

PROMOTION RECOMMENDATION
The University of Michigan
School of Education
College of Literature, Science, and the Arts

Patricio G. Herbst, associate professor of education, with tenure, School of Education, and associate professor of mathematics, without tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of education, with tenure, School of Education, and professor of mathematics, without tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D.	1998 University of Georgia, Mathematics Education, Athens, GA
M.A.	1995 University of Georgia, Mathematics Education, Athens, GA
Cosmography certification	1987 Universidad Nacional del Nordeste, Teacher of Mathematics, Argentina

Professional Experience:

2010 – present	Associate Professor (without tenure), Department of Mathematics, College of Literature, Science, and the Arts, University of Michigan
2005 – present	Associate Professor (with tenure), Educational Studies, School of Education, University of Michigan
1999 – 2005	Assistant Professor (without tenure), Educational Studies, School of Education, University of Michigan
1998 – 1999	Visiting Assistant Professor (postdoctoral position), Departments of Counseling, Educational Psychology, and Special Education, and Department of Mathematics, Michigan State University
1994 – 1998	Graduate Assistant, Department of Mathematics Education, University of Georgia
1990 – 1993	Mathematics instructor and research fellow, National Council for Research of Argentina, Department of Mathematics and Mathematics Group, Universidad Nacional de Córdoba

Summary of Evaluation:

Teaching: Professor Herbst has made important contributions through his teaching and mentoring. His courses are carefully designed and informed by his scholarship and his teaching style is structured and rigorous. There are three programmatic contexts of his teaching: the secondary teacher education program; the master's in Educational Studies; and the mathematics education doctoral specialization.

Teaching in secondary mathematics teacher education: Since coming to the University of Michigan in 1999, Professor Herbst has taught EDUC 413 ("Teaching secondary school mathematics") in 10 of the past 13 years, including field instruction during three semesters. Since his promotion to associate professor in 2005, he has taught the course four times, from 2005 to 2007 and again in 2011.

In line with the practice-based orientation of the School of Education's teacher education program, Professor Herbst has focused EDUC 413 on students' skills and judgment in practices demanded by

their work as mathematics teachers, notably: setting and enforcing norms; explaining concepts and propositions; explaining procedures; assigning and reviewing work; and managing classroom discussions. He has developed a highly structured course with a detailed syllabus and rubrics. He has developed innovative activities and approaches to make his curriculum and pedagogy more focused on practice in this important methods course, but some of his undergraduate students find him unapproachable or intimidating; some find his assignments unduly long and/or rigid; and some find the style of his feedback to be harsh and not constructive. Professor Herbst has worked on his teaching of this complex course, and has made improvements in his teaching, and is aware that this will continue to require calibration with students' reactions and responses to his approaches.

Teaching in the Educational Studies master's program: A major component of Professor Herbst's research and development work has addressed the ways to represent teaching practice, and to use such representations for both scholarly work and teacher education and development. When the Educational Studies master's program was revised, Professor Herbst developed a course on representations of practice, available to students in the digital media and education concentration. Professor Herbst has taught two versions of the resulting course, with variable evaluations.

Teaching and mentoring in the mathematics education doctoral specialization: Professor Herbst has helped develop the mathematics education doctoral curriculum, and taught each of its foundational courses: EDUC 711 ("Problems and practices in research on mathematics education"); EDUC 781 ("The study of mathematics instruction"); and EDUC 782 ("The study of mathematics thinking and learning").

In addition, he has advised five completed doctoral dissertations, been on four other dissertation committees, directed eight scholarly papers, and been a reader for four more. He has also co-authored many papers with his students, and given them prominent roles in presentations at professional meetings.

Summarizing across his teaching record, Professor Herbst's syllabi show his courses to be carefully designed and informed by his scholarship. He gives care to all of his teaching, designing opportunities to learn that are thoughtful and detailed. His teaching style is structured and rigorous. Students at the graduate level value his teaching and mentorship, whereas teacher certification students' reactions have tended to be less positive. Although the evaluations provided by the teacher education students is a concern, it is clear that Professor Herbst takes teaching seriously.

Research: Professor Herbst is a mathematics educator whose research focuses on the nature of the mathematical work that students do in secondary classrooms and on the work teachers do to manage knowledge development. His research is a linked coupling of basic research on the inner dynamics of mathematics instruction (mainly in geometry) and the design and development of multimedia environments with which to stage experimental probes of his theoretical hypotheses. He has studied mathematical work, student thinking, and teacher decision-making in geometry classrooms with particular attention to the use of reasoning and proof to solve problems and develop new ideas. His central object of study is an understanding of the mostly invisible reasoning underlying the moment-to-moment decision-making that guides the work of experienced teachers.

The theoretical framework for understanding this is what he and his collaborator, Dan Chazan, call "practical rationality." Practical rationality builds on the work of other scholars, notably Pierre Bourdieu's logic of practice and Guy Brousseau's notion of the *didactical contract*—a set of mostly tacit mutual expectations held by the teacher and students. Professor Herbst elaborates this idea in

terms of what he calls situational norms, also mostly tacit, that guide teachers' decision-making (often unconsciously) in typical instructional situations (like doing proofs in geometry, or solving equations in algebra). The theory of practical rationality, developed by Professor Herbst and Professor Chazan (who focuses on algebra as content area), is an attempt to make more explicit this system of situational norms.

In the early 2000s, educational policy shifted emphasis toward experimental research models, mainly focused on studying the effectiveness of interventions, using randomly sampled treatment and control groups. Professors Herbst and Chazan reflected on what experimental methods might look like in the basic research they were doing. The model they adopted, and have since developed, is that of a *breaching experiment*. Given a hypothesis about the presence and nature of a situational norm, a breaching experiment affords a way to test this hypothesis. Specifically, Professors Herbst and Chazan seek an instructional situation where a presumed norm is violated. They show a video record of this transaction to focus groups of experienced teachers, and monitor their reactions, the strength and character of which can reveal the presence and nature of the norm. This work, and the ethnomethodology used, has been quite productive. However, there were conceptually natural norm breaching situations for which they could not easily find real instructional examples with which to problematize the question.

This problem was one major motivation for the development of virtual representations of instructional situations, in which a specific norm-breaching situation could be scripted, yet represented in ways preserving some of the naturalistic features of actual instruction. Solving this problem of methodological design became itself a major agenda of Professor Herbst's work, leading to the development of the technological infrastructure of LessonSketch, which has since found much wider application, in particular in teacher education. It has also supported contributions to the Illustrative Mathematics Project of the Common Core.

Professor Herbst has an active and extensive publication record. Since his promotion to associate professor in 2005, he has published 24 articles in refereed journals, 10 of which list him as first author. He has seven articles published in top mathematics education journals and general education journals, three as first author. He has also written four peer-reviewed book chapters and 25 publications for peer-reviewed conference proceedings (seven as first author).

Professor Herbst has successfully secured external financial support for his research. Currently, he is the principal investigator for one ongoing National Science Foundation (NSF) grant, and the co-principal investigator for a second ongoing grant. Beyond this, he has also been the PI or co-PI for four completed grants, one of which was a prestigious CAREER award from the NSF.

Reviewers characterized Professor Herbst's theoretical work as sophisticated, innovative, programmatic, and prolific. In sum, Professor Herbst is an exemplary scholar with a sustained program of research and a significant record of publications. Reviewers universally agreed that his scholarship has provided innovative contributions to knowledge about mathematics teaching as well as to theory and methodology in the field.

Recent and Significant Publications:

Herbst, P. and Chazan, D. (2012). On the instructional triangle and sources of justification for actions in mathematics teaching. *ZDM The International Journal of Mathematics Education*, 44(5), 601-612.

- Herbst, P., Nachlieli, T., and Chazan, D. (2011). Studying the practical rationality of mathematics teaching: What goes into “installing” a theorem in geometry? *Cognition and Instruction*, 29(2), 1–38.
- Nachlieli, T. and Herbst, P. with González, G. (2009). Seeing a colleague encourage a student to make an assumption while proving: What teachers put to play in casting an episode of geometry instruction. *Journal for Research in Mathematics Education*, 40(4), 427-459.
- Silver, E. and Herbst, P. (2007). Theory in mathematics education scholarship. In F. Lester (Ed.), Second Handbook of Research in Mathematics Teaching and Learning (pp. 39-67). Charlotte, NC: Information Age.
- Herbst, P. Chen, C., Weiss, M., and González, G., with Nachlieli, T., Hamlin, M., and Brach, C. (2009). “Doing proofs” in geometry classrooms. In M. Blanton, D. Stylianou, and E. Knuth (Eds.), Teaching and learning of proof across the grades: A K-16 perspective (pp. 250-268). New York: Routledge.
- Herbst, P. (2006). Teaching geometry with problems: Negotiating instructional situations and mathematical tasks. *Journal for Research in Mathematics Education*, 37, 313-347.

Service: Professor Herbst has an impressive record of service to the profession, to the University of Michigan, and to the School of Education. He currently serves on the editorial boards of three leading international journals in mathematics education: *Educational Studies in Mathematics*, *Journal of Mathematics Teacher Education*, and *Recherches en Didactique des Mathématiques*. He has served as a reviewer for 19 journals.

He has served on review panels for funding agencies in the U.S. (NSF-EHR), Canada, Israel, and South Africa. In the American Educational Research Association, he served on the board of the SIG-RME (Research in Mathematics Education). In 2009 he founded, and continues to run, a well-attended annual conference on Representations of Practice in Education Research and Teacher Education.

In the School of Education, Professor Herbst has led the secondary mathematics strand in the Teacher Education program and served as an advisor to the W.K. Kellogg Foundation’s Woodrow Wilson Michigan Teaching Fellowship. In addition, he has served on three faculty search committees, the Educational Studies Executive Committee, the Promotion and Tenure Committee, the Research Advisory Committee, and the Technology Advisory Committee.

External Reviewers:

Reviewer A: “I have been impressed by the coherence, originality and depth of his research activity, and also by its intensity and productivity in the recent years (14 articles in peer reviewed journals, many of these in first class journals in the field, in the last two years is really amazing!). . . I would not hesitate to recommend Patricio Herbst for a similar promotion in my own institution.”

Reviewer B: “The theory of the ‘practical rationality of mathematics teaching’ is an important theoretical contribution of Dr. Herbst’s scholarship and is at the center of his long-term, ongoing collaboration with Dr. Chazan to understand and improve teaching. . . offers two innovative methodological contributions: the ‘breaching experiment’ and a set of cartoon animations for use in breaching experiments. . . Dr. Herbst has published more than 30 articles in peer-reviewed journals, 30 articles in peer-reviewed conference proceedings, and numerous peer-reviewed book chapters and non-peer-reviewed papers. His publications have appeared in a variety of venues including top-tier journals in mathematics education. This broad range of journals, and particularly the top-tier

journals outside of mathematics education, is indicative of the wide audience that his scholarship has reached.”

Reviewer C: “His analyses of classroom interactions, particularly those around the notion of mathematical proof, are insightful and display a deep knowledge of the dilemmas and challenges of mathematics teaching. . . I have read a number of papers stemming from this work and have come to the view it is some of the finest research currently being conducted on mathematics teachers’ instructional practices. It is clear that Dr. Herbst has contributed substantially to both the theoretical underpinnings of the project and to the empirical analyses of teachers’ accounts of instructional practice. He is primarily responsible for the most cogent and coherent analyses of mathematics teachers’ practical rationality that I have encountered. In addition, he and Dr. Chazan have developed an ingenious methodology for investigating this practical rationality that involves showing teachers animations of classroom situations that are purposefully designed to breach specific norms. . . This work is setting new standards for the analysis of activity in mathematics classrooms and of teachers’ instructional practices. The success of Dr. Herbst and his colleagues in securing external funding for this work indicates that I am not alone in this assessment.”

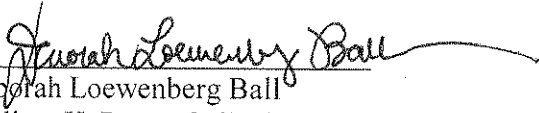
Reviewer D: “Patricio is one of the strongest theoreticians among mathematics educators in his rank. Based on my reading of his work since 2005, I can say without hesitation that Patricio is still one of the most prominent theoreticians among mathematics education researchers. . . Like Brousseau, Patricio has investigated the nature and impact of the didactical contract, assumed to be held in any classroom, between a teacher and her students. Patricio has advanced Brousseau’s work in three respects: methodology, theory, and implementation. . . Patricio offers new theoretical constructs which better describe and explain teaching.”

Reviewer E: “My sense is that based upon quality and extent of his publications, he would fare very well in promotion from Associate to Full Professor in ...”

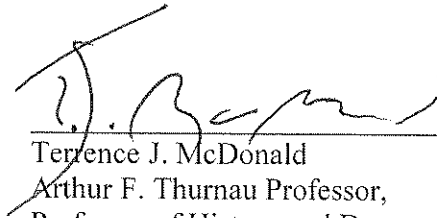
Reviewer F: “His work is now robustly framed in terms of practical rationality. . . An ingenious method is used in Dr. Herbst’s empirical research as a means of eliciting these special routines: the participating teachers are shown animated cartoons picturing instructional situations involving norm breaching and are invited to comment. . . Brousseau’s term (didactic) situation that featured prominently in his previous work, established itself in the specially defined key term *instructional situation*. Thanks to a precise definitions of his keywords, Dr. Herbst is able to show in a convincing way how a given task of, say, ‘doing proof’ or ‘installing theorems,’ may be handled by the same teacher differently in different classrooms. This is being explained as indicative of differing instructional situations (Herbst & Chazan, 2011). . . . Dr. Herbst’s main interest, at least for now, is in collective rather than individual processes that take place in mathematics classrooms. In this respect, his work is comparable with that of Paul Cobb and his group, except that it can be clearly distinguished from the latter by its focus on teachers’ decision-making processes. . . a further development in Dr. Herbst’s ingenious work in the domain of teacher education, and in particular, in his instructional design based on animated classroom episodes. Here, the main occurrence was the development of LessonSketch. . . Also remarkable is the fact that in spite of his being a member of English speaking researcher community, he has been able to build on the important work of French scholars (Bourdieu, Brousseau). . . the quality of Dr. Herbst’s work indicates that he may well be one of the most prominent . . . researchers in mathematics education today. As good as his work has been so far – or just because of this – it is easy to believe him when he says that his ‘best work still lies ahead.’”

Reviewer G: "I can say without hesitation that Dr. Herbst would more than meet the requirements for promotion to full professor here at ..."

Summary of Recommendation: Professor Herbst is an innovative, imaginative, prolific, internationally recognized scholar in mathematics education. He has contributed substantial service to the field, notably in editorial work for top-tier journals, to the university in diverse leadership roles, and to the local community. It is with the support of the Executive Committees of the School of Education and the College of Literature, Science, and the Arts that we recommend Patricio G. Herbst for promotion to professor of education, with tenure, School of Education, and professor of mathematics, without tenure, College of Literature, Science, and the Arts.



Deborah Loewenberg Ball
William H. Payne Collegiate Professor
of Education, Arthur F. Thurnau
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Terrence J. McDonald
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