Part III
Equity and Curriculum Diversity

Ferdinand Rivera and Helen Forgasz

Part III consists of two reprinted ZDM articles and two new chapters that address issues in equity and curriculum diversity. Our working notion of curriculum (diversity) is tied to “the study of educational experience” (Pinar 2004), a view that does not dwell on planned courses of study (unit and lesson planning and assessments, scope and sequence guide construction, effective use of textbooks, etc.) but critically explores and reflects on various underlying power/knowledge issues that “always-already” characterize the development of a curriculum. Thus, a curriculum that is conceptualized in this manner articulates its highly symbolic nature. That is, following Pinar (2004), it is “the site on which generations struggle to define themselves and the world [and that] it is the symbolic character of curriculum that renders debates over the canon” (p. 186), with canon in our case as referring to the valued institutional versions of the mathematics curriculum. The four chapters in this section together address the equity issue that deals with the complex relationship between mathematical knowledge construction, on the one hand, and individual and institutional histories that influence the constructive process, on the other. Thus, the curriculum diversity related concerns that are tackled in this section seek to understand how students’ differing levels of access to a mathematics curriculum consequently shape how they understand their own lives and their emerging mathematical identities, and how both are embedded within the complex fabric of society, politics, and culture (Pinar 2004, p. 36).

Skovsmose in his chapter addresses issues concerning the sociopolitical roles of mathematics education and what he calls “mathematics-based rationality” between two opposing lifeworlds (i.e. the progress of science, on the one hand, and technology, on the other). Such rationality, he notes, “brings us into an open space of contingencies, and that development could take very different routes.” Skovsmose introduces the concept of “fabrication by mathematics-based rationality,” which both enables and complicates our understanding of the different natures of mathematical knowledge. For example, mathematical rationality fabricates: possibilities (with choices that are neither necessarily accessible nor optimal); strategies; facts; contingencies (with risks); and perspectives. The author then explores the implications of such fabrications, including their operational mechanisms, in our societies and especially in the “school mathematics tradition” that cultivates and values “a prescription readiness among students.” Prescription readiness involves the (predictable and rather stable) mathematical predisposition of knowing “what
it means to operate with given information [that is both necessary and sufficient] within a given space of possible strategies for solution [with possibilities often-
times framed within the oppositional binary practice of right and wrong].” In the
remaining sections, Skovsmose further explores the implications of fabrication in
the school mathematics tradition from the way in which our schools engage in
“differentiated labeling of students” to the “ethically filtrated” assumptions we im-
pose in “mathematical transposition” activity. Drawing on several powerful empir-
ical studies in the emerging counterdiscourse of critical citizenship in mathemat-
ics education, he provisionally closes the chapter by exploring how it can be put
into praxis within/against such fabrications with a cautionary note that responses or
conditions of possibility vary depending on the complex context/s of specific life-
worlds.

In her chapter, Valero uses very recent theoretical and methodological frame-
works that enable us to “understand the meaning of mathematics education as so-
ciopolitical practices and the implications of these notions for researching mathe-
metics education.” Utilizing two case studies that have been drawn from an empir-
ical study in two schools in Denmark and South Africa, she extrapolates ways in
which students’ “advantaged and disadvantaged positions” could possibly emerge
in a “network of school mathematics practices” (NSMP), which is a reformulation
of an institutional system model of mathematics education (ISME). In ISME, the
teaching and learning of mathematics in a school system are viewed in the con-
text of a relationship between and among school leaders, mathematics teachers as
a group, and the individual teachers. Valero’s NSMP encompasses “the network of
routines, ideas, shared meanings and ways of talking and conceiving mathematics
education among the actors in the school organization, and even outside of it.” The
two interesting case studies, narrated and interpreted from a critical perspective, il-
lustrate how excluded and marginalized students oftentimes perform their socially
constructed roles in the classroom as a consequence of a network in which some
“micro-physics of power” may have (unintentionally) contributed to their “differ-
entiated positions,” ultimately denying them (full) access to learning. Valero then
notes that marginalized students’ disadvantages in mathematics classrooms appear
to “trespass the boundaries of individual attributes and of instructional organization
in the classroom,” which means that notions of “disadvantage and equity could be
reformulated in terms of positioning within the relations and practices that constitute
mathematics education in the school.”

Leder in her chapter discusses interpretive findings that she has drawn from
studies that have been published in the ZDM journal from 1990 to 2009 in re-
gards to the education and needs of mathematically gifted students and compares
them with results drawn from a representative sample of studies taken from the
broader mathematics education literature. She notes at the outset that despite the
voluminous amount of research on gifted students, no consensus has been reached
among scholars in terms of how to conceptualize giftedness as a category. Con-
sequently, her analysis accepts the various definitions of giftedness at face value
(e.g. high achieving, mathematically able, expert students, etc.). In her thorough
research of published ZDM articles on gifted students, she notes that a range of
issues has been covered from promoting special problem-solving programs and developing effective instructional interventions, strategies, and approaches for gifted students to establishing strong (psychological and neural) linkages between and among creativity, intelligence, ability, flexible and adaptive thinking, and gifted students’ problem solving proficiency and performance in solving difficult and non-routine mathematical problems. Additional recent studies describe the quality of their (nonstandard) thinking processes and the significant role of access to practice and appropriate curriculum materials as a way of enhancing their problem-solving strategies. Leder, in one section, underscores important equity issues such as the social value of equality and access to challenging curricula between gifted and “regular” students and possible gender differences among high-ability students (see Penner and CadwalladerOlsker in this volume for an interesting discussion of gender differences in mathematical performance among high-ability groups across several countries). In their commentaries to Leder’s chapter, Koichu raises several thought-provoking questions concerning equity issues surrounding gifted students in mathematics, while Callingham draws possible research implications of the key themes in Leder’s chapter that might inform future empirical investigations with the mathematically gifted.

In his chapter, Were writes about his ethnographic experiences with the Nalik people of New Ireland in Papua New Guinea when a federal systemic initiative developed and introduced “a community-based (elementary) mathematics education program in the local vernacular that was sensitive to children’s existing knowledge of local cultural traditions.” Were’s analysis focuses on the properties of cultural forms that are collected, developed, and used in class as tools for learning mathematics, especially in light of the fact that some forms either contain stipulations and secrets of particular clans (e.g. kirugu) or are conveyed nonverbally (e.g. the craft of carving canoes) and that, in most other cases, require teachers to work closely with key members of the community who possess the requisite information. Drawing on findings from a few ethnomathematical projects, Were also points out how “studying mathematical ideas in a cultural context” presupposes the necessity of “extending beyond the tangible forms and expressions” and locating them “in abstract relations that order social relations.” In his ethnographic case study, he explores how everyday patterns of tangible forms (especially the kapkap) are effectively used with the Nalik children in order to help them transition in their mathematical thinking from the concrete (i.e. through the forms) to the abstract (i.e. the relevant systems of geometric transformations). Were also notes how the principles that structure and generate those forms represent systems of paradoxical structures that are “lived out” and “regulate and maintain order in the social domain” among the community. His conclusion provides a materialist view of mathematics, and, in particular, patterns that are loaded with both mathematical and socialization values. In their commentaries to Were’s chapter, Bishop dwells on several complex issues that arise when “the cultural discourse [moves] into the educational sphere” in which case “the problems revealed are far more complicated than first realized,” while Khan underscores potential dilemmas such as “desubstantiation” and rele-
vant translational implications when ethnomathematical ideas are appropriated in capitalistic societies.

References