This Neuroscientist Wants to Know Your Brain On Art—and How It Improves Learning

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Research around the way humans learn is booming these days. Consider viral brain-based teaching trends and explorations of how the act of teaching shapes kids’ brains.

Mariale Hardiman, vice dean of academic affairs at the Johns Hopkins School of Education and and director of Johns Hopkins’ Neuro-Education Initiative.

But studying how the brain learns doesn’t necessarily mean memorizing proteins and brain chemistry. Sometimes it’s about empathy—or in the case of some of the latest research coming out of Johns Hopkins, it’s about understanding how art plays a role in learning.

One person who has closely watched, and even shaped, the coevolution of neurosciences with education is Mariale Hardiman, vice dean of academic affairs at the Johns Hopkins School of Education. The education professor is also the co-founder and director of Johns Hopkins’ Neuro-Education Initiative, a center that aims to bring together research on learning and neuroscience, teaching and education.
EdSurge sat down with Hardiman recently to learn about the Initiative’ recent findings around how injecting art into lessons across disciplines can boost memory and retention. (This conversation has been lightly edited and condensed for clarity.)

EdSurge: I’d like to start with a bit of history about the program. What were you hoping to do with the program when it was first launched?

Hardiman: So it launched in 2007. The 90s was the decade of the brain. All these neuro fields were popping up—neuroaesthetics, neurolaw, looking at things like adolescent brain development. So much research came out in the popular media and it seemed that teachers were becoming interested. So I connected with people who run the Learning and the Brain conference and began to attend. And in my own doctoral work here at Johns Hopkins I became interested in looking at the research on neuro and cognitive sciences and what of that is relevant to educators. And how is this research informing how children learn and why should teachers be consumers this research.

(1) Hardiman worked in the Baltimore City Public Schools for more than 30 years before her role at Johns Hopkins. She was a principal at the time that she developing Brain-Targeted Teaching.

My first book was in 2003 (1*), and that book was all about connecting research with effective teaching. And in that book I launched what I called the Brain-Targeted Teaching model. At the time, our state test was based upon performance assessment, and learning the thinking skills framework. So based on that framework and other frameworks like Bloom's Taxonomy and multiple intelligences, I married those thinking skills frameworks with what I felt was really relevant from the neuro and cognitive sciences and created a teaching model to a translational model.

I came up with six areas that I called brain targets. When I was studying at Hopkins, my professor knew I was interested in this. What he said to me was, ‘Brain-based learning is the silliest thing I've ever heard,’ or ‘Where else would learning occur? We don’t think with our feet.’

And I looked at him and I said, ‘Yes, brain-based learning is a silly way to describe it. However, while we know all learning is brain-based, we also know that all teaching does not result in learning.’ I don’t use the term brain-based learning. I focus on teaching targeted to how the brain thinks and learns. And that's how I came up with the name Brain-Targeted Teaching. I’ve been doing talks like this for 10 or more years.

What does Brain-Targeted Teaching look like in practice?

(2) A simple breakdown of Brain-Targeted Teaching:

1) Climate
2) Environment
3) Design
4) Mastery
5) Application
There are six components (2). The first is the emotional connection to learning, which has just exploded in terms of the research. Some of that is on the effects of stress on learning, and then also the effects of positive emotions and personal connections to learning. Social-emotional learning programs have proliferated—the idea that schools can be protective factors for students who are in toxic stress situations. A lot of intervention has been developed, like mindfulness training, restorative practices, et cetera.

The second component is how the physical learning environment—like light, sound or too much noise—can impede learning.

The third target is looking at the brain’s propensity to use patterning and think holistically to design instruction. What are the standards that we want the children to know? How does that map into objectives? How are you going to evaluate it? And now let’s start thinking through what activities we’re going to do for mastery and for application.

The arts became a central part of this because I found that art teachers working with classroom teachers really helped them think through creative ways to plan those units.

Brain target four: What strategies are we using from the neuro and cognitive sciences to teach for mastery? And mastery means memory. You have to remember what you’re learning or else you can’t do anything like that. And we know that’s a problem in education. Think about summer slide (3) right now. Many, especially vulnerable learners, seem to lose the most over the summer. I started looking at things like chunking, active retrieval, spacing and then, obviously, repetition.

As I thought about repetition, that’s where the arts first started coming in. You don’t want to teach something if you’re going to repeat that content enough times that it sticks. You certainly don’t want to keep teaching them the same way over and over again. That’s going to be pretty darn boring for them. So how can the arts help to reinforce content, and then how can it help to teach it in the first place? And so we started embedding the arts into every Brain-Targeted Teaching learning unit.

Brain target five then is applying knowledge. When kids can demonstrate that they understand something, that they know something, you’re done teaching when they can do something real with it. So what are the big-picture activities that you want the children to be able to do or apply in some way? That mirrors project-based learning.

Then six is evaluation, and lots of research around feedback and even student’s’ knowledge of when they’re getting feedback and how that affects performance. Not assessing of knowledge but assessing for knowledge.

What areas of research is the center looking at right now?
We published two randomized controlled trials, one in 2014 and then the second one in 2019. Then we did a similar study where we randomized kids and wrote treatment and control units using the same science content and matching for duration of activities and dosage as tightly as possible.

While we know all learning is brain-based, we also know that all teaching does not result in learning.

Our research question was, is teaching with arts integration the same as or better than traditional instruction? And the reason we said ‘same as,’ is that there are so many other benefits from the arts [that are] well documented, like student engagement, creative thinking and problem solving. So we were just testing memory [after] 10 weeks out, which is similar to the summer slide.

So every group of randomized kids got one unit with one condition, and then the reverse in a different content. So they may have had astronomy and arts integration for three weeks and then took a post-test and then went on to their second unit, which would have been in the opposite condition.

How was this being measured?

Very standardized. Just multiple choice. And interestingly, in both studies what we found was the real drivers of this are for students at the lower levels of achievement. In the second study, we broke students down into proficient and advanced, proficient and basic. Both times the kids at the lower levels of achievement really rocked it in terms of what they remembered in arts versus what they remembered in traditional instruction.

For kids at the higher levels of achievement, there was no difference, really. So there was no harm done. But that makes sense because if you are an adept learner in the traditional style, then you don’t need anything different to be an adept learner. You can learn the way your teacher teaches you. But if you have maybe a learning disability, you don’t speak English as well as others or your achievement has not been the same, arts gives these children multiple ways to express what they know.

How do teachers respond to this? Have you ever run up against, say, a math teacher who doesn’t want to incorporate arts into their lessons?

(4) Hardiman told the *New York Times* that “arts integration should not replace arts education.” She instead suggest a three-pronged approach: arts education, arts and cultural offerings, like museum visits, and then integrating the arts into teaching other subjects.

That’s a really interesting question. In fact, it is another study we’re doing because we gathered a lot of data from the teachers. We’re now studying the student results compared to how the teachers said they liked teaching the units. But we haven’t published that yet. I can just tell you anecdotally we did see a teacher who just said, ‘I really don’t like to sing. I don’t want to sing in front of my kids.’ So, you know, we tried to help her out. If this were to be instituted, you’d just have it on CD or on your phone and play the song. You don’t have to sing. But our art activities were simple enough (4) that it did not require teachers to have a degree in the arts at all. And we did training, so we walk them through the arts activities, so that they could do that in our
training before the study.

You mentioned how the '90s was sort of this boom of brain science research. How has the conversation and research around neuroscience and education changed over the last few decades?

(5) Hardiman believes teachers should know some neuroscience basics. Does that mean they need to know every protein and mechanism that occurs in the brain? "No," she says. "But do they need to know that for the children in front of them, their brains are continuing to grow... Teachers' belief systems, what we call efficacy beliefs, is mapped to student achievement tighter than almost any other construct."

There's so much more acceptance. So many more people are writing books and articles. And you know, when I first started in this field and my, when my book first came out in 2003, I will say that there were a lot of people, especially in the field of education, not even in cognitive science or psychology, brain science [that rejected the idea]. It was education professors (5) who didn't want to have anything to do with this.

Could asking teachers to use these techniques backfire?

I think one area that we should be cautious of is that there's a lot of research on the effects of toxic stress. And a lot of the research was done with children in poverty. So the idea that children in poverty do experience more toxic stress than children who do not grow up in poverty.

So what I would worry about is if someone said, “These kids’ brains are impaired [due to stress] [so] these children can't learn because they're in poverty, and their brains had been damaged.” What I always say with that is that the brain is plastic. And can schools be protective factors and reverse any effects of stress? And the answer is absolutely yes. And that's where we get into the strategies.

(6) Some education experts are more skeptical of SEL. Chester E. Finn, Jr., a fellow and president emeritus of the Thomas Fordham Institute, recently wrote: "We see a clear and present danger that SEL could go off the rails in any number of ways,” if not implemented properly.

So I would never want to give them research without saying, Here's what you can do as a protective factor. That's also why the SEL [social emotional learning] (6) stuff is important because what we’re learning is one of the most important protective factors for kids is a relationship with a caring adult in a school building.

What else are you paying attention to that's happening in this field right now?

(7) Federal funding for arts in education has experienced major cuts in the last decade, going from $40 million in 2010 to $26.9 million in 2018.

What I'm most excited about is could the arts be a driver of school reform instead of a victim? (7) Could the arts actually help to
Nobody knows quite how to close the achievement gap, and I think that the arts could be at least one answer. And that’s what I want to do. I want to keep studying this and seeing whether or not we can have all students learn at high levels and just be excited about learning, and the arts do that.

*Footnotes can be viewed in the desktop version of this article.

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