Collecting to the Core — Writing in Mathematics

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Too often, when technical services is asked for assessment reports they are rebuilding the same reports from scratch year after year. **Servizzi** lays out a seven-step process that details a more efficient way to manage this information and make data more accessible and apparent to the library's key stakeholders.

The chapters throughout this book provide case studies that show how technical services is key in the assessment picture of demonstrating library value. Through their collective experiences perhaps even more institutions will find success at demonstrating this at their various locations.

ATG Reviewer Rating: *I need this on my desk.* (This book is so valuable, that I want my own copy at my desk that I will share with no one.)

Hakala-Ausperk, Catherine. *Win 'Em Over.* Chicago: American Library Association, 2019. 978-0-8389-1811-1, 48 pages. \$19.99

Reviewed by **Michelle Polchow** (Electronic Resources Librarian, University of California, Davis) <mpolchow@ucdavis.edu>

A professional promotion is great news! Now that you have the job, do you (and others) wonder if you're up to the task? **Hakala-Ausperk's**

new book is a confidence builder for anyone facing a new job, especially with the need to establish leadership skills. Even more so, this book even helps with that potentially awkward experience of receiving an internal promotion where you suddenly become the boss of your friends and colleagues.

This brief book is presented in workbook format. The author acts in the role of mentor or career coach, providing space for reflection, visualizing exercises, recognizing your accomplishments and creating a plan to meet the challenges ahead of you. Given the author's extensive and diversified set of experiences earned over 30+ years in the field (including library service work, management, administration and as an iSchool instructor for **Kent State University**), she's written this book that will help a large variety of younger professionals. The leadership planners focus on successful team building by developing strong and effective library leaders. Features in *Win 'Em Over*, such as "Walking the Plank" exercises and suggestions to "push yourself to try something new," can fundamentally shape your career, not just launch a new job. In this era when libraries face challenges as never before, it's gratifying to discover a book focused on the development of human resources and recognizes this is one of the library's paramount investments.

Editor's Note: *We do not condone writing in the print materials found in our collection — so if you are using this book from a collection, please record your answers in a notebook!*

ATG Reviewer Rating: *I need this available somewhere in my shared network.* (I probably do not need this book, but it would be nice to get it with three to five days via my network catalog.) 🌿

Collecting to the Core — Writing in Mathematics

by **Kristine K. Fowler** (Mathematics Librarian, University of Minnesota; Mathematics Subject Editor, *Resources for College Libraries*) <fowle013@umn.edu>

Column Editor: **Anne Doherty** (*Resources for College Libraries* Project Editor, CHOICE/ACRL) <adoherty@ala-choice.org>

Column Editor's Note: The "Collecting to the Core" column highlights monographic works that are essential to the academic library within a particular discipline, inspired by the *Resources for College Libraries* bibliography (online at <http://www.rclweb.net>). In each essay, subject specialists introduce and explain the classic titles and topics that continue to remain relevant to the undergraduate curriculum and library collection. Disciplinary trends may shift, but some classics never go out of style. — AD

"We're being WEC[k]ed." Such is the slang at the **University of Minnesota School of Mathematics** in developing and codifying a Writing-Enriched Curriculum; mathematics departments elsewhere have gone or are going through similar processes. Despite the misconception that math is the opposite of words, the effort to explicitly use effective writing in learning math concepts and communicating math research is of long standing. Evidence can be seen in current interdisciplinary education emphases such as STEAM (science, technology, engineering, the arts,

and mathematics), in iterations of the writing across the curriculum movement, in math style guides, and in the many prizes established over the years to recognize excellent math writing. This article will highlight some of the key resources around writing in mathematics, in its various aspects.

Educational Aspects

The intentional focus on integrating written communication objectives into teaching and learning has had many labels (and acronyms), with somewhat differing emphases: writing across the curriculum (WAC), writing to learn, writing in the disciplines (WID). A seminal general source is *Writing Across the Curriculum: A Guide to Developing Programs*, edited by **Susan H. McLeod** and **Margot Soven**.¹ **David R. Russell** traced the progression of writing-enriched education in *Writing in the Academic Disciplines: A Curricular History*, with a particular focus on 1970-2000 in the 2002 second edition.² He notes that "though it may seem surprising at first glance, mathematics has been a leader in this regard," particularly in the shift to departmental programs that can create more lasting institutional change than an individual instructor's efforts.³

John Meier and **Thomas Rishel** provide direction for math-specific implementation in their 1998 *Writing in the Teaching and Learning of Mathematics*, advocating "sensible, well-formed writing assignments which are

consistent with the pedagogical style and goals of a course."⁴ With many practical suggestions and exercises teachers can use, they address how to incorporate writing into courses, while also discussing why. The short answer: "Writing requires thinking, and thinking is what we, as teachers, want to encourage.... We hope to convince you that to get students to absorb mathematics, or any other subject, better, you need to have them think about, then write about that subject."⁵

Many more ready-to-use suggestions are provided via the **Mathematical Association of America's (MAA)** Classroom Resource Materials series, specifically **Annalisa Cranell** et al.'s *Writing Projects for Mathematics Courses: Crushed Clowns, Cars, and Coffee to Go*.⁶ The lively projects utilize a range of skills and are indexed by undergraduate course, from pre-calculus through differential equations. **Franco Vivaldi's** *Mathematical Writing* provides the basis of a dedicated undergraduate course, modeled on one he has taught, including examples and exercises (some of which have solutions/hints provided).⁷

It should be mentioned that in some mathematical contexts, "writing" refers specifically to the writing of proofs; indeed, the math course most likely to be explicitly identified as writing-intensive is often a course in logic/proof-writing that forms a transition from low-

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er to upper level undergraduate mathematics. **Ulrich Daepp** and **Pamela Gorkin's** *Reading, Writing, and Proving: A Closer Look at Mathematics* is in this vein, which makes clear the intertwined nature of mathematical reasoning and its written expression.⁸ This connection is built into the Process Standard for Communication outlined in the highly influential *Principles and Standards for School Mathematics* for pre-kindergarten through grade 12 from the **National Council of Teachers of Mathematics**: "Students who have opportunities, encouragement, and support for speaking, writing, reading, and listening in mathematics classes reap dual benefits: they communicate to learn mathematics, and they learn to communicate mathematically."⁹

Stylistic Aspects

That there are many different perspectives on what constitutes good mathematical communication is exemplified by the process leading up to the publication of *How to Write Mathematics* (**American Mathematical Society**, 1973).¹⁰ Originally intended to be a consensus "pamphlet on expository writing of books and papers at the research level and at the level of graduate texts" by a high-powered **AMS** committee, it ended up as a compilation of four individual essays on the topic by the four committee members: **Norman Steenrod**, **Paul Halmos**, **Menahem Schiffer**, and **Jean Dieudonné**. **Halmos**, always entertaining to read, begins his essay with "There Is No Recipe and What It Is." Many of the recommendations, like the shared emphasis on rewriting, could be applicable to any subject; but each author discusses some specifically mathematical concerns, from the ordering of theorems to the level of detail that should be included in proofs.

There are several book-length guides to the subject, such as *A Primer of Mathematical Writing: Being a Disquisition on Having Your Ideas Recorded, Typeset, Published, Read, and Appreciated* from the very prolific **Steven Krantz**.¹¹ He addresses the gamut from writing in TeX, the typesetting system invented by and for mathematicians, to the different style and organizational requirements for a research paper versus an opinion piece. **Nicholas Higham's** *Handbook of Writing for the Mathematical Sciences* gives an overlapping perspective on some of the same topics, as well as unique ones like preparing a research poster and writing and defending a thesis.¹² The chapter offering advice for those mathematicians for whom English is a second language is very relevant to this very international scholarly community.

Naturally there are various internet resources for math writing. A rich source for educators is the **MAA's** *mathcomm.org*, which originated in the **MIT** Department of Mathematics and provides a collection of resources aimed at engaging students, including "General Principles of Mathematical Communication," a list of resources for "Writing to Learn: Using Writing to Help Students Learn Math," and more.¹³

Exemplars

The Internet also serves as a source of written mathematics in traditional and emerging formats, such as **Evelyn Lamb's** "Roots of Unity" blog on the *Scientific American* web site and the **Simons Foundation's** *Quanta Magazine*, which both present current mathematics for a general audience.¹⁴⁻¹⁵ **Terry Tao's** blog section "On Writing" addresses the issues directly, while his many posts and research publications can be mined for excellent prose.¹⁶

Both the **MAA** and the **AMS**, as well as other organizations, regularly give prizes for excellent math writing, which are convenient for identifying good examples. For instance, the **Joseph L. Doob Prize** recognizes research-level books that attain the "highest standard" in exposition and the **Euler Book Prize** recognizes "exceptionally well written books with a positive impact on the public's view of mathematics." The most recent **Doob Prize** was awarded to **John Friedlander** and **Henryk Iwaniec** for their book *Opera de Cribro* and the 2019 **Euler Book Prize** winner was **Cathy O'Neil** for *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*.¹⁷⁻¹⁸

For a sampler of outstanding recent short pieces, see the annual series *The Best Writing on Mathematics*, edited by **Mircea Pitici** since 2010.¹⁹ Intentionally non-technical and drawn from a wide variety of sources, including *Nature* and *The New York Times* as well as *The Mathematical Intelligencer*, the selections are meant to be enjoyed by the general reader. Famous mathematicians are among the writers represented, as are early-career academics, science journalists, and others. Topics range from current news controversies, such as **Moon Duchin** on mathematical tests for gerrymandering, to foundational aspects of mathematics, such as **John H. Conway** on "unsettleable arithmetic problems."

Including the above resources in library collections will support students, faculty, and programs with written works about writing in mathematics. Whether these very fine pieces all follow the advice for how to write mathematics well is a proof left for the interested reader. 🌿

Endnotes

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Editor's note: An asterisk () denotes a title selected for *Resources for College Libraries*.