



Greater than the Sum of Parts: A Poetry/Science Collaboration

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Any good poet, in our age at least, must begin with the scientific view of the world; and any scientist worth listening to must be something of a poet, must possess the ability to communicate to the rest of us his sense of love and wonder at what his work discovers (Edward Abbey, qtd. in Brown xv).

Collaborations between disciplines in middle school usually occur between language arts and social studies, or between math and science; however, we found a collaboration between language arts and science to be a fruitful experience for our students in their learning both disciplines and in improving our own teaching.

Understanding poetry and science requires many of the same skills: close observation, description, and metaphorical thinking. To that end, we developed a curriculum that focused on those skills as our students studied barrier islands in sixth grade science and poetry in sixth grade language arts.

The collaboration began with Nancy's desire to improve the writing her science students did. While the content of their reports was satisfactory, Nancy found students did not use the writing skills they had learned in language arts classes. (This lack of transfer is commonly observed in middle school and is one reason for cross-disciplinary collaborations.) Nadine's involvement was first limited to helping students with the research and writing of their reports. Students used language arts class time to take research notes, and Nadine

helped them to revise and proofread their reports. This collaboration met Nancy's needs, but it was essentially a one-sided collaboration, with language arts supporting learning in science. We wanted a collaboration that better served student learning in both areas. Poetry proved to facilitate such a collaboration. Students would be applying the same skills in learning both science and language arts. They also would now be working on substantive tasks in both classes: researching barrier islands and writing original poems. Consequently, the learning in both disciplines was transformed. The whole was greater than the sum of the parts.

Why Science and Poetry?

The connection between art and science is well documented. Albert Einstein frequently referred to the value of his imaginative capability; one such example is found in *Bartleby's Quotations*: "I am enough of an artist to draw freely upon my imagination. Imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world." The writings of Stephen Jay Gould, Lewis Thomas, Rachel Carson, Annie Dillard and others are powerful because they use poetic language to precisely express science concepts.

We can also look at the relationship between science and poetry from the poet's point of view. Poets have often spoken of the drive to write in terms that could easily be used by scientists; John Ciardi describes writing as a compulsion, a search "for those glimpses of order that form can make momentarily visible" (Murray 4). According to Donald Murray, numerous poets have described the experience of writing poems in words such as "discovery" (John Ashbery, Jorge Luis Borges, Maxine Kumin, Denise Levertov, Gertrude Stein, William Carlos William), "surprise" (Robert Frost), and "exploration" (Charles Simic, Robert Penn Warren). Introducing an anthology of poems about science and math, Kurt Brown writes:

Perhaps the kind of imagination it takes to conceive of a radical and complicated new scientific theory, and prove it, is not so different from what is required to envision, compose and successfully execute a great poem. The human mind may not be as compartmentalized or fractured as we tend to believe. If science

and art have anything in common it exists in the resources of the human brain and our ability to create something unforeseen and revolutionary out of our dreaming. (xiv)

Close observation and careful recording of those observations are fundamental skills of scientific endeavors. Poets as well as scientists must see the world around them with new eyes, collecting an abundance of sensory images from which they can draw. Poet James Dickey offered a definition of a poet that could easily apply to scientists: “Someone who notices and is enormously taken by things that somebody else would walk by” (Murray 17). In *The Private Eye*, an interdisciplinary curriculum incorporating science and the arts, author Kerry Ruef proposes that skills provide the common ground: “The four most important tools, the four most important thinking skills of the arts or sciences—applied or academic—are looking closely, thinking by analogy, changing scale, and theorizing” (9).

Science and poetry are connected by an even stronger bond, that of metaphorical thinking (the “analogy” Ruef speaks of). In both disciplines, people use metaphor in an attempt to understand a new concept, by imaginatively comparing it to a known concept. Ruef notes the pedagogical value of this function of metaphor; metaphors “help make sense out of the unfamiliar, they sort new patterns into your own familiar patterns. They make a barnacle, or a spider, or your fingerprint into ‘a friend.’ The analogy allows you to see more....” (Ruef 25).

We can further “mine” the metaphor to uncover correspondences between the two objects, thereby helping us to learn even more about the new concept.

...analogies often contain clues to the function of whatever feature you are observing. 99% of what’s found in nature is functional, and since form follows function, ask yourself: “If it reminds me of *that*, I wonder if it might function like *that?*—in some way. (Ruef 17)

For example, in our classes, students were encouraged to think of the salt marsh as a sponge that successively fills with and empties water. Less obvious is the comparison of the functions of marsh and sponge: we use sponges to clean

things, and the marsh acts as a filter for the water. A sponge that has been dry for a while looks and feels very different from its usual damp state; likewise, the marsh at high tide looks quite different from the way it looks at low tide. In this way, the metaphor of sponge for salt marsh can also work as a mnemonic device, enabling students to integrate more new information about salt marshes.

The pedagogical use of metaphor is further explored by Pugh *et al* (122). Additionally, they note that scientists themselves use metaphor to expand knowledge:

Not only do metaphors help students learn about science concepts, but they also help scientists in discovering scientific precepts [...] the function of the heart became clear only after the invention of the pump. Indeed...the function of the heart became knowable only after the invention of the pump. Once people understood how a pump worked, they could use that knowledge to make sense of the heart's function. (Pugh *et al.* 122)

Because making metaphor is frequently an intuitive act, a "leap" of imagination (to use a metaphor), we are frequently surprised, even delighted by, metaphors. That quality of surprise is likewise found in both poetry and science. The words of writer Edward Abbey quoted at the head of this article express this idea, as did Einstein, as recorded by *Bartleby's Quotations*, when he said, "The most beautiful experience we can have is the mysterious.... the fundamental emotion which stands at the cradle of true art and true science."

The Curriculum

To introduce the focus on the skills of close observation, note-taking, and metaphorical thinking, we used activities from *The Private Eye* curriculum. According to this model, students use jeweler's loupes, which magnify objects by ten. Students examined a variety of objects using the loupes and followed these steps:

- Looking
- Sketching
- Writing about what they see
- Asking themselves what the object reminds them of, therefore making metaphors

- Finally, theorizing about why the object looks the way it does: what purpose does its shape serve?

Some of the objects we had students look at through loupes were the palm of their hands, celery, cardamom pods, and dried purple coneflowers.

These skills were then extended to a science project based on the different zones of a barrier island. Students learned about beach, dune, salt marsh, bay and forest zones, as well as about ecological models, producers and consumers, equilibrium, community, and interdependence. The unit culminated in the sixth grade retreat to Assateague, a barrier island off the coast of Virginia and Maryland. In addition to activities designed to create cohesion among the class and some just for fun, students also did primary research into one of the five zones. We brought the loupes and plenty of paper and pencils so that students could observe, sketch, and write as part of their primary research. The notes and sketches from the trip provided part of the raw material for their barrier island projects, which they created when we returned to school. Although projects took on various forms in the past, such as books, board games, dioramas, videos, and posters, when the project took place at the end of the science/poetry collaboration, many students chose to create poems that contain metaphors for their projects about what they observed.

Applying the skills of observation, note-taking, and metaphorical thinking in language arts class was easy. All the observational notes from the science notebook also served as the raw material of poetry. We read poems that provided either closely observed details and/or focused on something in nature. We primarily used Dunning *et al.*'s book *Reflections on a Gift of Watermelon Pickles*. To establish the importance of close observation in poetry, we read "To Look at Any Thing," by John Moffitt. We compared "The Bat" by Ruth Herschberger, which is full of scientific information and "The Bat" by Theodore Roethke, which is largely metaphorical. We also read Rosalie Moore's "Catalogue" to notice the closely observed details and metaphors and Wallace Stevens' "Thirteen Ways of Looking at a Blackbird" for a model of an interesting way to structure a poem and for the sheer mystery and fun of his multiple perspectives. Students also learned about and practiced using line breaks, alliteration, consonance, repetition, and white space.

With *The Private Eye* model for gathering information and the published poems as models for finished products, stu-

dents each chose an animal to observe closely over a few days. (We are fortunate to teach on a campus with geese, ducks, a swan, horses, and, at the time, tropical fish, so students did not need to have family pets.) These notes became the raw material for animal poems.

Students extended these skills yet again in another literature project. As part of our next unit, world literature, we read the novel *Walkabout*, which is set in Australia and which abounds in descriptions of the flora and fauna of Australia as well as in metaphor. Students were asked to select one of the flora or fauna, research it (in place of close observation), and draw it. They created poems and illustrated them with images of their subjects.

Student Work

In this section, we include (in roughly chronological order) four of our students' poems, first from the animal poems based only on direct observation, then the barrier island project using both observation and research, and finally Australian animal poems based only on research. For each poem, we will discuss how it reveals the student's understanding of scientific concepts and how it works as a poem. Students' comments are from their writing portfolios, written months after the poems, more evidence that the learning was fully integrated.

Seven Ways of Looking at a Hermit Crab

1
Among the tons of sand only one
moving thing,
the antennae of the hermit crab.

2
I was of two minds,
like a sponge in which are two
hermit crabs.

3
I do not know which to prefer,
the color of his claw,
or the tickle of his legs.

4
When the hermit crab
waddled out of sight,
he marked the cornmeal upon
which he fed

5
The cornmeal is disturbed,
the hermit crab must be moving.

6
A man and hermit crab are one,
a man, a hermit crab, and
the ocean are one.

7
Like a human buys new clothes,
a hermit crab changes shells.

By Max

This poem shows that Max closely observed his pet hermit crab. He noticed its behavior (its slowness and how it feels to hold one), habitat, its diet in captivity, and the coloration of its claws. He also uses a metaphor to express the way it sheds and finds new shells. As a poem, it succeeds in imitating the form and mystery of Stevens' poem. Max carefully chose language to communicate the details he observed, such as "the tickle of his legs" and "waddled out of sight." Verse 5 is especially effective in communicating the slowness of hermit crabs: a disturbance in the cornmeal is the only evidence of movement. This was a point of pride for Max, who noted in his writing portfolio that this "is a poem I wrote where I did a lot of observation of a hermit crab. (Which goes very slow!)"

We include two examples of poems from barrier island projects, from students whose command of poetic language was quite different in sixth grade—yet both students succeeded in using scientific information and poetic devices.

The Forest

The wind ruffles the forest floor
Sending spirals of leaves into the air

**To drift down again
The live oaks, loblolly pines, red cedars
Rise gracefully,
Towering over us
Protecting little heads
From the storm that rages outside
A magnificent palace, a peaceful sanctuary**

**Safe, quiet places, cheerfully invaded
By chittering squirrels
Singing birds
Cedar waxwings dart, stealing cones
To add to the growing pile of plundered nuts**

A mockingbird calls

**The forest grows silent
Squirrels freeze, and birds take wing.
You hear them, then see them
Tramping through the silent wood
Bright voices, loud colors
Scaring the forest away.**

**The forest revives
Shaking silence from every leaf
Slippery silver substance
Rides a roller coaster of leaves
To the wooded floor**

**A hummingbird buzzes by
Wings never pausing
As a monarch butterfly rests,
Dreaming
Of blooms long past**

**Night has come
The twinkling blanket of stars
Wraps the world in darkness
Overwhelming**

**Giant majesties have risen
And are again
Gently brushed by midnight breezes
Sending once more, spirals of leaves to the ground.**

**Moon and stars sweep across the sky
As dawn paints the horizon
Brilliant beauty ignored
By grim soldiers
Unrelenting
March**

**Huge Noise breaks loose
Buzzing, causing trees to shake
Down to their roots
Jolting animals out of sleep
Moments, and the forest is empty
Silent
But for the fearful shaking of those rooted
And the bone-shaking
Nay,
Bone-breaking
Sound that filled the forest**

**The sun beats down
With nothing to shade them,
The animals, terrified, peek
At the desert of stumps
Not majestic
Still oozing sap
Like tears.**

By Elizabeth

Elizabeth based her poem on a bike ride through the forest zone of Assateague, noting trees such as loblolly pines, which are specific to the island. She weaves into the poem the importance of the forest zone in providing protection for animals during the many storms a barrier island endures. Elizabeth describes the changes in the forest from day to night. By contrasting the protected Assateague forest to one being cut down to make way for development, she demonstrates understanding of the concepts of equilibrium and community. Elizabeth's command of the concepts and of the imaginative leap she took are especially evident in the poem's revision, as Elizabeth explains in her portfolio: "The second half—the half about the destruction of the forest—I wrote later, when the county started cutting down a forest near my house." Elizabeth does not stint on the poetic aspect of the assignment,

either. The use of poetic devices is impressive for such a young writer, from the numerous, effective uses of alliteration to the many evocative metaphors. She gave careful thought to the use of line breaks and white space to create pacing and meaning.

Silverside Fish

**My name is Mr. Silver,
I am a fish that lives in the marsh,
Zooplankton is my food every day.
I swim around all year until there is a
Spring tide and the salt marsh over flows and
I go zooming out to the bay like a silver bullet.
But once in a while I get picked up by those awful
Seining nets that you can't see through,
But then they throw me out back to the bay
Where I belong.**

By Justin

Justin studied the salt marsh; silverside fish were one of the consumers he researched. While mature silverside fish can also be found in the bay zone, young silverside fish are more common in the marsh, and we found many the day Justin's group went seining. His poem shows that he knows the fish's place in the food chain; he also clearly understood the unique circumstances of its habitat and behavior, when he writes: "I swim around all year until there is a/Spring tide and the salt marsh overflows and/I go zooming out to the bay like a silver bullet." This poem was more typical of sixth grade writing than Elizabeth's; nevertheless, it was rich in detail and poetic devices, not the least of which was Justin's effective use of metaphor in the above-quoted lines. He, too, gave careful thought to the use of line breaks and details. In his portfolio, Justin wrote, "I explained everything I knew about the silverside fish in a poetic way. I also said all the troubles that the silverside fish would encounter such as seining nets and spring tides."

Tasmanian Wolf

**He is the king of the desert.
His jaw is the size of a hippo's
He is swift and crafty as a tiger,
Sly as a fox and smart as an elephant.
He races by like a Ferrari chasing the rabbit,
The wolf gets closer and closer.
And then, the rabbit's gone.**

By Olav

Olav chose to research an animal we found on a website about Australia, rather than one from *Walkabout*. The series of metaphors communicate what he learned from his research: the animal's place in the food chain ("king of the desert"), its oversized jaw ("the size of a hippo's"), and its adaptations and predatory diet ("He races by like a Ferrari chasing the rabbit"). Olav uses simple language and a straightforward list structure for this poem. Young writers frequently rely on what we would consider to be clichés; nevertheless, words such as "sly," "swift," and "crafty" are not in their everyday vocabulary. Because Olav was able to draw on both disciplines, the poem is richer than it might have been.

Why the Collaboration Worked

Teachers frequently shy away from collaboration in the classroom, fearing it will take too much time from their own curricula. However, we found that our collaboration did not increase instructional time; rather time was used more efficiently, because frequently lessons served learning in both disciplines.

Teachers may also be reluctant to collaborate, fearing that they will compromise the integrity of their own curriculum. However, we did not find this to be true because, we think, the collaboration was authentic and well grounded in theory and practice. Focusing on common skills provided students and teachers entry points for science and poetry. The students had more practice in applying the skills of close observation, note taking, and metaphor making than they would have in just one or the other subject area. Even if we had separately covered the same material, we don't think the

mere duplication of effort would have had as powerful an effect on learning that the coordinated effort had.

The collaboration also provided scaffolding for students who felt they were better at one subject than the other. For example, a student who saw herself as “good” in science but not in writing could approach these assignments primarily from her science strengths. Likewise, the student who loved to write poetry but lacked confidence in learning science could focus on that aspect. The collaboration in effect raised the bar in both classes for quality of student learning. Students’ writing in science was richer and more evocative of their understanding. It opened up doors to description, making students take closer looks and ask themselves questions that otherwise may not have been asked. (*The Private Eye* curriculum does extend the model to theorizing, asking why a metaphor works.) In language arts, students had a new source of information to draw upon for their animal poems, and the results are more effective, interesting, and often sophisticated. In asking our students to be both poets and scientists, we found that, in the words of Edward Abbey, they possessed the ability to communicate to us their sense of love and wonder at what they had discovered.

Works Cited

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