

Ben Giles

### **CRITICAL THINKING**

# Want Mastery? Let Students Find Their Own Way

Prominent scholars say that to drive deeper learning, students need to become accustomed to confusion—and develop the persistence to find their own answers.

**By** Emily Kaplan

December 11, 2019

A few years ago, a little boy asked me when the world had become colorful.

I asked him what he meant.

Well, he said, anyone can see that when you look around now, everything has color. But in the old days, everything used to be in black and white. So what year did all the colors come?

I blinked.

He blinked.

I asked what made him think that the world used to be in black and white.

Because of the photos, he said, his exasperation evident. Like, in all the photos from a long time ago, there was no color. And on TV, too: no color. And he'd recently seen a clip from an old movie, he told me. And guess what: It didn't have color either.

If Eleanor Duckworth, professor emerita at the Harvard Graduate School of Education, had been there, she probably would have tried to tug at the limits of the little boy's conceptual framework. She might have shown him a photo taken recently that was in black and white; perhaps she would have asked him to consider what he knew about cameras and film, prompting him to consider the role of technology in presentations of the past.

What she would not have done, I feel quite certain, is correct him—by telling him that he'd made an incorrect assumption, or that he was drawing from a limited set of data.

But that's what I did—gently, of course, but ultimately misguidedly. I told that little boy that while the conclusion he'd drawn made sense given what he knew, it wasn't accurate. And, in doing so, I constructed a counterproductive shortcut in the fruitful, winding paths of his curiosity.

#### **TEST SCORES AREN'T MASTERY**

I recently had the chance to talk with Duckworth in a café in Cambridge, Massachusetts, where she's lived since the 1960s. Over tea, we talked about the nature of understanding—a subject that still fascinates her into her 80s.

Duckworth was a student of Jean Piaget, the Swiss psychologist and epistemologist who pioneered the theory of constructivism, which holds that children (and adults) actively construct knowledge and meaning from their experiences—and when they bypass this exploratory process, they forgo true, lasting learning.

#### In 1986, Duckworth published a pioneering paper titled "Inventing Density

(http://www.ndsg.org/monographs/NDSG\_1986\_Duckworth\_Inventing\_Density.pdf)," Which describes what happened when she presented a group of teachers with an assortment of materials—dishpans, snail shells, scrap metal, Styrofoam, driftwood, and the like—and a container of water. Given no specific directive, the teachers spent several weeks experimenting with the materials, discovering scientific relationships and physical properties through trial and error. Eventually, the group derived their own explanation of what floats and what sinks, constructing a much more enduring definition of the concept than if an expert had merely informed them that density equals mass divided by volume.

The paper's opening paragraph is emblematic of Duckworth's conception of learning as an iterative, perpetually incomplete practice: "This is a story about the collective creation of knowledge: its multiple beginnings; its movement forwards, backwards, sidewards; its intertwining pathways," it reads. Throughout our conversation, she returned, again and again, to these themes—that curiosity is the necessary impetus for learning; that questions, whether direct or indirect, are the only way to deepen comprehension; and that understanding comes only in degrees.

Similar insights emerge in the work of Constance Kamii, another influential Piaget protégé and a professor of education at the University of Alabama at Birmingham. In the 1990s, Kamii developed a math curriculum in which children aren't taught standard algorithms, but are instead encouraged "*to invent their own procedures* (https://sites.google.com/site/constancekamii/videos)" to solve the problems. Kamii and her colleagues found that while this

constructivist approach is far more time-consuming than traditional top-down instruction, it creates deeper, more lasting learning.

"It may seem more efficient to teach the algorithm," Kamii says in one video. "But when we ask traditionally instructed fourth-graders why they work from left to right in division but not in addition, subtraction, and multiplication, they always say that they don't know why—but are following the rules given to them by the teacher. Such blind obedience is the opposite of critical thinking." Instead, she argues that teachers should create environments characterized by student-driven exploration, which empowers them to discover properties and derive relationships independently.

In other words, to understand anything, learners must wrestle with a concept. As so many teachers know, what sometimes passes for true learning—say, the recitation of facts on a standardized test—is only a shallow impersonation of the real thing. "To be in a state of confusion is the richest way to increase your understanding," Duckworth told me. Confusion—the struggle to reconcile contradictory ideas—compels the learner not only to further investigate notions but to acquire additional information in the process.

Throughout our conversation, Duckworth emphasized that there is no such thing as complete understanding—nor, for that matter, are there such things as true mastery or fluency. At what point can one say that one has mastered the violin? Is it when you solo at Carnegie Hall? And, even then, what happens when, after you've already mastered it, you improve—is your mastery somehow even more complete?

## OK, BUT HOW CAN I DO THIS IN MY CLASSROOM?

Contemporary educators are seldom afforded the time to teach in a way that allows the kind of open-ended, curiosity-driven exploration that leads to deep understanding. "Most teachers know that education right now is nutty," Duckworth says ruefully. In an era defined by cramming as much curriculum as possible into a school day and a fetishization of standardized testing—with its goal of teaching students to choose among predetermined answers as quickly as possible—the teacher doesn't have time to do the job: to provide the time and the raw material to encourage self-directed learning.

Despite the constraints placed on today's teachers, however, Duckworth says, simply encouraging teachers to be aware of constructivist opportunities can help. Teachers should have the attitude of encouraging students "to just keep going," she says. The most important role for teachers to play is not to provide answers, but to model the pleasure of being in a constant state of discovery.

Of course, teachers must work with the reality that there are curricula to follow and standards to address—often, many more of them than they feel they can handle—and that there are already too few hours in the day. For teachers who feel that they can't fundamentally change the way they teach, there are ways to infuse constructivist practices into existing pedagogical structures. Some teachers add in a short period—whether a few minutes a day or an hour a week—of student-driven instruction (/article/genius-hour-elementary-school); others take stock of the way they talk with students, and attempt to make sure that students' curiosity (/article/teaching-students-how-ask-productive-questions) dominates discussions. Ultimately, the shift to constructivist pedagogy is less about specific practices and more about a shift in priorities: away from immediate outcomes and toward a messier, unfinished, and deeper form of understanding.

A year or two after I met the little boy who asked when color had come to the world, I decided to orient my secondgrade classroom around my students' curiosity. I encouraged my students to investigate anything that piqued their interest, to wander down tantalizing rabbit holes of Guinness World Records and *Who Would Win* (https://www.scholastic.com/teachers/lists/17-18/who-would-win-series-book-list/) books and kids' encyclopedias. A few months into the year, after working for weeks on a book they called *Weird but Awesome Animals*, two of my students brought their creation to my desk.

"Look!" the boys exclaimed, flipping through the pages of their book. Did I know that slugs have four noses? Or that kangaroos can't fart? They laughed and laughed, as second-grade boys do.

They turned to the Weird but Awesome Sea Creatures section, showing me their labeled illustration of the skate.

Did I know anything about skates? they wanted to know.

I admitted that I did not.

They were eager to educate me. Skates are a relative of the stingray, one boy said authoritatively. Then the other jumped in: Did you know that skates don't have any cones in their eyes? They can only see in black and white!

Really? I asked. Now my own sense of curiosity was piqued. I thought back to the little boy who'd asked about when the world had no color. For the skate, it seemed, this had always been true. Understanding, I was reminded, is just a matter of degree.

I realized then that I shouldn't have been too quick to assume that the little boy was wrong; the route to his conclusion had been flawed, but perhaps the conclusion itself hadn't been. I shouldn't have been so quick to be a teacher rather than a student. His question should have prompted me to pursue my own paths of inquiry: Was there anyone, anything, that saw the world black and white?

I marveled at the two little boys in my classroom, proudly showing me the results of their investigations. I smiled at them. "No, I didn't know that," I said. "Thank you for teaching me."

Editorial correction: An earlier version of this article incorrectly stated that "density equals mass times volume." It has been corrected to say that "density equals mass divided by volume."

# SHARE THIS STORY

#### **FILED UNDER**

**Critical Thinking** 

**Inquiry-Based Learning** 

Student Engagement

#### **CRITICAL THINKING**

Getting to the Heart of What Students Know in Math