Critical Mathematics Education
Theory, Praxis and Reality

Edited by:

Paul Ernest, University of Exeter, UK

Bharath Sriraman, University of Montana

Nuala Ernest

Mathematics is traditionally seen as the most neutral of disciplines, the furthest removed from the arguments and controversy of politics and social life. However, critical mathematics challenges these assumptions of neutrality and actively attacks the idea that mathematics is pure, objective, and value neutral. It argues that history, society and politics have shaped mathematics – not only through its applications and uses, but through moulding its concepts, methods, and even mathematical truth and proof, the very means of establishing truth. Critical mathematics education also attacks the neutrality of the teaching and learning of mathematics, showing how these are value laden activities indissolubly linked to social and political life. Instead it argues that the values of openness, dialogicality, criticality towards received opinion, empowerment of the learner and social/political engagement and citizenship are necessary dimensions of the teaching and learning of mathematics, if it is to contribute towards democracy and social justice. The books draws together critical theoretic contributions on mathematics and mathematics education from leading researchers in the field. It explores many facets of the practical implications of these critical views for the varying stages and phases of mathematics education around the globe. Recurring themes in the book include: • The natures of mathematics and critical mathematics education, issues of epistemology and ethics; • Ideology, the hegemony of mathematics, ethnomathematics, and real-life education; • Capitalism, globalization, politics, social class, habitus, citizenship and equity. The book demonstrates the links between these themes and the discipline of mathematics and its critical teaching and learning. The outcome is a groundbreaking collection unified by a shared concern with critical perspectives of mathematics and education, and of the ways they impact on practice and the realities of society and schooling.
TABLE OF CONTENTS

Foreword.
Contributors.
Introduction, Bharath Sriraman.
Chapter 1: Mathematics: A critical rationality? Ole Skovsmose.
Chapter 2: Ethnomathematics: A response to the changing role of mathematics in society, Ubiratan D'Ambrosio.
Chapter 3: Mathematics education ideologies and globalization, Paul Ernest.
Chapter 4: Scripting the world in mathematics and its ethical implications, Keiko Yasukawa, Ole Skovsmose, and Ole Ravn.
Chapter 5: The scope and limits of critical mathematics education, Paul Ernest.
Chapter 6: The elephant in the room: Equity, social class and mathematics, Robyn Jorgensen.
Chapter 7: Connecting the notion of foreground in critical mathematics education with the theory of habitus, Tine Wedege.
Chapter 8: The hegemony of English mathematics, Brian Greer and Swapna Mukhopadhyay.
Chapter 10: Ethnomathematics as a Human Right, Karen Francois.
Chapter 11: Negotiating critical pedagogical discourses Stories of contexts, mathematics and agency, Annica Andersson and Paola Valero.
Chapter 12: Critical mathematics education in the context of 'real-life education,' Helle Alro and Marit Johnsen-Høines.
Chapter 13: The role of mathematics in politics as an issue for mathematics teaching, Mario Sánchez Aguilar and Morten Blomhøj.
Chapter 14: Investigating critical routes: The politics of mathematics education and citizenship in capitalism, Maria Nikolakaki.
Chapter 15: Are there viable connections between mathematics, mathematical proof and democracy? D. F. Almeida.
Chapter 16: A historical analysis of democracy in mathematics and mathematics education in European culture, M. Sencer Corlu.
Chapter 17: Futures at stake: Children's identity work in the force field of social valorisation of school mathematics, Troels Lange.

Introduction

CRITICAL MATHEMATICS EDUCATION: CLICHÉ, DOGMA OR COMMODITY?

Bharath Sriraman

The present volume revisits an old theme in mathematics education, namely the significance of incorporating a “critical” approach to the teaching and learning of mathematics with emphasis on real world contexts. A critical approach to any domain of inquiry is preferred to a dogmatic approach, but this begs the question—does an excessive focus on this term in the domain of mathematics education make it clichéd? What does a critical approach refer to really? Does it mean an emphasis on culture in a broader sense that would include different points of view on the nature and significance of mathematics, its teaching and learning? Or does it mean a politicized approach influenced by critical theory, which suggests a social justice and “democratic” agenda?

The critical approach to mathematics education can be traced back via several lineages. For the sake of brevity, I will pick on two well-known schools of thought because of their contrasting features. One is the work of Alan Bishop on Mathematical Enculturation and the other is Ole Skovsmose’s Towards a Philosophy of Critical Mathematics Education. The former characterizes mathematics as a pan-cultural activity characterized by (1) playing, (2) designing, (3) locating, (4) explaining, (5) counting, and (6) measuring. In such a view, no culture (Eastern, Western or otherwise) can claim dominance or precedence for the creation of mathematics. The critical aspect of this school of thought is to uncover the unneutral nature of school mathematics and tacit meanings conveyed to the learners of mathematics. For instance, some of the research influenced by Bishop’s work has focused on school mathematics in different parts of the world that still contain vestiges of a colonial past and ways in which school mathematics can be made truer to the local culture. The latter characterizes mathematics as an invisible structure that plays a role in the way societies are shaped and mutate, and, in the ensuing research that has followed Skovsmose’s school
of thought, mathematics is viewed as a tool (and means) of emancipation, and learners “foregrounds” predispose them ontologically and even epistemologically.

If one removes the word “mathematics” from the term critical mathematics education, do the two schools of thought still hold any weight or significance, or is it the centrality of mathematics in culture and society that propels their arguments forward? One can argue that enculturation shapes student lives within institutions such as family, community, schools, and so on, and mathematical enculturation in an unneutral sense often perpetuates incorrect ideas about the origins, transmission and the development of mathematics, and the tools that constitute doing mathematics. Similarly, critical education is meant to foster critical thinking or critical pedagogy where learners are transformed from being passive recipients of institutionalized knowledge to those that question, challenge, and even shape the nature of their learning experience. This means critical mathematics education proposes conditions in which learners become critical of the role of mathematics in society.

In spite of the overuse of the term “critical” in the recent mathematics education literature, this domain of inquiry still remains wide open from many perspectives, particularly ways in which it is branded, commoditized, and sold to less affluent countries under the guise of equity or progress or democratization. Consider the conjoined notions of “mathematical literacy” and “reading literacy,” which are major components of items found on the Program for International Student Assessment (PISA), a test devised by the Organisation for Economic Co-operation and Development (OECD), originally a selective group of affluent European nations interested in promoting economic cooperation and generating wealth. The OECD now includes partners from non-European nations such as Israel and South Korea, and is keen to involve partnerships from countries such as Brazil, India, and other “developing countries” on the cusp. PISA is touted as an assessment tool that provides a barometer of how “competent” students are in areas such as mathematics, science, literacy, and so on, and in a broader sense of the “quality” of schooling that students have access to. In other words, demographic questionnaires administered to participants can reveal variations in performance as a function of socioeconomic class and other variables. There is no causal link between a country’s performance and the state of its educational services.
Consider the following thought experiment. Suppose a nation, “Mathistan,” agrees to administer this expensive assessment and finds that its students performed woefully in comparison to, say, the Netherlands, Finland, or South Korea. Does this mean that students in this hypothetical country are lagging behind on domain specific knowledge in comparison to students in these other countries? Or does this mean that the school curricula in “Mathistan” does not cover material necessary for proficiency in the types of items found on the PISA? If this is indeed the case, one way to improve their students’ performance would be to replicate curricula from countries that have been successful in the test by importing professional development and a host of other teacher-training and student-training tools at a considerable cost from one of the OECD countries! The unasked question in this scenario is, why should “Mathistan” bother? Are the types of competencies being touted by PISA really essential or “critical” to the schooling and societal needs of this country? It may very well be the case that the mathematics curricula in place is more than adequate for the scientific and industrial needs of that country! Many mathematics educators jumped on the modeling curricula bandwagon as a way to improve student’s performance on PISA. Why should a modeling based mathematics curriculum act as a panacea for this country? Or why should mathematics be homogenized because an economic organ has devised an assessment tool that claims to measure competencies considered “critical” for their citizenry in the twenty-first century? These are critical questions that are unasked. When poverty and day-to-day infrastructure are more prescient for the developing world, why should these countries bother with administering an expensive assessment tool that commoditizes competencies deemed to be critical by an economic body? Economic growth and wealth may be “critical” for the developed world to sustain its current rates of consumption and standards of living, but this need not be the case for the rest of the world grappling with more basic problems and a reality not based on consumption. However, PISA even claims that low educational performance on its assessment has an economic impact on the countries in question. The reader is advised to critically think about the validity of such a claim by examining the data provided in Hanushek and Woessmann’s (2010) report for the OECD.²

This book does not address these larger questions, but it does address attempts by mathematics educators trying to incorporate a critical approach to questions within mathematics education. It not only theorizes the “critical” aspect of mathematics education but also provides avenues for praxis situated in current realities.
NOTES

1 The astute reader will note that I have omitted Mellin-Olsen’s work on the political aspects of mathematics education as well as D’Ambrosio’s work on mathematics and society, which are more or less concurrent with the two schools of thought under discussion here.


REFERENCES


