

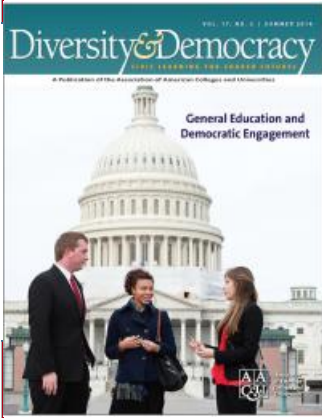


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[Current Issue](#)

Search Periodicals

Search

TABLE OF CONTENTS

[Overview](#)

[From the Editor](#)

[Modeling Democratic Practices through General Education Reform: A Developmental Journey](#)

[Moral Discernment: Essential Learning for a Principled Society](#)

[Public Sphere Pedagogy: Engaging Students as Participants in Democracy](#)

[Connecting Democratic Engagement and Global Learning in General Education](#)

[Integrating Democratic Education at Stonehill](#)

[Bridging Cultures to Form a Nation: A Project for Democracy](#)

[Science Literacy: A Key to](#)

Diversity and Democracy

Science Literacy: A Key to Unlocking a Fully Engaged Citizenry

By: Amy F. Savage

In January 2011, Bard College implemented an innovative addition to the college's first-year core curriculum. Emphasizing science literacy as a necessary tool for lifetime civic engagement, Citizen Science lays the foundation for students to develop the key habits of mind and critical thinking skills that allow for informed decision making about scientific claims. Required of all first-year students, the program generates campus-wide conversations about the processes of scientific inquiry and their applications to complex, real-world problems.

Science Literacy and Citizenship

Bard College is a private college of the liberal arts and sciences located in New York's Hudson Valley. Central to the Bard culture is the core curriculum, which is most pronounced during students' first year of study. In keeping with the goals of a liberal education (AAC&U, n.d.), Bard's core curriculum aims to provide all students with opportunities to engage with complex issues in a diverse and changing world, to develop a sense of social responsibility, and to build practical skills across major fields of study. Experiences like these have been positively associated with an inclination to inquire, lifelong learning, openness to diversity and challenge, and socially responsible leadership (Seifert et al. 2007).

The first-year experience at Bard College is designed around the belief that an educated citizenry is essential for responsible social action and community well-being (Lang 1999). In today's world, such an educated citizenry must be prepared to make decisions that are rooted in scientific or technological knowledge. Whether as voters or advocates, today's citizens need to be able to engage with scientific issues of societal concern, such as environmental sustainability and climate change, the risks associated with nuclear power, or the increasing drug resistance of certain microorganisms. They also need to be able to apply scientific information at the individual level—for example, incorporating new information about experimental drug therapies or genetic data into their health decisions (Dougherty et al. 2014; Lupia 2013).

[Unlocking a Fully Engaged Citizenry](#)

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[An Ethic of Listening in Higher Education](#)

[Parts of a Whole: Contingency, Democracy, and Higher Education's Mission](#)

[Game Theory and Reality TV: Pathways to Democratic Thinking](#)

In order to fully consider the implications of these complex societal and individual issues, citizens must be able to engage appropriately with scientific evidence and language. Yet most Americans are scientifically or technologically illiterate (National Science Board 2004). Without the agency and the competency to engage appropriately with scientific information, they are left with a disempowering alternative: to turn over responsibility for their decisions to someone they perceive to be credible and hope that person chooses wisely (Lupia 2013). To avoid this outcome for students and help develop a fully engaged citizenry, colleges and universities must actively advance science literacy. With this goal in mind, Bard College added Citizen Science to its first-year core curriculum.

Learning Goals

Citizen Science is a science literacy program required of all first-year students at Bard, regardless of their intended field of study. Policy makers and educational advocates have done much to articulate the concept of science literacy for students at the K–12 level (see, for example, the American Association for the Advancement of Science's Project 2061 at project2061.org). But reformers have placed comparatively little emphasis on science literacy for college students, even though college is potentially the last opportunity educators have to instill necessary life skills.

When developing the learning goals for the Citizen Science program, faculty and administrators at Bard College considered current nationally accepted ideas about the features of a scientifically literate individual. Summarized generally, a scientifically literate individual understands how science works. More specifically, a scientifically literate individual knows how to ask scientific questions, how to collect and evaluate empirical data, how to identify patterns in those data, how to access and read relevant primary research, and how to determine the strengths and limitations of different methodologies (Coil et al. 2010; Feinstein 2010). In the Citizen Science program, students develop these characteristics while learning how to identify the proper use of evidence and how to differentiate between scientific and pseudoscientific claims.

Program Elements

Citizen Science is a short, immersive academic experience held between the fall and spring semesters of students' first year. Accommodating an average incoming class of about five hundred students, the program consists of approximately twenty-seven concurrent sections, each following a slightly different path (determined by faculty expertise) to the same learning goals. Over the course of twelve teaching days, all students consider the question, "How do we reduce the global burden of disease?"

Just as professional scientists employ a range of

approaches to address such large questions, so too do Bard students. In order to both mirror the diversity of scientific approaches and engage a broad spectrum of learners, the twelve days consist of three distinct four-day rotations, through a microbiology laboratory, a computing module, and a problem-based learning (PBL) unit. In the laboratory, students use microbiological techniques to develop inquiry-based experiments within a compressed timeframe (Savage and Jude 2014)—for example, hypothesizing the degree or type of bacterial contamination on different surfaces, designing and conducting experiments testing their hypotheses, and analyzing the resulting data. In the computing module, students build and apply computer models to identify patient zero in a disease outbreak or analyze the relationship between vaccination and herd immunity, often using data they have collected in the lab or obtained from public repositories. Finally, both during the PBL unit and throughout the program, students synthesize their own experiences, empirical data, and current and historical literature as they engage in discussion and small-group work.

In collaboration with Bard's Center for Civic Engagement, the Citizen Science program supplements students' academic experiences with science outreach activities in area school systems. Since Citizen Science began incorporating these outreach activities, considerably more Bard students of all academic majors have elected to participate in sustained, year-round science outreach opportunities in local schools and communities. By remaining engaged in this way, these students are reinforcing literacies they gained during Citizen Science, as well as promoting science engagement and literacy among the local community's youngest citizens.

Promising Outcomes

Though the Citizen Science program is young, student participants have reported significant learning gains in the areas the program was designed to address. These include improvements in their ability to recognize the appropriate use of evidence, understand scientific material, and identify patterns in data (Savage and Jude 2014).

Building on the program's early successes, a team of Bard College science faculty have obtained support from the Howard Hughes Medical Institute (HHMI) Science Education Initiative to draft a working definition of science literacy at the college level, to develop pedagogical tools supporting science literacy, and to develop assessment tools to measure the efficacy of these interventions. Entering its third year, the HHMI project works with the Citizen Science program to build strategies that foster science literacy in all students, across the undergraduate curriculum.

References

Association of American Colleges and Universities

(AAC&U). n.d. "[What Is a 21st Century Liberal Education?](#)"

Coil, David, Mary Pat Wenderoth, Matthew Cunningham, and Clarissa Dirks. 2010. "Teaching the Process of Science: Faculty Perceptions and Effective Methodology." *CBE Life Sciences Education* 9: 524–35.

Dougherty, Michael J., Katherine S. Lontok, Katherine Donigan, and Joseph D. McNerney. 2014. "The Critical Challenge of Educating the Public about Genetics." *Current Genetic Medicine Reports*. doi:10.1007/s40142-042-0037-7.

Feinstein, Noah. 2010. "Salvaging Science Literacy." *Science Education* 95 (1): 168–85.

Lang, Eugene M. 1999. "Distinctively American: The Liberal Arts College." *Daedalus* 128 (1): 133–150.

Lupia, Arthur. 2013. "Communicating Science in Politicized Environments." *Proceedings of the National Academy of Sciences* 110 (suppl. 3): 14048–54.

National Science Board. 2004. "Science and Technology: Public Attitudes and Understanding." *Science and Engineering Indicators 2004*. Arlington, VA: National Science Foundation. <http://www.nsf.gov/statistics/seind04/c7/c7s2.htm>.

Savage, Amy F., and Brooke A. Jude. 2014. "Starting Small: Using Microbiology to Foster Scientific Literacy." *Trends in Microbiology*. <http://dx.doi.org/10.1016/j.tim.2014.04.005>.

Seifert, Tricia A., Kathleen M. Goodman, Nathan Lindsay, James D. Jorgensen, Gregory C. Wolniak, Ernest T. Pascarella, and Charles Blaich. 2007. "The Effects of Liberal Arts Experiences on Liberal Arts Outcomes." *Research in Higher Education* 49 (2): 107–25.

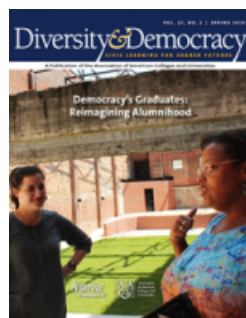
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