Reflections on Science, Art, & Sustainability

Two Knology researchers reflected on the history and state of science, art, and sustainability collaborations including the relatively recent art/science divide in the literature. They conclude that the artificial polarizing of the concepts is not congruent with how we understand mental processes and the richness of thinking across the disciplines. The text was developed as part of a brief for participants in the A2A: Awareness to Action, Science, Art, and Sustainability 2018 Workshop. The workshop was facilitated by the Knology team under NSF Grant #1746106 awarded to the University of Colorado, Boulder, James White, PhD, Principal Investigator. Co-authors on the briefing material were Marda Kirn and Bethany Wall.

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Science and art have been connected for more than 20,000 years. Images of the pre-historic cave paintings in Lascaux, France are claimed on the first pages of both science history and art history books as “first images” of their disciplines. A cursory look over the last three millennia makes clear that the separation of art and science is a relatively recent trend. Within Western European traditions, for example, poetry has been intertwined with scientific study since at least the sixth or fifth century B.C.E., when Pre-Socratics used verse to write about physics, chemistry, geology, astronomy, theology, metaphysics, and epistemology (Curd, 2016). Renaissance philosophers from Leonardo da Vinci to Johann Wolfgang von Goethe often don’t distinguish between their work as artists and their study of biology, anatomy, botany, and astrology.

Under more recent ways of thinking, these two broad areas of practice are often typified as opposed forces, polar opposites on a spectrum of mental process. As Wright and Linney (2006) note, science and art are "stereotypically thought to be at opposite ends of the intellectual spectrum." This is evident from the "legacy of blind faith in scientific fact, coupled with romantic notions about the subjective and imaginative qualities of art" (p.11). The two disciplines are often pitted against each other based on their perspectives on core epistemological questions. Art is typically characterized as "comfortable with uncertainty, and is not necessarily interested in finding answers... whereas much of science is looking for answers, and is — in some cases misguidedly — seeking certainty" (Wright & Linney, 2006, p.11).

These differences in perception are used as arguments both for and against collaboration. The perspectives offered by science and art are often categorized as part of opposing spectra: objectivity vs. subjectivity, restriction vs. freedom, public vs. private. Some people, however, suggest that the collaboration may compromise the integrity of the work in terms of the artistic or scientific content as well as the critique of the work. For example, skepticism among arts gatekeepers about the appropriateness and potential aesthetic excellence of "issue-based art" continues to hinder support for collaboration, even if that art is about sustainability or scientific information.

Although interesting and thought provoking, critics of interdisciplinary approach to science and art fear that collaboration might weaken the impact of the individual disciplines. Furthermore, it has been suggested that an individual may be taken more seriously in their field by focusing on their area of specialty. We argue that allowing collaboration across these artificially siloed disciplines can enrich both without negative consequences to either. For example, we can allow subjectivity to inform notions of truth without loss to scientific integrity or artistic merit.

While the STEM to STEAM movement is infusing art and design into the teaching of STEM subjects across the country, professional performing and visual arts networks remain largely separated from STEM endeavors. This lingering distance does not appear to be due to the aforementioned concerns about cross-disciplinary work. The evidence suggests that these critiques have not necessarily limited the willingness of artists and scientists to collaborate. Indeed, the increasing number of science-art-sustainability collaborations have the potential to impact society broadly. Unfortunately, they also seem to be raising barriers to the creation, proliferation, dissemination, and evaluation of the products of and research about these collaborations. It would seem that the evaluative frame of mind used to assess learning does not comport well with how art makers assess their impacts.

Art / science collaborations are often the result of the engagement of traditional visual or performing arts with the physical sciences such as chemistry, physics, earth science or biology. Efforts to apply both STEM and arts research, modes of knowing, and wisdom to sustainability topics (e.g. food, energy, and water security; transportation; health; waste management; and urban planning) are often not grounded in basic social sciences that explore effective communication and engagement strategies. Furthermore, as Wright and Linney (2006) explain, "A motivating factor at the heart of both arts and sciences is a desire for the pleasure of understanding something new and of communicating this to others" yet

the “binary division” between science and art often neglects to take into consideration how social and cultural context inform the pursuit of each discipline.

If we consider, for example, the concept of science/art collaborations for the purpose of advancing sustainability behaviors, we come closer to the definition of purpose for conservation psychology. That is a psychological discipline that focuses on changes to human behavior that result in biodiversity protection. In this context, the United States Global Change Research Program (2012) defines sustainability as *“balancing the needs of present and future generations while substantially reducing poverty and conserving the planet's life support systems.”*

If this is indeed an example of a field of inquiry for science/art collaborations, then one could measure the effectiveness of these efforts by looking for evidence of progress towards a healthy human society that is in harmony with both natural and social/cultural environments. Such a society would focus on concepts of environmental justice, resilience, regeneration, stewardship, and sustainability. And it would explore these concepts in sectors such as food, energy, and water security; health; transportation; waste management, urban planning, traditional knowledge, mental health and well-being, and politico-social paradigms.

While these topics have been studied in the context of the natural sciences, the social sciences, as well as by a broad array of artists, they have not yet been explored in the context of science-art-sustainability collaborations, a relatively new field often involving social practices that have not been researched as extensively. To date, most artist-initiated science-art-sustainability collaborations have relied on anecdotal reports of their societal effects since few quantitative studies have been funded to explore their impacts. To date, there remains a lack of empirical research that describes how successful collaborations have resulted in significant behavioral changes that lead to environmental sustainability.

Plurality of Thought

We believe the lack of a common bridging language for art/science work and even the disciplinary silos within the arts and sciences are relevant to this issue. Science, art, and other disciplines may have distinct cultures and outputs, yet they share many similar intentions and precepts. This creates the perfect foundation from which to explore the possibilities of their partnership. We suggest that one of the greater obstacles to appreciating the value of science-art-sustainability thinker and practitioner collaborations is a misunderstanding of how to facilitate communication between different cultures. Our work at Knology suggests that much interdisciplinary work typically falls prey to a natural tendency to acquiesce and diffuse tension through compromise. This desire to suppress difference, perhaps as a way to avoid tensions, may conceal important epistemological differences that play key roles in impactful interdisciplinary collaborations.

Conflict Transformation Theory offers a useful set of principles that can aid in explorations of the potential offered by cross-disciplinary collaborations. The theory acknowledges the underlying intentions of all participants to seek and produce knowledge or gain wisdom and insight through their disciplinary rules and practices. It suggests that to reach beyond those unique disciplinary practices, participants have to let go of prescribed or assumed successful outcomes that conform to within-discipline rules and practices in order to compare the outcomes that flow from each discipline alongside those of other disciplines. We suggest

that benefits will flow from more directed social science research into these types of collaboration with the understanding that deeper knowledge may arise from exploring the tension between fields rather than the commonalities that tend to arise. By acknowledging the value in paradox and tension, we can accept that different perspectives can contribute different bodies of knowledge about the same phenomena, without threatening the integrity of any one practical or intellectual pursuit. Through this transformative practice, we believe a new transdisciplinary framework can emerge.

We also suggest that observing conflicts as they play out, can help build new ways of creating public knowledge. Certainly, having multiple and at times competing perspectives is a natural manifestation of the human experience. However, plurality of thought and tensions between worldviews that cause an impasse are two different things. Here we focus on plurality of thought as a way to *strengthen* collaborations.

We feel Bhabha's 1990 model of emergent production of knowledge in a *"third"* space is essential for the work proposed in this text. This third space is where meaning is constructed across the bar of difference and separation (Bhabha 1990, p. 210). We classify the context of this work as exploring a third space that exists outside of participants' disciplinary homes and work pursuits. This physical, emotional, and intellectually hybrid space allows for learning to occur amidst seemingly incompatible narratives. It encourages participants to make new meaning, gain a deeper understanding of topics, and to explore new ideas.

Within these rules of engagement, Bhabha notes that it is important to have a moderator/interpreter (or educator in Bhabha's framing), whose roles is to translate the multiple languages without suppressing the value of any. This is perhaps exactly the phenomenon that Tom Finkelpearl was referring to when he noted that "*a lot of artists want to do social action but they haven't been trained in social action and there are people who know how to do that stuff called Community Organizers for example. And we have community organizers on our staff and we've had staff members who have gone for training in community organizing because they've been trying to do things that community organizers do but they don't know how to do it*" (Finkelpearl, 2012).

Finkelpearl's framing does not cede territory to community organizers. Rather, he suggests that by opening the doors of an art museum to disciplinary specialists, it was possible to create new ways for artists and communities to develop shared knowledge.

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