Book review: Lesson study with mathematics and science preservice teachers: finding the forms

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Introduction

"Lesson Study with Mathematics And Science Preservice Teachers: Finding the Forms" is a collaborative effort led by editors Sharon Dotger, Gabriel Matney, Jennifer Heckathorn, Kelly Chandler-Olcott and Miranda Fox. This book emerged from the fruitful discussions and shared expertise of 33 teacher educators who participated in the Lesson Study for Mathematics and Teacher Educators Conference (LSMTEC) in April 2021. In response to the increasing adoption of lesson study (LS) practices among USA teacher educators and the unique challenges posed by the COVID-19 pandemic, this national working conference aimed to provide a platform for teacher educators to exchange ideas and refine their approaches to LS.

Supported by a grant from the National Science Foundation (NSF), the conference facilitated engaging sessions, including small-group discussions, whole-group dialogs and structured activities, all designed to elicit and enhance LS practices. The insights and experiences gained from these collaborative endeavors have been distilled into this comprehensive book, which serves as a practical resource for teacher educators seeking to implement LS in mathematics and science education contexts.

With a focus on practical guidance and real-world insights, "Lesson Study with Mathematics and Science Preservice Teachers, Finding the Forms" offers valuable perspectives on the implementation of LS in preservice teacher (PST) education. Drawing on the collective wisdom of experienced educators and researchers, this book promises to enrich the teaching and learning experiences of PSTs and contribute to the ongoing dialog surrounding effective pedagogical practices in mathematics and science education.

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Summary

This book comprises an introduction, main sections and a conclusion, featuring 17 chapters contributed by various authors across four main sections. Organized around the concept of

shu-ha-ri, originating from Japanese martial arts and translating to "learn the form, master the form, depart from the form", these sections provide a systematic approach to understanding and implementing LS. Sections I and II focus on "learn the form," Section III on "master the form" and Section IV on "depart from the form." Each section offers unique insights and strategies tailored to different stages of LS implementation.

The introductory section, penned by the editorial team, elucidates the book's objectives and origins in collaboration among LSMTEC members. It offers a brief overview of LS and delineates its key steps and significance in teacher education. Additionally, this section outlines the book's primary themes and clarifies its target audience, aiding readers in comprehending its relevance and importance.

Learn the form

Section I elucidates the relationship between LS and PST education, exploring how USA teacher preparation structures facilitate LS adoption. Through these three insightful chapters, the authors provide a nuanced understanding of LS's adaptation to PST education, its integration with decision-making frameworks and the roles of teacher educators during the LS process. A breakdown of each chapter is provided below.

(1) Chapter 1, authored by Jennifer Heckathorn and Sharon Dotger, delves into the adaptation of LS for PST education in the USA, tackling the disparities between teacher preparation and in-service teaching. This chapter identifies areas in which clarity is needed regarding LS implementation for PSTs and explores different models of team composition.

(2) Chapter 2, authored by Nadia Stoyanova Kennedy and Jesse Wilcox, underscores the effectiveness of integrating decision-making frameworks into LS for PST education programs, demonstrating its impact through two distinct cases. One case utilized Alan Schoenfeld's (2014) Teaching for Robust Understanding framework, whereas the other was guided by Clough *et al.*'s (2009) decision-making framework. These examples highlight the adaptability of decision-making frameworks for preparing PSTs for classroom challenges and improving teaching practices.

(3) Chapter 3, by Gonzalez, Hernandez-Rodriguez and Villafane-Cepeda, introduces a project in which mentors guide PSTs in LS to link math methods with fieldwork. The authors explored mentor roles using cultural-historical activity theory (CHAT; Engeström, 1999) to develop a model for leading LS with PSTs, addressing potential conflicts between LS facilitation and field experience supervision.

Section II provides a detailed exploration of how teacher educators and PSTs engage *in the Prepare*, *Study*, *Plan*, *Teach* and *Reflect* stages of the LS cycle, offering practical strategies, insights and examples tailored to support PSTs' development. A breakdown of each chapter is provided below:

(1) Chapter 4, Jenifer Hummer and Kristin Lesseig focus on the *Prepare* stage, offering recommendations to ready PSTs for engagement. Drawing from research and LSMSTEC insights, this chapter provides guidance on introducing PSTs to LS, establishing cooperative norms, forming research teams and negotiating with field partners.

(2) Chapter 5, by Meyer Rogers, Shelton and Wilkerson, delves into the *Study* stage, with the aim of enhancing PSTs' content and pedagogical knowledge. They proposed four sub-phases and a framework comprising five key areas, offering practical recommendations for implementing the study step with PSTs.

(3) Chapter 6, explored by Kevin J. Reins and Matthew Melville, delves into the *Plan* stage, highlighting essential components for guiding PSTs in developing research lessons. Drawing from focus groups and the literature, the authors offer practical strategies and solutions, including a case study to illustrate effective implementation.

(4) Chapter 7, authored by Rosemarie Michaels and Nicole Glen, focuses on the *Teach* stage. This underscores the importance of robust partnerships between universities and schools. The authors offer essential elements and suggest various approaches to effectively engage PSTs, providing teacher educators with actionable strategies and real classroom examples.

(5) Chapter 8, by Sharon Dotger and Kelly Chandler-Olcott, addresses the Reflect stage, emphasizing its role in integrating knowledge into teaching practice and strengthening PSTs' commitment to improvement. Drawing from LSMSTEC contributions and their experiences, the authors discuss strategies for supporting PSTs in achieving reflection goals while identifying challenges and limitations.

Master the form

Section III highlights how LS transcends traditional teaching methods in PST education. It emphasizes LS's role in promoting diversity, equity, inclusion and justice, fostering equitable educational practices. The details of each chapter are as follows.

(1) In Chapter 9, Melissa Graham and Amy Roth McDuffie explore the root causes of educational inequities and propose strategies to address them. They discuss an experimental course that integrates equity and LS, providing practical methods to promote equitable teaching practices among PSTs.

(2) In Chapter 10, Curtis A. Taylor, Kristin Komatsubara and Daisy Sharrock investigate a longitudinal teacher preparation program that promotes anti-racist pedagogy through LS. It discusses LS structure, its impact on teacher self-efficacy and strategies for overcoming implementation challenges. This chapter underscores LS's role of LS in promoting anti-racist education and emphasizes the importance of intentional design and support structures.

(3) Chapter 11 by Crystal Kalinec-Craig *et al.* focuses on integrating equity-based practices into LS for PSTs. Using the Torres' Rights of the Learner framework (Kaline-Craig, 2017), this chapter illustrates how LS fosters PSTs' reflection and teaching strategy evolution for equity promotion in math education.

Depart from the form

Section IV highlights the creative adaptations of LS, designed to enhance PSTs' learning experiences. The authors meticulously detail modifications made to the traditional LS cycle, considering contextual factors influencing their approach for different purposes.

(1) Chapter 12, by Janelle M. Johnson, Nursen Konuk and Mark Koester, addresses persistent obstacles to interdisciplinary collaboration and school partnerships for PSTs. They explore LS's potential through a study in which mathematics and science PSTs collaboratively plan interdisciplinary lessons.

(2) In Chapter 13, Rita Hagevik and Irina Falls investigate using technology tools to enhance collaboration and reflection in online LS. They leverage a case study approach to examine PSTs' perceptions and reflections on their science teaching efficacy.

(3) In Chapter 14, Gillian Roehrig and Jennifer Suh delve into structured video reflection to enhance PSTs' noticing during LS, drawing on the Noticing Framework (van Es and Sherin, 2002, 2008).

(4) Chapter 15, by Hanna Haydar, Meral Kaya and Joanna Weaver, explores how LS fosters interdisciplinary collaboration among PSTs, particularly integrating literacy with elementary mathematics. They evaluate its impact through a qualitative study within elementary methods courses.

(5) In Chapter 16, Joanna Weaver and Gabriel Matney introduce Jigsaw Lesson Study, a novel LS model adapted from Lewis and Hurd's (2011) model. They detail its implementation in preparing PSTs for their teaching roles and highlight the benefits observed from its application.

(6) In Chapter 17, Christopher Nazelli and S. Asli Özgün-Koca outline four objectives for early PST preparation. They introduce two LS learning activities tailored for elementary and secondary education courses, emphasizing adaptations to address challenges and advocating for new partnerships.

The conclusion, authored by the editorial team, summarizes the book's composition and its alignment with the concept of *shu-ha-ri*, which signifies "learn the form, master the form, depart from the form." It reveals how each section advances progressively, guiding readers from fundamental concepts to advanced applications and innovations. This structured approach mirrors the stages of *shu-ha-ri*, facilitating a transformative exploration of LS's potential in preparing and enhancing PST's teaching practices.

Critical analysis and personal reflection

The book, co-authored by professionals in science and mathematics, LS and teacher educators from LSMSTEC, demonstrates strengths in both content and structure. In terms of content, it adeptly integrates theory with practice, which is particularly evident in Section II. Drawing from the pertinent literature, this book offers comprehensive guidance for PSTs to navigate each stage of the LS cycle. Additionally, it provides practical strategies, insights and examples tailored to support PSTs' development, effectively bridging the gap between theory and application.

Furthermore, the book showcases LS as a powerful tool capable of preparing PSTs for various purposes in flexible ways. Section III, notably Chapters 9, 10 and 11, illustrates how LS extends beyond PSTs' content or pedagogical practice, assisting them in learning and implementing STEM core ideas. This extension also benefits in-service teachers by addressing long-standing challenges in STEM education. Moreover, the book exemplifies the adaptability of LS, as seen in its integration of online tools, facilitation of collaboration across STEM disciplines and the utilization of jigsawing LS. These examples underscore the versatility and potential of LS to transform STEM education.

In terms of structure, each chapter and the book appear to be logically organized. Chapters follow a clear progression, typically starting with an introduction to the topic, followed by a discussion of relevant theories or frameworks, practical examples or case studies and concluding with reflections or recommendations. The chapters build upon each other, with Section I establishing the connection between LS and PST education, Section II guiding PSTs through each stage of the LS cycle and Section III exploring the transformative role of LS in PST education and showcasing innovative adaptations of LS. Furthermore, the book's introduction and conclusion effectively frame the content and connect everything together, and Section IV provides a cohesive narrative. Overall, the logical organization enhances readability and comprehension for the reader, reflecting a journey from learning and

mastering the foundational aspects of LS to exploring innovative adaptations and departures from traditional approaches, thus resonating with the theme of "learn the form, master the form, and departure from the form."

While the book offers valuable insights and practical strategies for implementing LS in PST education, as a PhD student engaged in LS research, I found myself wishing for greater diversity and depth of perspectives, particularly regarding research methods and findings. Although the examples and case studies provided rich insights, incorporating a broader range of voices and contexts could enrich the discussion and provide a more comprehensive understanding of LS applications, especially concerning students' perspectives and teacher educators' reflections. Additionally, some chapters could benefit from providing explicit details about the research instruments and data analysis methods used and catering to readers seeking a deeper understanding of the research methodologies employed in the book.

Overall, reading this book deepened my appreciation for the complexities of PSTs' education and the potential of LS as a transformative tool for professional growth. It has inspired me to reflect critically on my own research and explore innovative approaches to support the development of future teacher educators.

Conclusion

In summary, "Lesson Study with Mathematics and Science Preservice Teachers: Finding the Forms" offers invaluable insights into implementing LS in USA mathematics and science education. Organized around the principle of "learn the form, master the form, depart from the form," the book serves as a comprehensive guide, facilitating transformative journeys for teacher educators, university faculty, administrators and PSTs alike. While providing practical strategies for LS application, the inclusion of broader perspectives on research methods and detailed data analysis methods could further enrich its scope. By addressing the needs of various stakeholders and deepening our understanding of teacher education dynamics, this book encourages critical reflection and establishes itself as an indispensable resource for practitioners and researchers in the education field.

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