Learning from the Natural World

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In a testy op-ed piece published in Science more than a century ago (1), the American botanist and museum curator William J. Beal asked, “What is nature study?” Beal posed the question at a time when educators across much of the United States had embraced the movement to provide elementary school students with regular firsthand exposure to the natural world. But even as millions of young schoolchildren were learning to identify local birds, observe the life cycles of insects, and cultivate school gardens, debates raged about the goals, methods, and even the very definition of the educational innovation that had come to be widely known as nature study. Was this new approach primarily an effort to introduce the rudiments of science or to cultivate a broad sympathy for the natural world? Like many of his colleagues, Beal acknowledged that the burgeoning nature study movement had accomplished much good, but he also worried that the educational activities carried out under that name relied too much on imagination and sentiment rather than reason and cold, hard scientific facts.

In Teaching Children Science, historian of science Sally Gregory Kohlstedt (University of Minnesota) offers a meticulously researched, engagingly presented, and wonderfully perceptive history of the multifaceted nature study movement. Prior to the end of the 19th century, a handful of widely scattered American educators had introduced natural history into their classrooms, but they failed to gain a lasting foothold for their curricular innovations. By the 1890s, however, progressive educational reformers increasingly challenged the hidebound curriculum that had long dominated American primary schools, a curriculum that used rote memorization and recitation to teach the venerable trivium of reading, writing, and arithmetic. Resonating with these calls for reform, nature study advocates called for a more hands-on, child-centered approach to primary education, one that relied on extensive interaction with the natural world to enliven a mind-numbing curriculum that tended to squelch rather than encourage children’s inherent curiosity. But beyond a commitment to placing local natural objects at the center of the learning experience, the professors, teachers, and educational administrators who promoted nature study shared little else in common. Even so—or as Kohlstedt argues, perhaps because of this very diversity—nature study rapidly gained entry into America’s public schools during the century’s final decade.

More-or-less distinct visions for the enterprise radiated from at least three geographic centers. In Chicago, Wilbur Jackman introduced his particular approach with a pioneering text (2). Through this, subsequent publications, and prominent positions at the Cook County Normal School and the University of Chicago’s Laboratory School, Jackman promoted a “rolling year” curriculum in which students experienced regular field trips during the warmer months of the year and completed indoor observations and experiments when cold weather made venturing outdoors less appealing and less productive. In New York City, the newly opened Teachers College of Columbia University and several normal schools in the region joined forces with the American Museum of Natural History, the New York Botanical Garden, and other local natural history institutions to promote the wide adoption of an urban-focused nature study. Maurice Bigelow, a Harvard-trained biologist and Teachers College faculty member, launched the first professional journal specifically devoted to the topic, Nature-Study Review, in 1905 and the American Nature-Study Society two years later. According to Kohlstedt, these events perhaps marked the “high point of the nature study movement.”

At Cornell, the botanist, horticulturalist, and educator Liberty Hyde Bailey, whom Kohlstedt describes as “perhaps the most publicly recognized name in nature study,” focused on rural contexts. He hoped that fostering a stronger sense of place in rural children, along with a sense of wonder about the rich natural bounty that surrounded them, would help stem a troubling out-migration from America’s hinterlands. In a widely cited and frequently reprinted book (3), Bailey argued that “Nature study is not a science. It is not knowledge. It is not facts. It is spirit. It is concerned with the child’s outlook on the world.” Numerous Cornell faculty shared Bailey’s vision, including Anna Botsford Comstock, who authored a leading text in the field (4) that remains in print to this day.

In the years following the Great War, science and technology gained in cultural authority, progressive optimism waned, and standardization and testing increasingly infiltrated America’s larger school systems. In this new cultural and educational milieu, “elementary science,” which included not just beginning biology but also basic chemistry and physics, triumphed over nature study. Behind the name change, however, Kohlstedt sees much continuity: “A legacy of window boxes, school gardens, nature walks, classroom terrariums, and hamster cages—whether designated ‘nature study’ or not—remained as evidence of the significant classroom innovation that had occurred in just one generation.” At the same time, nature study continued to infuse the informal educational experiences offered through scouting programs, Audubon societies, summer camps, and state and national parks.

A definitive history of the American nature study movement, Teaching Children Science will appeal not only to historians of science, education, and the environment but also to environmental educators of all persuasions, who continue to struggle with the tension inherent in trying to inculcate students with both a sympathy for and a scientifically

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Sampling nature. Elementary school students collecting caterpillars to study (Louisville, Kentucky, circa 1910).

Teaching Children Science
Hands-On Nature Study in North America, 1890–1930
by Sally Gregory Kohlstedt
informed understanding of the natural world. In the current era of increasing environmental peril, it is more imperative than ever that we strike the right balance here.

References

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PSYCHOLOGY

Seeing and Thinking
in the Mist

Aude Oliva

In a scene reminiscent of “Candid Camera,” a disoriented “journalist” holding a map asks a pedestrian for directions while events are captured on video. As the pedestrian diligently points along the map, two “workers” carrying a large door rudely walk between the interlocutors, disrupting the face-to-face conversation. Behind the door, out of the sight of the pedestrian, one worker changes places with the journalist and proceeds to continue the conversation. Amazingly, more than half of the pedestrians who had unknowingly walked into this experiment failed to notice that they were now talking to someone new.

In The Invisible Gorilla, cognitive psychologists Christopher Chabris (Union College, New York) and Daniel Simons (University of Illinois) describe psychology experiments, historical facts, and interesting anecdotes that reveal the fallibility of our intuitions about what we see, remember, know, think, predict, and believe. The book explores illusions of attention, memory, confidence, knowledge, cause, and potential, which in essence work in concert and construct the mind. With each chapter, the reader’s self-awareness grows as previously neglected dimensions of our everyday experience are witnessed.

Dating back to Ronald Rensink’s 1997 demonstration of “change blindness” (1), many of the visual illusions described in the book have become popular teaching tools featured in countless lectures and videos. The authors’ infamous gorilla experiment (2), now a staple in vision sciences studies, asks the participant to count the number of times a basketball passes between members of one of two distinct teams while a “gorilla” walks through the scene. Surprisingly enough, most participants miss the imposing gorilla, even though it stops to bang its chest, as they are too focused on the assigned task. I have probably ruined the effect for you, but try it on a friend.

The gorilla illusion is an elegant demonstration of attentional blindness, a phenomenon describing how people can miss unexpected objects that appear right where they are looking. The belief that we can see and remember more than we actually do creates an illusion of control, one that can be dangerous when talking on the phone while driving or texting while crossing a street. We are never completely in charge when we are multitasking. We have limited mental resources and the more demanding a task is, the less resources are available to catch the wandering gorillas. Our mind is faithful to one thing at a time.

Take the illusion of memory: Because the world is consistent and predictable most of the time, we rely on our past experiences to fill in the proverbial blanks of what was actually seen with what we think we saw. Failure to recall exact details can lead to continuity errors. The authors discuss the job of the script supervisor, who is supposed to ensure consistency between scenes by tracking all of their details. Do script supervisors have a superior memory? Perhaps not, but critically important details are better remembered when we have feedback about what was missed, such as a script supervisor’s notes. Real life, for better or for worse, does not often provide such feedback.

Chabris and Simons explain the illusion of confidence (the tendencies to overestimate our abilities and to confuse other people’s confidence levels with their real capabilities) through tightly reasoned descriptions of tournament games, competitive reality shows, and other group decision processes.

The authors describe ingenious experiments on the “confidence inflation phenomenon”: individuals who all independently register low levels of confidence about an option will regardless choose that option with high confidence by simply deliberating among themselves. In addition, groups such as juries who must reach a collective decision are susceptible to arriving at the wrong conclusion because it was argued for by someone extremely confident in their logic, despite its flaws. Inflated confidence can defeat the purpose of a group meeting (to combine knowledge to arrive at the best possible decision).

The illusion of potential leads people to believe that there are mental exercises that can make them smarter, faster, prettier, or stronger. That conviction is even more inflated when merged with the illusion of knowledge, where people confuse the mere familiarity they acquired from repeated exposures to a concept with a true understanding of the process. Add the other illusions to the false beliefs and you can picture how the mind functions: the six illusions work together, one for all and all for one. Altogether, I applaud Chabris and Simons’s articulate communication of the many ways our minds fail us.

What have we learned? Vision can be blind, memory egocentric, knowledge sparse, reasoning false, and thoughts doubtful. So, are our minds hoaxes? No, these illusions are the consequences of how our brains work. Most of these failures are shortcuts that our minds use to deal with the overflow of information. The danger is not that our minds work this way but that we often wrongly estimate our capabilities and limitations. By making us aware of the realm of everyday illusions, The Invisible Gorilla teaches us a lesson of cognitive modesty: think before you leap.

References

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Frequently missed. A frame from the gorilla experiment.