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Greer, Brian; Mukhopadhyay, Swapna; Powell, Arthur B. & Nelson-Barber, Sharon. (Eds.) (2009) *Culturally Responsive Mathematics Education*. NY: Routledge.

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In an effort to enhance global competitiveness and economic superiority, authorities have devalued diversity, particularly in school settings. Increasingly, in fact, student academic achievement is gauged only by performance on various standardized tests. Not only do these tests ignore the background, culture, and resources of minorities and rural dwellers, but they also place an enormous level of stress on teachers and administrators as they strive for job security. All of this comes at a time of rampant demographic changes in classrooms across the country.

Because it is frequently called a “gatekeeper” discipline, governments continually scrutinize mathematics achievement. To further complicate matters, most people

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consider mathematics to be politically neutral. After all, mathematics problems have unique, right answers—or do they?

Culturally Responsive Mathematics Education seeks to establish mathematics as a human activity, constructed by those who practice it and subject to the uncertainties of any human endeavor. As the authors note, “Mathematics is comprised of a diversity of practices that make it as historically, culturally, socially, and politically situated as any other human activity.” (p. 1)

This book includes essays written by different authors, each of whom is a respected leader in mathematics education and/or cultural diversity. For example, Paul Ernest, author of the chapter *New Philosophy of Mathematics: Implications for Mathematics Education*, is Emeritus Professor of Mathematics Education at Exeter University, UK. He is internationally known for his research at the intersection of mathematics, education, and philosophy, having written over 200 papers, chapters and books (Ernest, 2011.). Also contributing to this manuscript is Eric Gutstein, a mathematics educator committed to social justice via mathematics education. Gutstein strongly believes that students should use education to challenge oppression in whatever form it presents itself. As an editor of *Rethinking Mathematics: Teaching Social Justice by the Numbers*, Gutstein demonstrates the importance of appropriate teacher training to incorporate social justice principles in the mathematics curriculum (UIC Faculty Profile, 2011). Julia M. Aguirre is another influential educator featured in this book. Her TEACH MATH (Teachers Empowered to Advance CHange in Mathematics) project is committed to preparing teachers for increasingly diverse student populations by helping them recognize the assets of cultural and linguistic diversity (UW Beyond the Bricks, 2011). With regard to college teaching, Shandy Hauk is one of the authors of the final essay. In addition to her research and publications on culturally responsive teaching, Hauk models her findings in her own classes of prospective mathematics teachers (Hauk, 2007). Ubiratan D’Ambrosio further solidifies the expertise of all of the authors contributing to this book in his foreword. Not only does he tout their success in approaching mathematics

education from a broad perspective, but he also recognizes their focus on principles that harbor equity and liberation.

This book is divided into two main sections, one of which seeks to enlighten readers on the foundations for culturally responsive mathematics education and the second, which deals more directly with the teaching and learning of mathematics. To confirm that math is indeed a human activity, the authors of this book stress the importance of accurately examining its history and cultural foundations. According to Swetz, Mukhopadhyay, Powell, and Frankenstein, for instance, the history of mathematics is often presented with a Eurocentric viewpoint. Western scholars, most often responsible for the writing of such history, frequently overlook significant contributors from other cultures; indeed, the culpable authors usually give European mathematicians credit for discoveries made in Asia or Africa. For example, the Pythagorean Theorem is named for the Greek philosopher Pythagoras, but was certainly known to be used by the Babylonians as early as 2000 BCE. In fact, traditional histories such as Kline's (1953) claim that there was a 1000-year dormancy of mathematics with the weakening of the Greek civilization. However, during these 100 years, mathematicians accomplished much in China, India, and Persia. With the increasing diversity in North American schools, educators need to do much better. Mathematics belongs to everyone—and students need to hear that math is not the province of one “race” or culture. It belongs to them, too. Such perspectives are *ethnomathematical*, and several authors in this book embrace ethnomathematics, including Mukhopadhyay and colleagues and the team of Barta and Brenner. Instead of limiting their studies to academic mathematics only, these authors examine a diversity of mathematical practices, most of which connect to students' lives. Included in this perspective are implications for teacher preparation and development. According to Moschkovich and Nelson-Barber, contemporary bilingual and multilingual classrooms require an understanding of the ways in which various dialects and national languages express mathematical knowledge.

The second part of the book focuses on the application of these theories to specific cultures, school settings, and teacher preparation. Cultures represented include African American, Latino/a, and Native American. Authors affirm

the positive offerings of these cultures while denouncing the bias that often exists in school settings. Although explicitly expressed by Martin and McGee, all of the authors seem to convey the same hope—that children receive mathematics education “that resonates with their cultural and racial identities and that is not based on what is best for other children” (p. 231). Embedded in this belief is the necessity of appropriate teacher training considered at length by Geneva Gay (2000) in her *Culturally Responsive Teaching*. As Gay states,

Inability to make distinctions among ethnicity, culture, and individuality increases the risk that teachers will impose their notions on ethnically different students, insult their cultural heritage or ignore them entirely in the instructional process. In reality, ethnicity and culture are significant filters through which one’s individuality is made manifest. (p. 23)

Not only does teacher training implicate new knowledge and skills about themselves, their students, and their subject matter, it also demands a knowledge and respect for the intellectual history and cultures about which, as math teachers, they likely know little to nothing. Some of these contributions are detailed by authors of this book and include navigation and parka patterns of the Yup’ik elders, four-fold symmetry and the related Cartesian coordinate system of Native Americans, and the invention of algebra by African Arabs.

No longer can our society ignore the need for culturally responsive mathematics education. According to Greer and colleagues, projections indicate that the white population will be in the minority by 2042, while the proportion of white teachers in US schools persists at 83%. As the demographics in our classrooms change, teachers and teaching must change too.

While I agree that mathematics is oftentimes portrayed as a neutral discipline, I had not considered the absolutist philosophy of academic mathematics as it is compared to the fallibilist philosophy. The route to this understanding, in this book is through ethnomathematics. Certainly, because mathematics is constructed by humans, it is politically and culturally positioned, and is subject to

constant revision—though this is hardly the impression that students get in school. As Ernest says,

Overall, the reconceptualization of mathematical knowledge as a cultural and social construction demystifies the concepts, results, proofs, methods, and theories of mathematics and sees them not as something extrahuman imposed upon humanity, but as something created and shaped by human concerns, interests, powers of reasoning, and historical and social practices. (p. 56)

What is most important here is the generic use of the word “human”. Mathematics has been and continues to be created by all cultures in all parts of the world.

Ethnomathematics lies at the intersection of mathematics and culture, and consequently demands that mathematics education reaches beyond mathematical Eurocentrism. Although I can never truly know how another culture is affected by such a viewpoint, this book has opened my own eyes to the oppression felt by students in all parts of the United States. I agree with Gutstein when he says that education needs to be “reframed for the purpose of fundamentally transforming society, from the bottom to the top, to end injustice in all forms” (p. 159). With the increased interest fostered by new cultural perspectives and the willingness of students to be change agents for greater justice, mathematics could also inhabit such a paradigm shift.

Although Gutstein and his colleagues have brought recent attention to the need for social justice through education, this concept is far from novel. From the beginning of the Progressive Movement in the late 1800s, educators have recognized the need for school curriculum to reflect society. However, in the late 1920s John Dewey and other intellectuals expressed their dissatisfaction with what they believed to be “a system riddled with injustice” (Kliebard, p. 181). Subsequently, strong efforts to drastically restructure the American curriculum began. Along with support for scientific and activity curriculums was a plea for reform to meet social concerns. In fact, George Counts, in his 1932 manifesto *Dare the School Build a New Social Order?* addresses what he feels to be a weakness of the Progressive Education movement—a lack of attention to social welfare. While he acknowledges the positive

qualities of the liberal-minded upper middle class, he also questions their ability to shape educational programs. In particular, he claims that this class is insensitive to social injustice and considers themselves “members of a superior human strain.” According to Counts,

If Progressive Education is to be genuinely progressive, it must emancipate itself from the influence of this class, face squarely and courageously every social issue, come to grips with life in all of its stark reality, establish an organic relation with the community, develop a realistic and comprehensive theory of welfare, fashion a compelling and challenging vision of human destiny, and become less frightened than it is today at the bogies of imposition and indoctrination. (p. 9)

This theory of social meliorism began in the 1930s as a response to American dissatisfaction with the economic and social systems. With an effort focused on social reconstructionism, Counts and colleagues felt that social injustice and the negative effects of capitalism could be diminished (Kliebard, 1987). One way to do this, according to Paul Theobald, is through changes in the educational domain. He states,

Citizens whose first passion might be the health of the environment, or media reform, or term limits, or campaign finance reform, or any other sort of political or economic reform, need to recognize that a crucial first step to achieving those ends may well be a genuine conversation about what goes on in the local school. (p. 130)

As mathematics educators continue to face questions of job security related to high-stakes testing, the authors of this book remind us of the true measure of educational success. As students become aware of the mathematical contributions of all cultures, they may develop an interest in mathematics and wish to contribute themselves. But most importantly, through culturally responsive teaching, society as a whole receives the ultimate benefit. According to the educational philosophy espoused by Eric Gutstein’s Chicago school, students build on their community knowledge while striving to expand both their academic and critical knowledge of mathematics. In this way, not only do they develop the mathematical abilities for access

and opportunity, but they are also able to use these skills to transform society locally as well as globally.

Where's the rural? Although there is some mention of rural areas and themes, no chapter focuses entirely on the challenges that confront rural students and communities. The first significant reference to rural place appears in the chapter by Barta and Brenner. As part of their discussion on the role of culture in mathematics instruction, they describe the efforts of a rural Guatemalan community to prepare culturally relevant mathematics lessons. With reported assistance from a US nonprofit organization headquartered in Dallas, the Guatemalan elders are now valued by the younger generation for their expertise in many areas. One suspects that some or many of the other contributors to this volume might have stretched to tell similar stories. For the most part, however, dilemmas and struggles in U.S. rural communities remain seemingly invisible, and this devolution is too familiar a story when it comes to discussions of curriculum and instruction.

Also of benefit would be a greater awareness by the authors of the struggles faced by rural communities as they are continually oppressed by the dominant metro- or cosmopolitan culture. (See Raymond Williams, the originator of cultural studies, for the classic argument; Williams, [1989, 1973] took a special interest in rural places confronting the hegemony of the cosmopolitan outlook). Such an awareness would have served to add depth to the argument for culturally responsive education. Further still, cultural diversity (that is, ethnic and "racial" diversity) is no longer an urban phenomenon; rural areas are also experiencing rapid growth of minority populations of all kinds. According to the Economic Research Service of the U.S. Department of Agriculture (ERS), racial and ethnic minorities make up 18.3% of nonmetro residents and are geographically scattered throughout the U. S. (ERS using U.S. Census Bureau county population estimates, 2005). While culturally responsive education includes using innovative pedagogy to reach all students, including African Americans, Native Americans, and Latino/as, perhaps the authors could also take into account the places where these various cultures reside. Although many studies focus on diversity in urban areas, where many reformers consider the "greatest problems" to be, rural places confront unresponsive forms of schooling—

based on Williams' notion of the hegemony of the cultural metropolis (which, by the way does not originate from dispossessed urban minorities). Rurally appropriate schooling would, according to many voices, help strengthen the rural communities the nation as a whole is going to need in the age of declining oil production and rising post-industrial demand for food, lumber, and natural fiber. Refreshingly, in light of this criticism, Moschkovich and Nelson-Barber discuss place-based education in their chapter *What Mathematics Teachers Need to Know about Culture and Language*. Recognizing the importance of place to many of these cultures, these authors support mathematical lessons that are relevant to students' experiences.

Finally, now that the case has been made for culturally responsive mathematics education, including a responsiveness sensitive to rural place and the construct of "place" in general, we must begin the task of convincing the public and the power brokers that schools had better build a new social order (cf. Counts, 1932), and daring ourselves to do so more frequently—and to keep on with the doing. Future volumes need to consider the politics, economics, and cultural implications of the struggle.

This book is written for a varied audience. Unquestionably, mathematics educators would benefit from the discussion. In addition, students, researchers, administrators, and anyone interested in the transformation of mathematics education would benefit. Although the book focuses on the United States almost exclusively (with Guatemala oddly representing rural places in this context!), many of the ideas espoused by the authors might, with considerable care in the translation, be useful in other parts of the world; and even in rural places in North America.

This book confirms the need for an intellectual and cultural transformation in mathematics education. It's not Arne Duncan's or Bill Bennett's or Margaret Spelling's vision of reform—not by a long shot. Mathematics itself (let alone mathematics education) is not neutral; it's filled with the uncertainties of any human endeavor, including the uncertainties of cultural, economic, and political catastrophe. More people should be worried; and this book can help them in their worries.

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