetic education within her curriculum and has accepted that call, initially with reservations, as she sees ahead to many of the benefits and drawbacks I have previously expressed. Tiffany faces her ditch, just as I face mine. So illuminating what such a facing might entail, let me sketch three imagined continuations of Tiffany's story. I can identify with the first and second of these imaginings^[12]. The last—the *teacher of faith*—as you will see, strains my inventiveness.

Problemata I

Tiffany, in my first imagining, has weighed the consequences of her actions and carefully set her priorities. I imagine that, as Maxine Greene (1973) puts it, she is "principled" (p. 277).

Art, so she thinks, in its many forms is a major human endeavor. However, it has a minor footprint in the elementary grades, and it is important, she thinks, indeed *right*, that she readdress this imbalance. Towards this end she designs a series of lesson that contextualizes the mathematics of points, lines, planes, and solids within a discussion of art that bridges the late Middle Ages and the early Renaissance.

Tiffany also thinks that the ugly guise that mathematics is often given produces an unproductive aversion. Children are intimidated rather than challenged. Stirrings of intellectual and aesthetic curiosity become transmuted into anxiety and avoidance. This, she believes, is *wrong*. Pondering on all this, Tiffany thinks it makes good sense for her to suggest to her students that they somehow re-prioritize their doing of school mathematics. They, together, might draw on their aesthetic experiences in art and music. They might intentionally take up within their doing of mathematics notions of beauty and elegance, placing the onus more on learning to move in broader mathematical horizons than on, merely, choral response to a sometimes traditional monotony.

Such a re-emphasis, as Tiffany sees it, would require that she allow each member of her class the freedom to approach the doing of mathematics as they best see fit. One child might decide to explore multiplication using the solidity of base-ten blocks; another, using the elegance of a graphical array; and still others, loving symbolic clarity and predictability, using pencil and paper and variations of the standard multiplication algorithm. Children, in a sense, will need to learn afresh as they experience and attend to the experiences of their classmates. Such a tack will, most likely, cause consternation among colleagues, school administrators, parents, and even among her students. However, for Tiffany, the overriding point is that she wants her students to understand certain mathematical principles, make clear their choices and explanations, and revise (mis)conceptions in response to their on-going experiences and those of their peers. If visitors, listening to the talk in her classroom, hear her students deliberating the reasons for and merits of a certain mathematical approach, she is gratified as they have developed a mastery new to them. If, however, they buzz from one approach to another with little discrimination and less engagement, she will feel that she has failed.

I applaud this Tiffany. I see in her thoughtful teaching and her Kantian impetuosity much that I could and do emulate. However, I am concerned. There is no guarantee that our blending of mathematics and the aesthetic will influence our students to develop as we might hope. I attempt, through a blending with the aesthetic experience, to re-structure the mathematics experiences of my students so that they will come to view the experience of mathematics in such a way that it is viewed as experience. However, some of these students may shrug off glimmerings of what it means to do and teach mathematics, and, as a default, continue to avoid, within their classrooms, the conjunction of children and mathematics. Tiffany, likewise, faces similar challenges:

Harold is a student in Tiffany's classroom. Harold is good at arithmetic. He knows his multiplication tables up to 12 times 12 and can efficiently divide four-place decimals. Whenever Harold's mother comes in for a conference, she speaks of how proud she and her husband are of Harold's mathematics ability, and how he already makes significant contributions to the operation of their small family-run grocery store.

Anika is another student in Tiffany's classroom. Anika is good at art. Her pastels plaster the walls of Tiffany's classroom and, I am told, her mother's refrigerator. Anika's art teacher, Ms. Swift, hopes to get her into water colors this school year and art classes are planned for the summer.

As I have noted, Tiffany has put together a series of mathematics lessons through which she hopes to motivate the geometric study and exploration of points, lines, planes, and solids. In her first lessons she draws on the symbolic two-dimensional art of the early Middle Ages and then launches into a discussion of points, lines, and planes. This is followed by a series of lessons in which she attempts to motivate the study of solids through notions of perspective. The first lessons appear to go well, although Harold, Anika and a few of the other students seem restless and bored. Tiffany sits down next to Harold. He turns and says, "Ms. LaPointe, when are we going to start doing some mathematics again. This art stuff is okay, but I don't need to know this. When am I ever going to use it? This is a waste of my time!"

Later that day Tiffany has a chance to talk with Anika. "Ms. LaPointe," Anika says, "I really don't like mathematics. It's so, so tasteless. This is okay, but it gets really boring when you talk about lines and points. I wish we could spend more time talking about drawing! I really liked the story about Brunelleschi's peephole!"^[13]

Do such moments of *ennui* and alienation grow, in part, out of Tiffany's and my creation, with the best of intentions, a hybrid curriculum—something that is neither *fish nor fowl*—that, rather than engage, has the potential to alienate and offend the sensibilities of certain of our students? Anika seems to sense that what is being taught is not art. Harold seems to sense that what is being taught is not mathematics. Perhaps in *our* emulsions, Tiffany and I have frustrated that student act which we most want to surface, the very *choosing* of our students. On the other hand and in part, are such moments a consequence of the natural working out of the teaching-learning process? Perhaps our students, as ourselves, are called to face the anguish of their individual *ditches*.

Problemata II

Despite the *anguish* and *alienation* of Anika and Harold, Tiffany has created a classroom where, for the most part, students are exposed to significant aesthetic experiences and learn significant mathematics. Such contextualizing of the mathematics seems *good*. Nonetheless, I have, in this first vignette, arrived at a *fork in the road* and I am reminded by Robert Frost (1920) that there are other roads that make all the difference:

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I—
I took the one less traveled by,
And that has made all the difference.

A difference that, I suggest, might have its ultimate roots in Aristotle's vision of equity rather than some averaged good.

So let me imagine another Tiffany (and this may be Tiffany I of past, present, or future), a Tiffany who somehow in her teaching has taken another path, one that takes up and into account the alienation, the nothingness, experienced by certain of her students and, I add, those of my own. I imagine she is a teacher who holds that she and her students "give meanings to [their worlds], but through action, not by well-meaning thought" (Greene, 1973, p. 280). How might this look?

Imagine Tiffany as before. She and her students have re-prioritized their doing of school mathematics. They have learned to move in broader mathematical horizons, horizons that take under account mathematical notions of beauty and elegance. In their doing of mathematics, they draw on their experiences—experiences that she separately crafts—as inquirers within the arts. As lessons and the teaching year recede into memory, Tiffany is, as before, gratified when her students thoughtfully deliberate the reasons for and merits of a certain mathematical approach. However, she now teaches with an eye on anguish and *ennui*. She does not seek to assuage such feelings or to somehow downplay them. In fact she deliberately nurtures the disquiet they entail.

Tiffany becomes a provocateur. She is, in effect, laying the groundwork for the call of *conscience*, charging each of her students and herself to re-call what their responsibility is in the mathematics of the moment. What, for instance, are they thoughtfully bringing to bear on their own possibilities, on their own choices, as doers of mathematics. Is their mathematics compelling and does it elegantly call to be tasted and touched?

As a case in point, Jamal—one of her students—while skip counting by three, notices that the sum of the digits is

divisible by three. That is, he notices that

3 is divisible by 3

9 is divisible by 3

15: $1 + 5 = 6$ is divisible by 3

6 is divisible by 3

12: $1 + 2 = 3$ is divisible by 3

18: $1 + 8 = 9$ is divisible by 3

and, as conjectures are valued in Tiffany's classroom, tentatively and triumphantly claims that

If the sum of the digits of a whole number is a multiple of three, then the number, itself, is divisible by three.

Where before Harold might have viewed such mathematics talk as irrelevant, he and other students—in effect, *conscience-stricken*—now find themselves nagged by the need for a compelling proof or its refutation. Where before Anika might have viewed such mathematics talk as insipid, she and other students—again, *conscience-stricken*—now find themselves nagged by the need for that conjecture's elegant completion.

Yudkey, participating in the success of the class as they provide a reasonable demonstration of Jamal's conjecture, feels called to personally look further into divisibility. She chooses to skip count by 7, but is daunted when she realizes that although 14 is divisible by 7, $1 + 4 = 5$, which is not divisible by 7. She does not, however, stall there, but puts aside angst and looks at 21. Here $2 + 1 = 3$ which, again, is not divisible by 7. However, in re-examining this disconfirming evidence, she notices that two times three plus one is seven, and, rechecking, she realizes, that, in the case of 14, three times one plus four is seven:

$$14: \underline{1} \times 3 + \underline{4} = 7 \quad 21: \underline{2} \times 3 + \underline{1} = 7$$

Inquiring forward to 28, she sees that $\underline{2} \times 3 + \underline{8} = 14$ and, in that moment, experiences number, much as the bud of a flower, momentarily and gently unfold.

Alain, on the other hand, in attempting a similar exploration cries out in frustration, "This is stupid." Although dismayed, Tiffany recognizes that such an "experience of nothingness" (Greene, 1973, p. 130)—an experience that occurs all too often in the upper elementary mathematics classroom and beyond—may, in part, reflect an overwhelming experience of fear and shame. Mathematics has become mystery, and answers and explanations seem of random chance or blind caprice accessible to only the talented few. Working respectfully with her students in such moments, Tiffany seeks, rather than to mollify them, to empower them, to remind them that they are, in a sense, the *authors* of their mathematical lives. They will come face to face with angst and uncertainty, with *lathos* (the hidden). They will choose how they author the aftermath.

I admire this Tiffany. I see in her thoughtful teaching and her Kierkegaardian impetuosity much that I could and do emulate. She attempts, as I attempt, to open windows into *strangeness*, windows into themselves and the doing of mathematics that her students, without engaging in the aesthetic, might not (and, perhaps, cannot) open otherwise. We are both provocateurs. I employ scholarly and professional readings, classroom discussion, and even mathematics. I utilize those aforementioned visits by a Lincoln Center Teaching Artist. These latter can be especially productive. Most of my students have an interest in the aesthetic, and, in effect, I am able to place them in the awkward position of trying to make some responsible sense of possible encounters with the aesthetic within a mathematics classroom.

I also puzzle, as Tiffany puzzles, over *ennui*, an *ennui* that often embodies in my classroom an indifference to mathematical understanding, indifference to mathematical beauty, indifference to the mathematical thinking of children. I see, as Tiffany sees, these more as protective structures that, in the face of blankness and inscrutability, are raised against fear and shame, and I attempt, as Tiffany attempts, to replace mystery by understanding. I attempt, as Tiffany attempts, to provoke a sort of mathematical *anguish*—a conscience for elegance, a conscience for completion and proof—and I deliberately provoke, as Tiffany deliberately provokes, unquiet as my students and I reconsider my students' interactions with their own students (and prospective students) and their ensuing moral and intellectual responsibilities within the teaching of mathematics (Ball & Wilson, 1996).

The Teacher of Faith

Tiffany and I have attempted to make, within our classrooms, a place for beauty and a place for aesthetic experience on our terms. We use the aesthetic experience to motivate, to entice, to provoke. It is, for us, a tool, a handmaiden to the doing of mathematics and mathematics education. Given our priorities and inclinations, this seems right, and many of our students

seem to thrive. Nonetheless, our protestations to the contrary, that ugly ditch between beauty and duty remains. Tiffany is uncomfortably aware of such duality and encourages her students to face their choices with an eye to their ditch. I do much the same. However, I have begun to wonder whether my ditch is something that I have created out of my own meaning making. Might it be possible to blend mathematics and aesthetic inquiry—for instance, art or music—so that each discipline is taken up in its integrity and simultaneously reinforces the other? I admit that this seems improbable, even paradoxical to me.

The Tiffany I will imagine here does the paradoxical. She faces her ditch and somehow manages its pragmatic dissolution. Let me, awe struck, try to imagine:

Tiffany, as before, makes the decision to give voice to the aesthetic within her mathematics classroom. This, she feels, in full recognition of her responsibilities as a teacher of mathematics, is the *right* thing for her to do. However, this Tiffany intends to dissolve her ditch. She intends, seeming in a leap of faith that all will be well, to set aside, to sacrifice, mathematics for the aesthetic. This Tiffany has her students pile their math textbooks in one set of boxes and compasses, rules, calculators and other tools for mathematics in another. She removes math posters from the blackboard and the walls and takes down the omnipresent number line running the perimeter of the ceiling. She has just asked Yudkey, Alain, and several other children to take the boxes down to the storeroom when suddenly Ms. Swift, the art teacher, enters the room, whispers in her ear, and just as suddenly exits. Tiffany turns to her students, smiles, and with their assistance, begins unpacking the boxes and restoring the classroom to order. However, it is not the same order. Unaccountably, some posters are not re-hung and some texts are placed on back shelves.

Tiffany begins her mathematics lesson. On the surface, the lesson is much like one that might be taught by either Tiffany I or Tiffany II. However, there are puzzling differences. At moments Tiffany makes a teaching move that catches me off guard, that I find puzzling and, perhaps, even absurd. There is, for example, her study of *The Benedictional of Saint Aethelwold* (Godeman, c. mid-970s), where the mathematics of points and lines and pre-Romanesque art seem to independently mirror and then unaccountably reinforce the other. I find, nonetheless, watching the responses of her students, that somehow she has, indeed, created a blend within which, for these students, mathematics and the aesthetic simultaneously stand alone and together.

As I can neither imagine myself making such a sacrifice, nor, having once made it, turning back from such a sacrifice, I find myself at a loss for words. I can well imagine a seeming reversal of roles in which mathematics becomes the handmaiden of the aesthetic, but this sacrifice of Tiffany dismays me. Such a setting aside of mathematics, and I speak from experience and observation, seriously compromises the integrity of the discipline of mathematics. Doing mathematics, while among the aesthetics experiences, is not significantly captured in a doing of art or music. Although there may be metaphorical similarities, the satisfaction of Michelangelo in crafting the statue of David in 1504 is not that of Sir Andrew Wiles in settling Fermat's Last Theorem in 1995. Further, how can Tiffany, as a principled teacher of mathematics, stick with her moral and intellectual responsibilities after resolutely giving them up for the aesthetic? The coinage of the aesthetic appears to buy little in the everyday marketplace. However, what I find most absurd is that Tiffany, in this sacrifice, wondrously, receives her intellectual and moral commitments to her students' learning of mathematics—mathematics in its disciplinary integrity—back again.

I find myself unable to follow the teaching moves of this Tiffany. The water that now sustains her runs too deep. Such concealment may well, in some Hegelian sense, speak to the impossibility of such a Tiffany. Nonetheless, there was a moment in that session with Don and Mozart when I came so close to experiencing what Tiffany blends, I could almost taste it. So let me assume that this Tiffany is a fingerpost on the way to my, at last, becoming a teacher. Then, attempting to bring about a degree of closure in these thought experiments, let me re-approach Tiffany's classroom through, in effect, the eyes of her students and four vignettes, each vignette being an example of what Tiffany's leap of faith is *not*:

Vignette 1: Imagine that Tiffany tells her students of her sacrificial decision, that she intends to pursue the aesthetic in whatever way possible, regardless of the consequences for their learning of mathematics. In fact, there is the possibility that they won't learn any mathematics at all.

However, she encourages them to face the anguish of this possibility and to keep a stiff upper lip. Her students plead with her. They tell her how much they have learned in the past and beg that she teach mathematics as usual. Imagine Tiffany's face distorting as she shouts, "Foolish children. Do you think I'm doing this for art? It is only because I'm selfish." But underneath her breath I hear her say, "Better they lose faith in me than in aesthetic inquiry."

The Tiffany of this vignette never makes a leap of faith. Religiously hardening her heart to the mathematical, she simply chooses the aesthetic. She has no hope of regaining the mathematical, no hope of dissolving the ditch. She has no hope at all.

Her students are motivated to learn mathematics, and they do participate in aesthetic inquiry. However, it is learning and participation fraught with fear and trembling. How fortunate is the mathematics teacher who does not need to employ even more terrible means to motivate her students!

Vignette 2: Imagine that, when Tiffany turns to her students and they begin unpacking the books and instruments, there is a look of anguish on her face, tears in her eyes. Her students try to comfort her, but to no avail. Imagine from this day on, although Tiffany goes through the motions, she seems to have joy neither in mathematics nor in the aesthetic. From this day on, all the vitality is leeches from her teaching as she forever regrets the risk she took.

The Tiffany of this vignette makes the leap, but finds herself unable to take any joy from the seeming dissolution of her ditch. She is haunted by the rashness of her sacrificial decision and it taints both her enjoyment of mathematics and her appreciation of the aesthetic.

Her students come to sense her torment and, although they learn mathematics and participate in aesthetic inquiry, they also express little enjoyment or appreciation. The year for each of them stretches interminably. How fortunate is the student who has not lost her mathematics teacher in this or some other way!

Vignette 3. Imagine that evening, while reflecting on the events of the day, Tiffany has second thoughts. “How could I?” she thinks, “forget my duty to my students and my discipline?” Then she thinks, “But if exploring the aesthetic is *right* and *good*, what would I do otherwise?” Imagine from that day on that Tiffany is never at peace as she is unable to reconcile her duties to mathematics and the aesthetic.

Her students, although unaware of this regret, nevertheless sense her ambivalence. Tiffany seems indecisive. One minute she is passionately involved in a discussion of the Parthenon. The next minute, apologizing for that passion and seemingly with little regard for what her students’ bring to all this, she is coldly discussing the mathematical proportions of a Doric column.

The Tiffany of this vignette makes the leap. However, from day to day she finds herself grieving that decision. She is no longer sure that giving voice to the aesthetic was right or good. She is no longer sure of her intellectual and moral duties to her discipline and to her students. She is tormented by indecision.

Her students learn mathematics and participate in aesthetic inquiry. However, they seem unsure of the value of either and, as Tiffany, hold both at arm’s length. In fact, they hold Tiffany at arm’s length. How fortunate are the teacher and students who share a love of mathematics and the aesthetic!

Vignette 4. Imagine that, when Tiffany asks Alain, Yudkey, and others to take the books to the storeroom, students hear harshness in her voice and see desperation in her eyes. Tiffany’s students never talk about what they have seen or heard, but, from this day forth, her students, unbeknownst to her, have lost their faith and trust.

The Tiffany of this final vignette approaches the leap with visible anxiety and misgivings. All of these feelings are easily read, much to their consternation, by her students. Where before they trusted her skill and insight, they now wonder at every suggestion, seeing possible caprice or malicious indifference.

This Tiffany differs from the Tiffany of Vignette #1, in that her students feel that had things gone otherwise, their mathematics learning would have been the unambiguous sacrifice. How fortunate are the mathematics students who have realized that, while their teachers may significantly constrain their immediate horizons, the choice to learn remains theirs!

This Tiffany presents a challenge. Is she, in Dickensian fashion, somehow the Spirit of Mathematics Teaching Yet-to-Come or simply a bit of undigested beef, a blob of Dijon, a crumb of cheese? Do I dare ignore what she augers? Even in imagination there are forkings less traveled by, turnings of awareness that might make all the difference.

At A Fork

Tiffany and I have much in common for, as an elementary school teacher who juggles competing disciplinary demands, she embodies my hopes as well as my fears. I struggle with the specter of mongrelization within mathematics, while simultaneously realizing that mathematics is a servant as well as a queen. On the other hand, my embrace of the aesthetic seems more that of Orpheus than Philemon of Tyana: I often find myself looking fondly back to what was rather than resolutely holding to what might be. I make room for the gift of Mozart in my classroom, but I am careful that he not overstep my bounds. I am resigned to the time given freely from my congested teaching schedule to a Lincoln Center Teaching Artist. I am resigned to not being able to give more, to not, in some sense, giving all. But most of all, I am resigned to no longer being a homebody in my own classroom and, now awakened, forever and again a stranger.

Nonetheless, I am, even within such resignation, given hope by the very idea and imaginative enactment of Tiffany's blending. During my Lincoln Center experiences (and that includes planning as well as enactment), my students and I were, although momentarily, called to bridge worlds we had individually authored. Consequently, I find myself now called to wonder whether and how my very inscription of mathematics education might be carefully rethought. Assuming I decide to take the leap—ditches are one thing, high cliffs are another—my final Tiffany, the teacher of faith, provides some clues:

- I need to complete the leap. Bewailing future consequences prior to a leap is inane; teetering on the edge is scary.
- Once I have taken the leap, I need to joyfully and passionately make the best of ensuing consequences. Students tend to hold teachers up so as to see the shadows they cast on the subject.
- Once I have taken the leap, I need to be at peace with my decision to do so. No matter the size of the leap, it takes substantial effort to craft situations within which persons might “truly see alternatives, perceive connections, create new orders” (Greene, 2001, p. 32).
- I should not leap out of a sense of resignation or fear as there is a significant possibility that I, together with my students, will fall short.

Taking these clues as indicative, what seems to be at stake here is not so much a matter of content—that is, the particular situations I might set out for my students—but a matter of teaching—that is, how I, in effect, open up particular situations for a student's study. Teaching becomes, fundamentally, an indwelling relationship with each particular student. Hard? Yes! Paradoxical? I am beginning to wonder.

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Notes

[1] This did not, necessarily and always, involve a trip to the Lincoln Center or museum, but was that time and place when my students and I put into practice some of the sensibilities engendered by the workshop.

[2] As a case in point, see Millay’s “Euclid Alone Has Looked On Beauty Bare” (1958).

[3] Keeping to a musical motif, there are, I note, a number of ways solutions might be arranged.

[4] I have supplemented, so to speak, my memory with experiences of succeeding workshops.

[5] Which quite possibly speaks to some significant lacks in my implementation and enactment. The number of students making some sort of connection has significantly risen over the years.

[6] Two students did comment on mid-semester evaluations that they were impressed that I chose to make such aesthetic opportunities available in, essentially, a mathematics class.

[7] It is not so much becoming another, but, as Chrétien (2003) puts it, to “call is to recall,” to be “shaken from a sleep that [I] never even suspected” (p. 10).

[8] I note that this and much of what will follow has, what might be termed, a *metaphorical resonance* with Kierkegaard’s *Fear and Trembling* (1983).

[9] There are, of course, what one might term stages on the way to such strangeness. However, I am here trying to look within and beyond.

[10] I am thinking here of the Moebius strip (1858), although a nicer metaphor might be the Klein bottle (1882).

[11] An initial version of this essay—as pointed out by Lisa Simon, a PWC colleague—lacked attention to the *could be*. I was firmly stuck, so to speak, within the usual teacher’s lament, ‘If I only had the time!’

[12] The first two of these imagined continuations loosely draw on characterizations given by Maxine Green (1973) pp. 275-283; that is, respectively, the *rationalist teacher* and the *existentialist teacher*.

[13] Brunelleschi (ca. 1413-1435) created a panel upon which he painted the Baptistry in Florence. At the center of this panel, at the vanishing point, a hole was placed. A mirror was placed in front of the painted panel and, looking through the hole from the unpainted side of the panel, a viewer observed the image in the mirror.