QUDWA 2017

EXPERT MASTERCLASS

Teaching Creativity: From STEM to STEAM

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Speaker

Drue Kataoka, Artist, Technologist, Young Global Leader, World Economic Forum, USA

Summary Paragraph/Key Points

"How many of you like drumming?" asks Drue Kataoka, before showing a video of Richard Feynman, one of the world's greatest physicists, who was actually best known for his work in quantum mechanics and particle physics. Not only was he an advisor to NASA and the Presidency of the US, he was an accomplished drummer. But this genius of a man was terrified of joining a drawing class. When he eventually plucked up the courage, he then created a whole body of work. "I wanted very much to learn to draw, for a reason I kept to myself … I wanted to convey an emotion I have about the beauty of the world". In turn, he said this enabled him to connect to others with this emotion.

Mathematical tools were visual to him; as soon as he could draw them he could simplify them, and Kataoka claims this was one of the fundamental reasons that he won the Nobel Prize.

She presents another example of Albert Einstein, who started playing the violin when he was four years old. The violin, and the practice of playing music, helped him think and led him to his "Eureka!" moments. He stated: "If I were not a physicist, I would probably be a musician…I see my life in terms of music".

Kataoka cites many examples for the arts playing an incredible role in driving innovation in science. Alexander Graham Bell could discriminate pitch on pianos, which led him to invent the telephone. Samuel Morse was an extraordinary painter – in fact, he established himself as a painter before he invented Morse code. The Wright brothers were accomplished mandolin and harmonica players. By his own admission, Steve Jobs said that the single most influential class he ever took was on calligraphy

and was taught by a Trappist monk. Kataoka claims this one class inspired him to transform the Macintosh and change the path of history.

Kataoka is an advocate for schools to progress from STEM to STEAM (an educational approach to learning that uses Science, Technology, Engineering, the Arts and Mathematics as access points for guiding student inquiry, dialog and critical thinking). Through her work as a Technology Artist, she believes we need to move to a world that is more interdisciplinary. Countless examples across history have proven that the deeper the interest of students in their topic, the deeper their accomplishments in arts and music. Root-Berstein data proves that those scientists who have a deep and profound interest in the arts are more successful. For example, Nobel Laureates in the sciences are:

- 25 times as likely as the average scientist to sing, dance or act
- 17 times as likely to be a visual artist
- 12 times as likely to write poetry and literature
- 8 times as likely to do woodworking or some other craft
- 4 times as likely to be a musician
- 2 times as likely to be a photographer

Kataoka quotes Charles Vest, Former President of MIT and Former President of the National Academy of Engineering: “I cannot imagine MIT without its visual arts and performing arts component.” She encourages all teachers to collaborate across specialties, and explains the “10% rule” as a basic rule of thumb for all teachers to recall when preparing their syllabus. She recommends that Art teachers should take 10% of their time to reference scientific links, and Science teachers should take 10% of their time to talk about the influence of the Arts.

“Scientists should step out of the closet, and speak about their artistic interests. It troubles me to see artists saying that they are bad in math. Newsflash: Leonardi da Vinci was really good at math. It does not make you a better artist to be bad at math. We need to change the way we think about this as professionals as well.” Kataoka declares. “I believe that art in its highest form is technology, and technology in its highest form is art.”

A prime example of this is a piece of art Kataoka was asked to create for the 1st Zero Gravity Art Exhibit in Space at the International Space Station. As space exploration is about breaking boundaries she wanted to create something with relativistic elements embedded within it: a conceptual portrait of father of son, inspired by Richard Garriott, the astronaut. *Up!* is a painting in two pieces: one piece travelled into space with Richard Garriott’s mission, the other remained on earth. As she had studied the effects of Einstein’s Special Theory of Relativity, she describes how the celestial piece is a fraction of a second younger than the terrestrial piece, making the reunited artwork a conceptual portrait of Garriott father and son.

Another of Kataoka's artworks, *The Tree of Pascal*, is a digitally enabled ecosystem within which brainwaves of 100 different people keep a small tree alive. Inspired by "the thinking reed" described by physicist and mathematician Blaise Pascal, the glass is calibrated so that it reacts to the collected intensity of brainwave participants. When their input is high, the glass becomes transparent, and conversely it becomes opaque.

Other artworks in which she has combined infinite series of reflections, transparencies and complex surfaces demonstrate her passion for combining her scientific knowledge with her artistic prowess. "I love the idea of art as a living organism", she states. "What excites me is creating artwork that stimulates creativity in other people".

Kataoka challenges teachers to identify whether their classrooms are truly creative or whether they are symbolic of the dystopia presented by Pink Floyd, with their iconic song from 1979, "Another brick in the wall"?

She proposes three strategies for teachers:

1. Make your classroom stand out and do something different. Paint the walls, and make it interactive and fun.
2. Move things around. Change the expectations of the students, "so they don't get bored".
3. Leave some visual puzzles in the classroom to delight and surprise students, and stimulate their thinking.

Teachers should be creative directors of their classrooms, and Kataoka leaves us all with the challenge of how we can think differently to do that.

MAIN TAKEAWAY: By incorporating the arts into an interdisciplinary method of teaching, all classrooms can be visual, musical, creative and inspiring, and assist schools in moving from STEM to STEAM.