Andrew Fiss, *A History of Communication and Anxiety in the American Mathematics Classroom*

New Brunswick, NJ: Rutgers University Press, 2020. Pp. 216. ISBN 978-1-9788-2021-0. $150.00 (cloth).

David E. Dunning

University of Pennsylvania

Readers of this journal will be unsurprised by the claim embedded in the title of Andrew Fiss's recent book that the history of American mathematical education reveals the performativity of mathematics. They may be more surprised, however, by the rich double meaning of 'performative' active throughout this engaging book. That maths is performative in the sense of students learning tacit rules for acting like maths students aligns with our widespread understanding of knowledge production as culturally situated. But Fiss means more than this, presenting student-led theatrical performances as central to the culture of studying maths at college. From the militaristic norms of blackboard demonstrations to elaborate traditions of burning or burying a textbook, learning maths, Fiss argues, was inseparable from performing one's identity as a college student on literal stages of various kinds in nineteenth-century America. These student productions were typically also ways of performing masculinity and whiteness, though Fiss uncovers fascinating instances of resistance to those norms as well.

Fiss motivates his analysis in relation to maths communication and education in the present, arguing that a view of mathematics as closely tied to art and theatre is not only historically accurate but also conducive to effective maths communication in classrooms and the public sphere. He invokes a movement called 'STEAM', which calls for integration of A – the arts – in the better-known acronym STEM (science, technology, engineering and mathematics). Maths communication matters because maths anxiety – though the term was coined relatively recently – is a long-standing and pervasive affliction in American education more generally. As Fiss shows, what it meant to perform mathematics in the classroom changed drastically over the course of the nineteenth century, yet the capacity of this performance to provoke stage fright was constant. The argumentative framing is thus unapologetically present-focused through its interdisciplinary engagement with communication studies. Fiss does not aim to upend received views in the historiography of mathematics, though the arguments described above certainly make novel contributions to that field, revealing previously uncharted layers of performativity that characterized American maths education during a formative period. He centres student experience wherever possible, modelling a history of mathematics that is more than a history of mathematicians.

Chapter 1 examines the contentious early nineteenth-century transition from the custom of students reading aloud from their textbooks to an expectation that they read aloud from diagrams. Yale president Jeremiah Day promoted new mathematical pedagogies as avenues to the attainment of mental discipline more generally. Yale alumnus and New Haven schoolteacher Nathanial William Taylor Root took this ethic even further, integrating mathematical discipline with gym classes and military drills. Through mental and physical discipline alike, maths students were to pursue an emerging ideal of disciplined masculinity, with textbook diagrams choreographing exercises of multiple kinds.

https://doi.org/10.1017/S0007087423000407 Published online by Cambridge University Press

Chapter 2 describes a tradition of elaborate, rebellious student performances beginning with the storied Burial of Euclid at Yale. Though prohibited, long-standing student traditions emerged around the theatrical destruction of their pedagogical materials. Fiss argues that while students transgressively asserted their own power over college life, at the same time they rehearsed the mathematical concepts and justifications of their teachers. They also asserted privileged identities. In the case of Bates College, where women and African Americans could enrol as full students, the typically gendered and racialized category of 'college student' was contested. Through theatrical mathematical traditions, white male students asserted their supposed superiority over other Bates enrolees.

The material culture of maths classes comes to the fore in Chapter 3. The blackboard, borrowed from the *école polytechnique* and rising to prominence in America by way of the US Military Academy, increasingly made the classroom a stage. Fiss shows how, as it spread to other schools, its military associations inflected the role of mathematics in wider curricular debates. The influential 'Yale Report of 1828' took as given that mathematics was rigidly disciplined, while acknowledging a need to argue that ancient languages displayed similar disciplining value. Students, meanwhile, resisted changing expectations around classroom performance. In Yale's Conic Sections Rebellion of 1830, students refused to perform blackboard demonstrations from diagrams, insisting they be allowed printed descriptions. The dispute escalated into a deeper conflict over the college's right to set the terms of education. President Day held his ground and expelled the rebelling students, preserving the centrality of disciplined performance at the blackboard.

In Chapter 4 Fiss focuses on performances of gender. After the Civil War, traditions of serenading women at neighbouring women's colleges largely replaced textbook burials as the central theatrical rituals of male student life. Fiss argues that, though ostensibly laudatory, male performers used these displays to safeguard a hierarchical distance between themselves and the female peers expected to listen passively to their songs. But women, too, used performance to assert their status as students. Beginning in the 1870s, Vassar students wrote and performed elaborate 'Trig Ceremonies'. Showing that women were legitimate college students required proving not just that they could learn maths, but that they participated in a theatrical collegiate culture blending humorous rebellion with exhibitions of mathematical understanding.

Chapter 5 discusses the performative regime that still governs maths classes today: the written test. Proliferating in the late nineteenth century, written tests supported efforts to standardize education and evaluation. Paper exams eclipsed the blackboard as the primary site at which students were tested. In one sense the written test marks the end of the performative maths culture Fiss has chronicled, but in a deeper sense it was only its next iteration: though the exam was a less literal stage than was the front of the classroom, it was a venue for stage fright nonetheless. Related experiences of anxiety have continued to shape the educational experiences of large proportions of students at every level.

From seated recitations, through blackboard demonstrations, to written tests, students were disciplined to perform mathematical ability. Many resisted these demands while simultaneously embracing mathematical performance as a way to assert their academic identities. By illuminating these performances and their cultural meanings, Fiss has provided rich historical material for rethinking maths education today.

doi:10.1017/S0007087423000407