

Transforming sociomathematical norms in a South African grade 11 classroom to enhance learners' mathematical proficiency

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Abstract

In this paper we use parts of qualitative data from the first author's doctoral study to explore how transforming existing sociomathematical norms enhance learners' mathematical proficiency. The study was conducted in a grade 11 mathematics classroom comprising of 23 learners, facilitated by the first author as learners engaged in a mathematical discourse on analytical geometry. Data were gathered through video recording, documents and researcher journal. We adopted Yackel and Cobb's (1996) interpretive framework and Kilpatrick et al.'s (2001) notion of mathematical proficiency as lenses, which guided the data analysis. We analyzed the data following Polkinghorne's (1995) narrative analysis method. We found that transforming existing sociomathematical norms to enhance learners' mathematical proficiency involved a three-stages process: negotiating entry into learners' existing sociomathematical norms, disrupting learners' existing sociomathematical norms and constituting 'new' sociomathematical norms. As learners developed new taken-as-shared meanings regarding acceptable mathematics explanations, justifications and mathematically different solutions they enhanced their conceptual understanding, procedural fluency, adaptive reasoning, and strategic competence.

Keywords: mathematics education, mathematical proficiency, sociomathematical norms

INTRODUCTION

Department of Basic Education (DBE) (DBE, 2018) in South Africa developed and published the '*Mathematics teaching and learning framework for South Africa: Teaching mathematics for understanding*' (TMU). The framework is aimed at providing guidance to mathematics teachers for all school grades (grade R-12) in teaching mathematics for understanding. TMU in a way provides standards for teaching school mathematics in South Africa, just like there are standards for teaching mathematics in other countries such as the United States, which are *problem solving, communication, reasoning and proof, representation and connections* (National Council of Teachers of Mathematics [NCTM], 2000). TMU framework is underpinned by five interwoven strands of mathematical proficiency: *conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition* (Kilpatrick et al., 2001). In this article, we argue that enhancing learners' mathematical

proficiency may require the transformation of existing norms in a classroom setting.

Sociomathematical norms are aspects of mathematics classroom culture, a set of distinct instructional practices, concerned with the shared understandings and behaviors related to mathematical activities that are encouraged and enacted within a classroom (Cobb & Yackel, 1996). However, classroom culture is implicitly learned through observation and participation, and not by deliberate study. As such, to achieve the goals of TMU, amongst other implications, teachers are expected to create learning opportunities to enhance learners' mathematical proficiency. Creating learning opportunities implies orchestrating classroom social interactions and negotiating classroom culture (Cobb & Yackel, 1996). Consequently, Cobb and Yackel (1996) define learning as "a constructive process that occurs while participating in, and contributing to, the practices of the local community" (p. 185).

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Mark Steyvers



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The Unresolved National Question in South Africa Edward Webster, Karin Pampallis, John Mawbey, Jeremy Cronin, 2017-03-01 This volume examines the way in which various strands of left thought have addressed the National Question The re emergence of debates on the decolonisation of knowledge has revived interest in the National Question which began over a century ago and remains unresolved Tensions that were suppressed and hidden in the past are now being openly debated Despite this the goal of one united nation living prosperously under a constitutional democracy remains elusive This edited volume examines the way in which various strands of left thought have addressed the National Question especially during the apartheid years and goes on to discuss its relevance for South Africa today and in the future Instead of imposing a particular understanding of the National Question the editors identified a number of political traditions and allowed contributors the freedom to define the question as they believed appropriate in other words to explain what they thought was the Unresolved National Question This has resulted in a rich tapestry of interweaving perceptions The volume is structured in two parts The first examines four foundational traditions Marxism Leninism the Colonialism of a Special Type thesis the Congress tradition the Trotskyist tradition and Africanism The second part explores the various shifts in the debate from the 1960s onwards and includes chapters on Afrikaner nationalism ethnic issues black consciousness feminism workerism and constitutionalism The editors hope that by revisiting the debates not popularly known among the scholarly mainstream this volume will become a catalyst for an enriched debate on our identity and our future

Engineering and Mining Journal, 1895 **The Mining Journal, Railway and Commercial Gazette**, 1907 *Cannabis/Hemp for Sustainable Agriculture and Materials* Dinesh Chandra Agrawal, Rajiv Kumar, Muralikrishnan Dhanasekaran, 2022-04-08 The book contains review articles on the latest evidence based scientific knowledge and future insights on industrial hemp applications ranging from sustainable agriculture sustainable development and commercial uses of hemp derived innovative products The research articles evaluate and review the latest research and development on hemp s agronomy ecophysiology the opportunities and challenges of hemp cultivation in the different regions of the world including Africa The book reviews complete patent literature on hemp from the publication of the first patent in 1856 till the end of 2020 providing an excellent insight into hemp s business growth and future potential for industrial applications along with region and sector wise patenting activity concerning industrial hemp In addition articles describe the applications of hemp derived green materials for building construction wastewater treatment and water purification The book will be useful as a reference book for students researchers farmers business houses and individuals interested in industrial hemp for commercial aspects sustainable development farming and other hemp derived innovative products

The Scottish Farmer, 1928

Indianapolis Monthly, 2003-12 Indianapolis Monthly is the Circle City s essential chronicle and guide an indispensable authority on what s new and what s news Through coverage of politics crime dining style business sports and arts and

entertainment each issue offers compelling narrative stories and lively urbane coverage of Indy's cultural landscape **A Seat at the Table** Hettie V. Williams, Melissa Ziobro, 2023-09-11 Contributions by Omar H Ali Simone R Barrett Tejai Beulah Sandra Bolzenius Carol Fowler Lacey P Hunter Tiera C Moore Tedi A Pascarella John Portlock Lauren T Rorie Tanya L Roth Marissa Jackson Sow Virginia L Summey Hettie V Williams and Melissa Ziobro While Black women's intellectual history continues to grow as an important subfield in historical studies there remains a gap in scholarship devoted to the topic To date major volumes on American intellectual history tend to exclude the words ideas and contributions of these influential individuals **A Seat at the Table Black Women Public Intellectuals in US History and Culture** seeks to fill this void presenting essays on African American women within the larger context of American intellectual history Divided into four parts the volume considers women in politics art government journalism media education and the military Essays feature prominent figures such as Shirley Chisholm Oprah Winfrey journalist Charlotta Bass and anti abortion activist Mildred Fay Jefferson as well as lesser known individuals The anthology begins with a discussion of the founders in Black women's public intellectualism providing a framework for understanding the elements structure and concerns central to their lives and work in the nineteenth century The second section focuses on leaders in the Black Christian intellectual tradition the civil rights era and modern politics Part three examines Black women in society and culture in the twentieth century with essays on such topics as artists in the New Negro era Joycelyn Elders a public servant and former surgeon general and America's foremost Black woman influencer Oprah Lastly part four concerns Black women and their ideas about public service particularly military service with essays on service members during World War II and the post WWII military Taken as a whole **A Seat at the Table** is an important anthology that helps to establish the validity and existence of heretofore neglected intellectual traditions in the public square

Pediatric Vaccines and Vaccinations Timo Vesikari, Pierre Van Damme, 2017-11-01 This graduate textbook serves as a highly readable guide on vaccines and vaccination in infants children and adolescents from an European perspective The first part of the book is dedicated to childhood and adolescent vaccine schedules maternal and neonatal immunization and safety of vaccines In a second part we focus on viral and bacterial vaccines Further chapters discuss pediatric travel vaccines vaccines in the pipeline and the European registration process This book is intended to be a reference textbook and will help to standardize the information on vaccines and immunization program in the WHO European Region

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