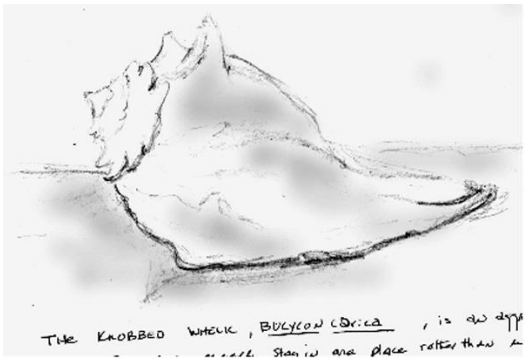
Catalyzing Creative Teaching and Learning in the Science Classroom through Arts Integration

The Power of *Drawing* to Learn

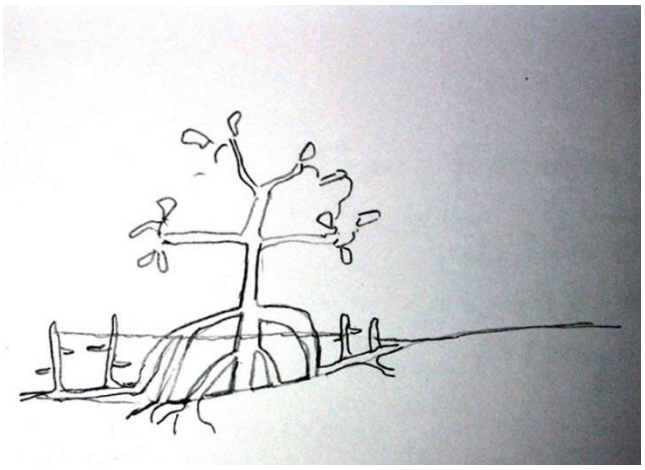
By Merrie Koester, Ph.D.



A young child discovers a feather lying on the ground. She* instantly picks it up and begins to tickle her face with it. She then smells it, studies its color patterns and reflections, maybe even tastes it. She will then also surely wonder what it feels like to be a feather, carried freely and lazily along by the whims of the breeze. When asked to describe her treasure, she may use words like soft, smooth, shimmery, and "tickly." Asked to draw a picture of the feather, she will scrutinize its properties of line, shape, pattern, texture, and color – arriving at a keen understanding of what "featherness" IS. She may even do experiments with her precious plume. Does it sink or float in water? Is it heavier than a penny? If its barbs are pulled apart, will it fall differently than before?

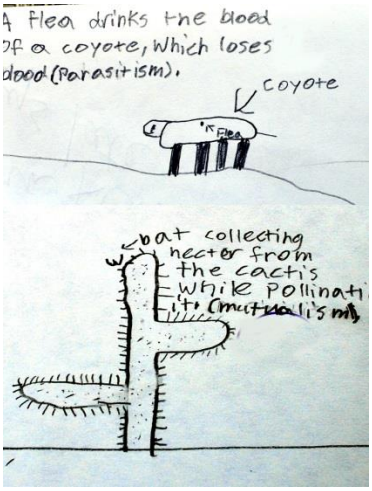
While making all these observations and discoveries, the child does not think about whether she is doing science or art – only that she now has new knowledge and understanding of something significant in her world. She is just as excited about naming the parts of a feather as she is about drawing a picture of it or pantomiming its movement. She has no preconceived ideas about science and art; they both stimulate her imagination and cause her to wonder…..

Whether it is immediately apparent or not, the fact is that art and science are connected as expressions of human creativity. Separated one from the other,only the most rudimentary levels of understanding are possible. A plant uprooted from the soil has little chance of surviving. Likewise, children (small and big), deprived of the chance to exercise the muscles of their creativity have little chance of ever maximizing their potential. Our most gifted and influential scientists have been among the most creative, inventive people ever to live, and yet many did not thrive until *after* they left school. They simply adapted as best they could, biding their time and adapting until their creativity could once again flourish.



Fortunately, today, more and more educators are realizing the importance of teaching through creative means. The "trick" is to choose the means of creative artistic expression (visual arts, creative drama, poetry, dance, etc) that best fits the science content you're trying to teach. When STEM teachers can pull this off, then the teaching/learning experience will have been transformed into truly viable ***STEAM*** education whose ultimate goal are *multi-literate* students, many of whom can *show* far more than they can tell if you create safe, enriching learning spaces for this to occur.

Arguably the most effective art forms to infuse into the science curriculum is drawing. Over five hundred years ago, Leonardo da Vinci recognized that not only was *vision* the dominant human sense but also that *drawing* was an extension of that sense. Deep study of da Vinci's work reveals that here was a mind that recognized that to draw something is to know it *and* to feel it, the hand providing conduit from perception to paper. Through the aesthetic, sensory experience of drawing, profound understanding can be achieved. Several hundred years after Leonardo called for scientists to develop skills in drawing, German teacher researcher Johann Heinrich Pestalozzi developed groundbreaking pedagogy which was based on the premise that children could come to an interpersonal relationship with themselves and the world through the dedicated practice of drawing. Pestalozzi believed that sustained time spent drawing the world should precede the learning of and with written language.



Throughout history, drawing has helped scientists and engineers evolve ideas. Such "idea sketching" was a valuable precursor to invention and discovery by the likes of inventor Thomas Edison, geologist Marie Tharp, and of course, Leonardo da Vinci, artist, scientist, inventor, architect, and even musician. Without imagination, problems would never be solved. Without art, there would be no design, no engineering. Jacob Bronowski has said that we need to use all our faculties to the full- the artist's brain, the poet's heart, and the painter's eyes. Failure to spark the creativity and imagination of science students will severely impair their ability to see beyond the "facts" in their textbooks, leaving them with only the lowest form of cognition in science and the misconception that school science is something to be avoided at all costs. Instead, picture learning science like this:

To learn more about research confirming that teaching science through drawing and the creative arts can achieve dramatic turnarounds even for struggling students, I have written ***Science Teachers Who Draw: The Red Is Always There***. I encourage you to join our community of teacher learners at **https://www.facebook.com/scienceteacherswhodraw**.

To join the action research initiative, Project Draw for Science, contact me through the website, **http://merriekoester.wix.com/project-dfs**