



Making Partnerships With STEAM

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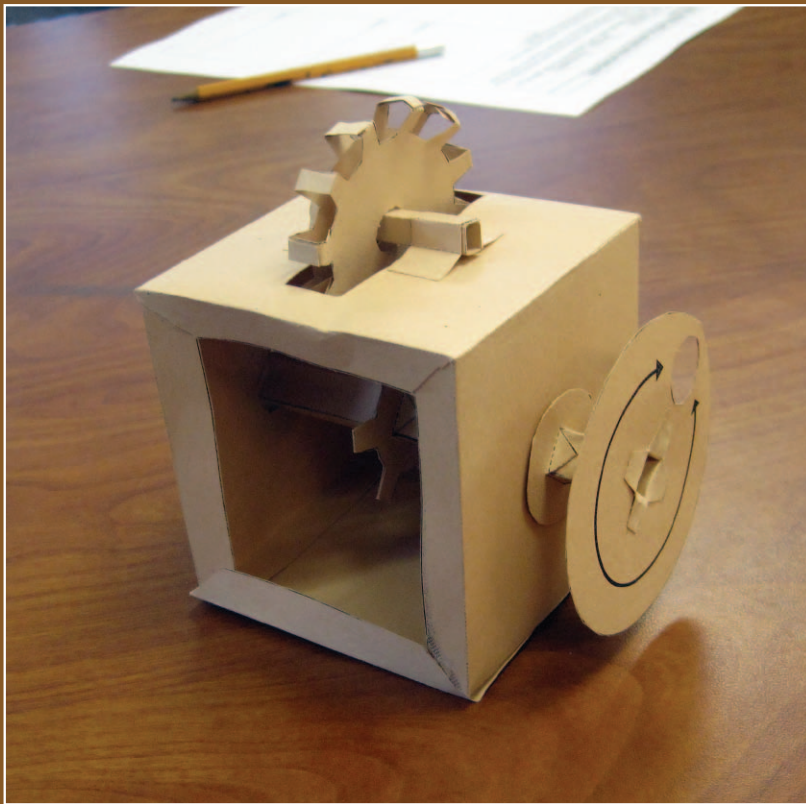


Figure 1. Paper gear box construction.
Photograph by author.

John Maeda had me at “Hello.”

When the former president of the Rhode Island School of Design spoke at the 2012 National Art Education Association (NAEA) Convention in New York, his words supported my own ideas about teaching and learning based on STEAM (science, technology, engineering, art and math). Specifically, I view STEAM as an exciting prospect for including arts into core curricula, yet am uncertain about its implementation. On the one hand, STEAM appears an essential path forward, while on the other hand, there seems to be little guidance assuring that STEAM moves on an advancing path.

Maeda, however, continued to captivate.

He spoke about design as a process for “making solutions” and art as a process for “making questions.” He stressed the need to foster critical thinking, which would then extend into critical making, or, in his words, “thinking as making.” Art, design, and science, he said, share historical connections that should be acknowledged, fostered, and reinvigorated, and that thinking and making are the pathways toward that connectedness.

As an artist educator and advocate for learning through the arts, the political implications of the label STEAM as opposed to STEM (science, technology, engineering, math) sounded exciting, but *what would the integration of art and design into STEM mean for arts education and for arts educators? How can the arts/art education partner in making STEAM?*

Maeda’s words and ideas fueled a desire to impact educational practice with a STEAM agenda, to invest integrative learning for preservice teachers as partners in this agenda, and to embrace STEAM and harness its potential to impact meaningful teaching and learning as *what can be, what might be, what will be*.¹ In sharing classroom examples of partnership practice, it is the author’s hope to reveal a partnership in action for facilitating meaningful STEAM integration through, and with, arts education.

Recognizing the “A” at the Table

Advocating for the “A” should illuminate relevant actionable pathways for the arts. Creating partnerships between classroom educators and preservice teachers highlights one potential pathway for educators who choose to embrace the arts in educational settings. Maeda’s STEM to STEAM approach suggests a path inclusive of the arts, recognizing how the arts enable learning based on active engagement in critical thinking or “thinking which is focused on the evaluation of various alternatives” (Lampert, 2006, p. 46). STEAM offers such an alternative.

Maeda’s words galvanized a call to action for political advocacy in arts education and in general education. Politically, he promoted the Congressional STEAM Caucus in 2013, chaired by U.S. Reps. Suzanne Bonamici (D-OR) and Aaron Schock (R-IL). Their efforts made strides for arts inclusion into core curricula as part of a well-rounded educational plan, as illustrated by Bonamici adding an amendment into the 2015 Every Student Succeeds Act (ESSA), calling for integrating the arts into STEM education (Eger, 2015; “Timeline,” 2015). Congressional efforts and directives both champion and compound the role of the arts in educational practice, especially since guidelines stipulating exactly *how* the arts will integrate into national or local curricula and standards are still being imagined and considered.

STEM initiatives date back to the 1950s (Gonzales & Kuenzi, 2012), but Maeda’s voice was the first I heard recognizing the impact of the “A,” while discussing the chasm separating art and science learning today—a chasm absent historically between the two disciplines. Consider the guilds that traditionally educated artisans and craftspeople, especially during the Renaissance. Mentors in these guilds transferred knowledge, skills, and dispositions to younger, untrained mentees in scientific, artistic,

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and craft/trade professions to secure the guilds and the institutions they promoted (Ito, as cited in Thompson, 2016, p. 53; Lucassen, De Moor, & Luiten van Zanden, 2008; Prak, 2003; Rolling, 2016). Learning cooperatively, mentors and mentees shared insights and inquiries as they enhanced individual skill sets. Artists, alongside scientists, learned to question, to ponder, to reflect, and to think, seeking answers and promoting dialogue through further questioning. Although the disciplines no longer share guild-like learning processes, inquiry remains a vital component for the disciplines. Arts-based learning intersects with and can even promote literacy in science when/if the two disciplines re-connect (Seifter, 2013 as cited in Robelen, 2011, p. 2). Maeda articulated connections between art and design that contribute to innovation and discovery championed by the STEM movement. But STEM recognizes no “A,” failing to make witness to what the arts provide for educational practices and creative advances in all fields.

Consider, for example, the “S” in STEM. The visual arts can integrate with science through visualizing scientific data collection, revealing an alternative presentation of scientific information. Technology, the “T,” suggests creative tool implementation, identifying how art and design positively impact innovations created through technological means (Fournier, 2013). The “E” for engineering presents other challenges as a companion to the core curriculum, especially in the preK-5/6 classrooms (Catterall, 2013), since a subject like engineering is not typically introduced as a direct course of study (Catterall, 2013, p. 5) until the high school level. However, integrating visual art processes in concept/model development, as employed in the engineering field, suggests a dynamic connection between engineering and art. In mathematics, the “M,” the arts can illustrate space or change through visual or movement-based creative undertakings. Such examples suggest where the “A” can play a critical role with all the letters in STEM.

The engineering model requires further reflection for potential partnering between art and engineering. According to Word



Figure 2. Paper pop-up construction. Photograph by author.

Central Student Dictionary Online (n.d.), engineering is “the science or profession of developing and using nature’s power and resources in ways that are useful to people (as in designing and building roads, bridges, dams, or machines and in creating new products).” Based on this definition, the idea of “creating new products” proposes a link between art and engineering. Schools that incorporate Project Based Learning (PBL) often

To design and create, or engineer, in the classroom, students and teachers must employ the skills, knowledge, and “critical thinking dispositions” vital for innovative solutions.

use the art classroom as pre-engineering/thinking environments and approximate the processes that engineers use to design and innovate within an art curriculum. Art classrooms that facilitate studio-based thinking/making/tinkering² enable students through discovery and explorative practice. To design and create, or engineer, in the classroom, students and teachers must employ the skills, knowledge, and “critical thinking dispositions” (Lampert, 2006, p. 215) vital for innovative solutions via problem-solving investigations; a place where the “A” can partner with the “E” and play an integral cooperative role in STEAM learning.

In 2013, I designed a curriculum model titled, *Contemplate, Create, Innovate*. The model served as a pilot partnership between myself and a visual arts teacher at a STEM high school in Hollywood, California.³ We designed a PBL course of study titled, “Amuse Me,” with her art/pre-engineering/medical students. Our instruction centered on posing a question for investigative creative exploration: “What can we create (an object, machine, toy) that is amusing?” Students worked in cooperative teams, or as individuals, to establish a fictional company to make and produce a prototype of their object in response to the essential discussion question guiding the learning process. To scaffold learning, students practiced creating gear boxes (Figure 1) and pop-ups (Figure 2) out of paper. They also explored Rube Goldberg machines and played with children’s toys, deconstructing them, to appreciate the technology of moving parts.

To emphasize the engineering aspects of the learning process, students kept regular logs to record task completion and feedback sessions with peers. Upon completing their prototypes, students

gave presentation pitches to classmates to showcase their ideas and innovations.

The “A” holds the potential to partner with other disciplines since the arts ask students to think differently, imaginatively, and without the restraints of finding a “right answer.” As with any assignment, an art lesson may ask students to create something, apply certain skills, and meet certain criteria for assessment purposes. The arts ask us to question, to develop our own questions based on what we see, hear, feel, and so on, and often questioning leads to more questioning (Berger, 2014), more exploration, discovery, and variation in answers. Questions channel discovery and experimentation, leading to innovation or further inquiry, but regardless of the outcome, learning through art has the potential to unleash experiences and propel STEAM practices in schools.

Integrating With the “A”

Some schools are already engaging in STEAM-based teaching models and integrating art-based learning into preK-12 programs. The “A” can complement other disciplinary content through considered and meaningful integration techniques that use arts-based practices and studio-thinking skills. However, meaningful engagement requires that the art portion is not an *add-on* to a lesson (Watts, 2010), but that the lesson translates between disciplines, creating a flow of ideas that ask for cooperative practices and vital input from differing content areas.

Cindy Foley, in her TED talk, *Teaching Art or Teaching to Think Like an Artist*, speaks to the practice of a “transdisciplinary” approach to arts integration—one that asks students to think like artists using “transdisciplinary research” (TED, 2014), research that gathers information from multiple sources to support, validate, and inform critical thinking and dispositional practice in an innovative learning environment. Transdisciplinary learning can activate integrative approaches across subject areas and promote cooperative, connected curriculum content and may be a vital consideration especially for schools still without designated art educators or a specified art(s) education curriculum.

Arts educators/leaders have a unique opportunity to broaden their professional acumen, seize the “A” in STEAM, and be recognized as partners in the shift toward inclusive, transdisciplinary learning environments. Partnerships blossom in school settings among teachers interested in giving students broad and well-rounded learning platforms, inclusive of arts integration. Ideally, partnerships and the disposition toward partnering should happen in the preservice realm, when students are nurturing skills necessary for teaching (Rabkin & Redmond, 2004), that can foster meaningful educator collaboration. As art educators employed in schools, they can reach out to other educators and bridge learning within school settings. If working in the community, arts educators can partner with organizations and schools to realize the potential for the “A” as a component for actionable programming. STEAM can provide a platform of opportunity for leadership and facilitation of vital content that translates across disciplinary distinctions.

Figure 3.
Broadway, looking north from Broome Street, New York, attributed to Silas A. Holmes or Charles DeForest Fredricks. Getty's Open Content Program, c. 1853-1855.





Figure 4. *House trees and birds* by Karla Gerard (2010). Used with permission.

Visualizing a Practicum Partnership

While teaching a course titled, “Art, Adolescence and the Child/ART300,” at California State University Long Beach, a course for general education majors to assist their knowledge in developing skills for integrating art and arts-based thinking into the K-5 classroom setting, I facilitated such a partnership (as described above) with a local elementary school in Long Beach, CA. The school was transitioning to STEAM-based teaching and learning. The principal recognized the need for the “A” in STEM and began to create spaces for inventive exploration with engineering and art labs woven into the campus core curriculum.

Our partnership consisted of preservice teachers developing meaningful art lesson plans, not as an “add-on” to a lesson in language arts or math or science, but as an intentional lesson with authentic arts-based practices that connected to and integrated with K-5 classroom content. Before practicum placement, the teams met with a classroom mentor teacher to gain an appreciation for the curriculum occurring in tandem during teaching placements. Armed with this knowledge, the teams worked to make meaningful lessons connecting art-thinking/making processes with interdisciplinary classroom content, using the “big idea” model to directly link art thinking into classroom content. Centering lessons on big ideas helped the preservice teachers define an art method/practice that included: finding professional/relevant artists as inspirational models to situate the big idea in historical, cultural, and aesthetic contexts; developing a process for artmaking/hands-on learning to support classroom content; considering materials and supplies; establishing assessment procedures and necessary accommodations; and planning exhibition/display options to culminate the practicum experience.

The following is an instructional model developed by one team during a semester of ART300. The model is based on the work of a team of preservice teachers assigned to a 1st-grade classroom studying “Community” as part of a citizenship unit. It reveals how this team constructed their art lesson through collaborative engagement.

Initially, the team of preservice teachers began looking at the work of photographers depicting urban street scenes (as represented by Figure 3) to illustrate the idea of diverse types of structures that can inhabit an urban community. Then, they considered the work of folk artist Karla Gerard (Figure 4) whose artwork focuses on imagining elements within a community in a colorful and illustrative manner. These two artistic views offered visual inspiration for representing a community that, in turn, formed the basis for their lesson plan that included a making session where the 1st-grade students used their civic citizenship unit as a basis for further creative investigation (Marshall, 2006). Gerard’s artwork looks at visualizing place as a model. The elementary students could then look at their own environments to visualize a place to connect citizenship ideas with the intended art lesson.

This team of preservice teachers chose “Exploring Community” as their big idea and designed their lesson to investigate how communities represent both individual and group dynamics. As the elementary students explored community within the school and in their neighborhoods, they discovered ways to illustrate and present their findings using the idea of “home” as a metaphor for a personal portrait (Figure 5). Students helped to create a web of traits they deemed important to include within their individual portraits. They then used materials to create a place to represent how they visually fit within their community, using the symbol of home/house/building. Grouping these portraits together, they created a class portrait or a community of collected expression (Figure 6), or a “Community of Learners.”

The lesson provided the elementary students a chance to look at visual examples of the big idea and then relate those images

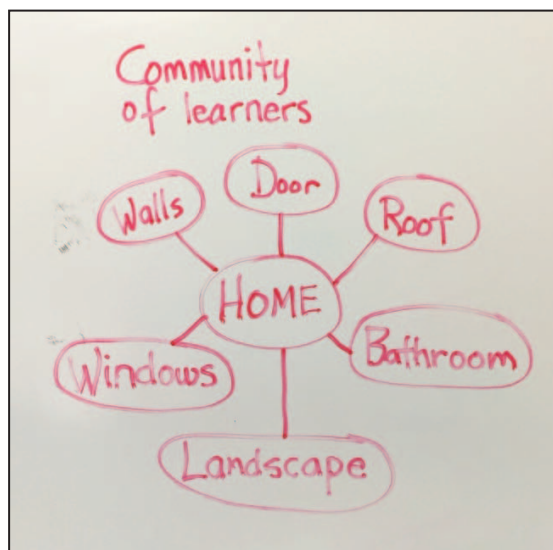


Figure 5. Concept map of “community of learners” for the idea of home.



Figure 6. Visualization of “community of leaders” constructed as a maquette supporting lesson planning praxis.
Photograph by author.

back to their civics lesson, all while making images based on civic engagement and community. STEAM-based teaching and learning wove the disciplines of art and civics into more than a simple mix of subject area. It facilitated a process of critical thinking, both visually and verbally, into how community is imagined, considered, and created by 1st-grade students as they navigate curriculum content through meaningful creative exploration.

The preservice teachers enrolled in ART300 are not art education students and many are wary of artmaking, not having developed a skill base as most art education students acquire. These students learn the art of integrative lesson planning and artmaking jointly, much like a guild-learning methodology. They practice techniques and making processes that are aimed at acquiring experience and confidence for successful and meaningful arts integration once they become classroom teachers.

ART300 aims to endow preservice teachers with a toolkit to equip them with tangible methodologies and applications when faced with real-life classroom curriculum challenges. The partnership prepared the preservice teachers to teach through the arts in a practicum setting with a classroom mentor while, at the same time, educating the mentors on the potential of meaningful arts engagement. Mentor teachers in this setting admitted to struggling with implementing arts integration as a vital component of classroom instruction and, because of the partnership, realized how arts integration could positively impact student learning and engagement.

The partnership offered mutually rewarding benefits; administrative personnel and classroom teachers acknowledged the potential for the practicum to address school and district standards and to support the school’s mission toward becoming a STEAM-based educational site. Universities may find that partnering with schools through a well-intentioned art integration program can support preservice learning outcomes through a field-based practicum while offering professional development for elementary classroom teachers. Preservice teachers can gain

more service hours with practical classroom experiences, and their mentors can glean an appreciation for how the arts can support all-subject learning.

Prospects in practicum placements at California State University Long Beach call for students to potentially engage in teaching through the art lab at the elementary school, delineating a specific site where students and teachers could learn through making and exploring art-specific content instruction. By making the arts integral to learning, the principal at this school has recognized and called witness to what the “A” in STEAM could provide for enhanced teacher/student learning. He has created a model of learning for his district—one that claims the “A” not as decoration, but as a vital and enriching component for elementary, and even secondary, classroom learning.

On Reflection

Maeda’s inspiring presentation ignited further commitment for arts advocacy and action as part of an inclusive teaching and learning methodology. The “A” in STEAM stands for “arts” but could also imply “action” since arts-based thinking/learning/teaching is an active, flowing process that stimulates connections across disciplinary interests. Arts educators can embrace STEAM as a partnership supporting transdisciplinary learning through investigation, critical thinking, and visual literacy. Preservice teachers can recognize the “A” and implement significant arts-based learning, advancing STEAM as an actionable process

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for building collaborative peer engagement. Participants in a partnership can explore a transdisciplinary approach to learning by considering curriculum content in each discipline and connecting research and exploration into arts-based outcomes that reflect a commitment to integrated learning.

STEAM can shift the paradigm of the arts from “nice to have” to “need to have,” as Maeda defined in his talk. Making the “A” a partner in STEM inserts the arts as an essential agent into what mindful arts integration can be, should be, and will be. ■

Author Note

Karen McGarry is a former Adjunct at University of Cincinnati, DAAP/Art Education. The model partnership described in this article was completed while an adjunct in the art education department at California State University Long Beach.

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Endnotes

- ¹ The quotes used in this article are gleaned from personal notes taken during John Maeda's presentation, "Super Session: STEM to STEAM: The Meaning of Innovation," at the NAEA Conference in New York City, March 2012.
- ² See, for example, the methodology behind TAB, *Teaching for Artistic Behavior*, at: <http://teachingforartisticbehavior.org>, and the approach described within Hetland, L., Winner, E., Veenema, S., & Sheridan, K. M. (2013). *Studio thinking: The real benefits of visual arts education*. New York, NY: Teachers College Press.
- ³ Thank you to Anne Uphoff, visual art educator at STEM Academy, Hollywood, CA, during the time of the pilot program. Information on Project Based Learning and the Buck Institute can be found at: <http://bie.org/>



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