

Preface

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The scholarship of teaching and learning is a growing field of inquiry in which faculty members bring disciplinary knowledge to investigate questions of teaching and learning and systematically gather evidence to support their conclusions. Submitting the results to peer review and making them public for others to build on have generally become expected components of the scholarship of teaching and learning, or SoTL. Individual faculty members, their students, departments, and institutions can all benefit from this work. As one of the contributors to this volume (Edwin Herman, Chapter 8) observes: “The process of doing SoTL research can be even more important than the results obtained. Framing and researching a question and designing a project encourages the researcher to experiment within the classroom, much as a painter experiments with styles on a canvas. As the project progresses, the question (or questions) become more refined, more interesting, and the answers can both inform and improve the way you teach” (p. 83).

This Notes volume is written for collegiate mathematics instructors who want to know more about conducting scholarly investigations into their teaching and their students’ learning. Faculty members in related disciplines, such as engineering, computer science, or the sciences should also find the book of interest, as should high school mathematics teachers. Conceived and edited by two mathematics faculty members, the volume serves as a how-to guide for doing SoTL in mathematics. It contains information and resources for undertaking scholarly investigations into teaching and learning, and includes many examples.

SoTL is a topic of increasing interest in the mathematics community. Well-attended MAA minicourses on how to get started in SoTL have been presented at the 2006, 2007, and 2008 Joint Mathematics Meetings and at the 2009 MathFest. Successful SoTL paper sessions have been offered at the joint mathematics meetings annually since 2007. Project NExT fellows have shown interest in the topic by inviting speakers to address SoTL on panels they organized for the 2009, 2011, 2012, and 2013 Joint Mathematics Meetings.

The book is divided into two parts followed by an epilogue. The four chapters in Part I provide background on this form of scholarship and specific instructions, a how-to guide, for undertaking a SoTL investigation in mathematics. The authors of Part I (the editors of this volume) target their advice to mathematicians. As two mathematicians who learned to do SoTL in the Carnegie Scholars program of the Carnegie Academy for the Scholarship of Teaching and Learning, they are able to write from experience about undertaking SoTL work without a formal background in educational research.

Chapter 1 presents the history of the SoTL movement and differentiates SoTL from related ideas (good teaching and scholarly teaching) and work (research in mathematics education). It describes the benefits of SoTL for faculty members, their departments, and their institutions. The rewards include improving the teaching and learning of individuals, providing evidence of effective teaching or scholarly publications for tenure and promotion portfolios, and making contributions to departmental and institutional initiatives.

Chapter 2 takes the reader through the initial steps of a typical SoTL investigation, beginning with a question or problem about teaching and learning and describing how to reframe it into a researchable question. It shows faculty members how to draw upon their disciplinary knowledge and teaching experience to advance their investigations and how to use the taxonomy of SoTL questions (*What is? What works? What could be?*) to monitor the development of their research questions. It offers suggestions for doing searches into education literature and explains how they can aid in launching a project.

Chapter 3 is about the design of SoTL studies. A significant portion of this chapter addresses various types of evidence used in SoTL work, including methods that may not be familiar to mathematicians, such as focus groups

and think-alouds. It discusses ways to analyze the qualitative data that result from these methods. It also contains guidelines for designing surveys and creating rubrics for use in SoTL studies.

Chapter 4 provides information and resources for pursuing SoTL and going public with findings. It addresses a practical issue unfamiliar to many teaching mathematicians, namely needing to obtain human subjects clearance. It offers suggestions for finding collaborators and advice on locating venues to present or publish SoTL work.

Part II contains fifteen examples of SoTL projects in mathematics from fourteen institutions, both public and private, spanning the spectrum of higher educational institutions from community colleges to research universities. Among the twenty-five contributing authors are four Carnegie scholars, three former participants in the MAA minicourses on Scholarship of Teaching and Learning, two faculty members with training in mathematics education, and several collaborating non-mathematicians. Their projects are rooted in a variety of mathematical topic areas: remedial mathematics, quantitative literacy, mathematics for liberal arts, pre-service teacher preparation, a freshman course for mathematics majors focused on mathematical problem solving and communication, precalculus, first-semester calculus, multivariable calculus, and statistics. The projects cover the gamut of methodologies; that is, there are examples of SoTL work that use both quantitative and qualitative methods, as well as SoTL work that involves the three different types of SoTL questions.

The purpose of the chapters in Part II is to reveal the process of doing SoTL. They serve as models for carrying out a SoTL investigation, the components of which are outlined in Part I. The authors describe how their studies began, and the design decisions they made. The authors are candid about the difficulties they encountered and the limitations of their work. They discuss lessons learned about doing SoTL and offer recommendations. An Editors' Commentary prefaces each chapter to highlight certain aspects of the process of doing SoTL revealed by its authors. Each chapter reports the benefits that accrued to the authors and their careers from engaging in SoTL.

The fifteen illustrations of SoTL are grouped into five themes:

- Experiments with Approaches to Teaching
- Crafting Learning Experiences around Real-World Data or Civic Engagement
- Using Assigned Reading Questions to Explore Student Understanding
- Exploring Student Understanding of the Nature of Mathematics
- Tackling Large Questions

This volume is intentionally interconnected. The chapters in Part II illustrate many of the concepts, issues, methods, and procedures discussed in Part I. For example, when the taxonomy of SoTL questions (Chapter 2), the construction and use of a rubric (Chapter 3), or the institutional review process for human subjects research (Chapter 4) is discussed, the reader is referred to chapters in Part II for additional descriptions derived from the authors' experiences. The Table of Contents previews each chapter by listing the questions being investigated and the SoTL process topics addressed.

In the Epilogue (Chapter 20) we present a synthesis of the authors' perceptions of the value of SoTL. While our primary goal is to assist mathematics instructors interested in undertaking a scholarly study of their teaching practice, a secondary goal is to promote a greater understanding of SoTL work and its value to the mathematics community. This final chapter allows us to reflect on the outcomes and benefits that accrued to the 25 authors as a result of their scholarly inquiries into teaching and learning.

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