This book grew out of a public lecture series, *Alternative forms of knowledge construction in mathematics*, conceived and organized by the first editor, and held annually at Portland State University from 2006. Starting from the position that mathematics is a human construction, implying that it cannot be separated from its historical, cultural, social, and political contexts, the purpose of these lectures was to provide a public intellectual space to interrogate conceptions of mathematics and mathematics education, particularly by looking at mathematical practices that are not considered relevant to mainstream mathematics education. One of the main thrusts was to contemplate the fundamental question of whose mathematics is to be valorized in a multicultural world, a world in which, as Paulo Freire said, “The intellectual activity of those without power is always characterized as non-intellectual”.

To date, nineteen scholars (including the second editor) have participated in the series. All of the lectures have been streamed for global dissemination at: http://www.media.pdx.edu/dlcmedia/events/AFK/. Most of the speakers contributed a chapter to this book, based either on their original talk or on a related topic.

The book is divided into four sections dealing with:

- Mathematics and the politics of knowledge
- Ethnomathematics
- Learning to see mathematically
- Mathematics education for social justice.
ALTERNATIVE FORMS OF KNOWING (IN) MATHEMATICS
NEW DIRECTIONS IN MATHEMATICS AND SCIENCE EDUCATION
Volume 24

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Scope

Mathematics and science education are in a state of change. Received models of teaching, curriculum, and researching in the two fields are adopting and developing new ways of thinking about how people of all ages know, learn, and develop. The recent literature in both fields includes contributions focusing on issues and using theoretical frames that were unthinkable a decade ago. For example, we see an increase in the use of conceptual and methodological tools from anthropology and semiotics to understand how different forms of knowledge are interconnected, how students learn, how textbooks are written, etcetera. Science and mathematics educators also have turned to issues such as identity and emotion as salient to the way in which people of all ages display and develop knowledge and skills. And they use dialectical or phenomenological approaches to answer ever arising questions about learning and development in science and mathematics.

The purpose of this series is to encourage the publication of books that are close to the cutting edge of both fields. The series aims at becoming a leader in providing refreshing and bold new work—rather than out-of-date reproductions of past states of the art—shaping both fields more than reproducing them, thereby closing the traditional gap that exists between journal articles and books in terms of their salience about what is new. The series is intended not only to foster books concerned with knowing, learning, and teaching in school but also with doing and learning mathematics and science across the whole lifespan (e.g., science in kindergarten; mathematics at work); and it is to be a vehicle for publishing books that fall between the two domains—such as when scientists learn about graphs and graphing as part of their work.
Alternative Forms of Knowing (in) Mathematics

Celebrations of Diversity of Mathematical Practices

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Mathematics education frequently is theorized and organized according to standard practices, the purpose of which is to educate adapted citizens. Even though constructivist theory emphasizes the personal construction of knowledge, actual mathematics education practices generally aim at making students construct the “right,” that is, the canonical practices of mathematics – not realizing that for many, this may mean symbolic violence to the forms of mathematical knowledge they are familiar with, and that the standard processes typical of mathematics education contribute to the reproduction of social inequities. Those who do not complete academic mathematics courses at the high school level are systematically biased against when it comes to university entry and other career choices.

This book grew out of an ongoing public lecture series concerned with thinking about mathematics education differently. The series was titled Alternative Forms of Knowledge Construction in Mathematics and has taken place every Spring term since 2006 at Portland State University, Oregon, and also, since 2009, Portland Community College. The impetus for the lectures came from the fundamental belief that mathematics is a human construction, thus mathematics cannot be separated from its historical, cultural, social, and political contexts. To date, nineteen scholars from North America and beyond have participated in the series. All of the lectures were videotaped and then streamed for global dissemination at: http://www.media.pdx.edu/dlcmedia/events/AFK/. Readers are encouraged to access these talks, each about an hour long, that supplement the chapters in this collection. These chapters have been contributed by sixteen speakers from the first five years of the series, based either on the original talks or new writing. Although contributions from Rochelle Gutierrez, Cyril Julie, Lionel LaCroix, and Arthur Powell are absent from this collection, we encourage the readers to access their lectures in the series from the live link cited above.

In mentioning the cultural aspects of mathematics, and especially their educational implications, we always remember the impact of Claudia Zaslavsky (1917–2006). As an activist-scholar, Claudia was a pioneer in documenting and valorizing mathematical activities of many cultures, particularly in her seminal book Africa Counts, published in 1973. As well as being a leader in ethnomathematics, Claudia served as guide and mentor to many. Fittingly, the first year’s set of lectures was dedicated in memory of her contribution to the exploration of alternative ways of thinking in mathematics. In continuing the struggle to recognize the knowledge and voices of others, our aim in the lecture series was to reach out to many who, even within the mainstream, do not realize their own voices.

As a public lecture series, and now this book, the project grew out of collaboration of various kinds. We would like to take an opportunity to thank many without whose support it would not have happened. Firstly, we were funded through annual awards from 2006 to 2011 from Portland State University’s Diversity Action Council. Human diversity is mostly recognized in relation to
race/ethnicity, linguistic capabilities, religions, or sexual orientation. Extending its boundaries to the cognitive/cultural realm is not only helping us broaden our understanding of diversity, it also potentiates a discourse in higher education on diversity in mathematical practices, which is a radically different perspective.

We thank Portland Community College, Cascade campus, for its unwavering support since 2009. This is mostly due to Ann Sitomer of the mathematics department at PCC to whom we owe a great deal of gratitude for her intelligence, keen interest, and sense of partnership in collaboration. We believe that a strong and stable partnership between a community college and a four-year college is essential not just for enhancing STEM participation, but also for the fundamental reason that education, in its all aspects, should be easily accessible to every member of society.

We thank Provost Roy Koch, Portland State University, Dean Randy Hitz of the Graduate School of Education, and Professor Christine Chaille, the chair of Curriculum and Instruction, for their ongoing interest in, and support for, the lecture series. Despite their busy schedules, they attended the lectures and often welcomed the speakers to Portland by introducing them to the participating audience.

Our heartfelt thanks got to the participants – first as speakers, now as authors – and the audience. The talks were deeply engaging and further invigorated by the participation of audiences as diverse as one could imagine, spanning a wide range of age and interests, many of whom travelled for hours to attend the lectures. Without their interest and support, the series would not have lasted. The speakers were, simply put, assets of an extraordinary quality. They adapted to the low-cost operation of the series by staying in Swapna’s modest guestroom, and provided not only stimulating public talks but also remarkable professional development opportunities at her own house!

Big thanks go to the technology crews of Portland State University (Rick Arnold and his team) and Portland Community College (Michael Annus and his team). They worked tirelessly in videotaping, streaming, and storing the lectures on their servers. Not only were they a vital part of the logistical team, they enjoyed each lecture and had thoughtful comments on each of the topics presented.

Last but not least, we thank Brian Greer for his ongoing cognitive and emotional support. Not only is he generous in terms of offering his expertise, he also has been a major architect in designing the project.

There are many others to whom we owe gratitude for their support – we thank you all.

In solidarity

Portland, OR
Mt. Gravatt, QLD
January 2012
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Brian Greer worked for most of his career in the School of Psychology, Queen’s University, Belfast, before moving to a position in mathematics education at San Diego State University in 2000. He now lives in Oregon where he is an Adjunct Professor at Portland State University and works independently. His work has evolved from psychological studies of mathematical cognition, through work on aspects of mathematics teaching/learning, towards a critical stance and an interest in the cultural and political contexts in which mathematical education takes place.

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Eric (Rico) Gutstein teaches mathematics education at University of Illinois – Chicago. His work includes teaching mathematics for social justice, Freirean approaches to teaching and learning, critical and culturally relevant urban education, and mathematics education policy. He has taught middle and high school mathematics in Chicago public schools, is author of *Reading and Writing the World with Mathematics: Toward a Pedagogy for Social Justice* (Routledge, 2006), and is co-editor of *Rethinking Mathematics: Teaching Social Justice by the Numbers* (Rethinking Schools, 2005). Rico is also a founding member of Teachers for Social Justice (Chicago) and is active in social movements against education privatization.

Chris Jordan is an internationally acclaimed artist and cultural activist based in Seattle, WA. His work explores contemporary mass culture from a variety of photographic and conceptual perspectives, connecting the viewer viscerally to the enormity and power of humanity’s collective behaviors. Edge-walking the lines between beauty and horror, abstraction and representation, the near and the far, the visible and the invisible, his work asks us to consider our own role in the incomprehensibly complex world we find ourselves part of. Jordan’s works have been exhibited and published worldwide.

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CONTRIBUTORS

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Remember that our basic message is: We are allowed to think about alternatives. (Slavoj Žižek, speaking to the Occupy Wall Street protesters, October, 2011)

This book is about the celebration of diversity in all its human forms, specifically in relation to mathematics and mathematics education: culture, ethnicity, gender, forms of life, worldviews, cognition, language, value systems, perceptions of what education is for. All of which are reflections of the unavoidable (yet often denied) reality that mathematics education is politics.

There are obvious and direct manifestations of political involvement in education. Governments, through their bureaucracies, set policies and control curricula, testing, teacher education requirements, research bodies, and so on. They also, increasingly and with more and more guile, control the discourse – while no child is to be left behind (a deliberate echo of the ethos of the US Marines), a student who cannot jump through the hoops of algebra (the intense study of the last three letters of the alphabet) is now framed not just as stupid, but also as undeserving of educational and economic opportunities, and even as unpatriotic. For studying these processes in action, the National Mathematics Advisory Panel (NMAP) set up by George Bush constitutes an invaluable case study (Greer, 2012; Roth, 2008).

As one manifestation of the increasingly nationalistic rhetoric surrounding mathematics education, national egos are bound up with international comparative exercises such as PISA and TIMMS. Poor performance by the US in such “beauty contests” is exploitable for political leverage – to find scapegoats (whether the increasing cultural and linguistic diversity of the US population, or the teachers, students, parents), and to create the perception of crisis so that radical deformation can be pushed through. Students, teachers, and school communities (i.e., people) are invisible inside a black box that can be manipulated by external levers of tests, carrots and sticks (many more of the latter than the former), in the context of a set of hysterical demands, such that all children be at grade level in reading and mathematics by 2014. Meanwhile, back on planet Earth, the differences in test scores between the White majority and other ethnic groups – particularly African American, Latino/a, and Native American – stubbornly persist. Meanwhile, under
President Obama’s embrace of privatization, the public school system faces an existential threat (Ravitch, 2010).

Less obviously, there is an pervasive political influence in applications of mathematics in ways that impact most aspects of our lives, but are generally outside our control or even our awareness, that has been characterized and extensively analyzed as “mathematics in action” (e.g., Skovsmose, 2005). Mathematics education does little to prepare people to be aware of, and to deal with, this formatting of their lives by educating them about the nature of mathematical modeling (Greer & Mukhopadhyay, 2012). To the contrary, mathematics education largely provides training in simplistic argumentation (the mathematical concept of “function” corresponds to a single cause producing a single effect, which is a good model for essentially nothing, even in the physical sciences), blind faith in numbers and mathematical models, and slavishly following rules, the rationale for which is not questioned and that absolve people from making human judgments. It also encourages the attitude that simple technical solutions can be applied to complex human problems (including mathematics education). Both forms of thinking in fact belong together and are the pinnacles of metaphysical thinking that today expresses itself in technology gone wild (Heidegger, 2006).

The world is in a mess. Nearly a century ago, H. G. Wells (1920) commented that “human history becomes more and more a race between education and catastrophe” (p. 594). We need to ask what responsibilities we bear as mathematicians and mathematics educators for bringing this situation about and for trying to change it:

It is clear that mathematics provides the foundation of the technological, industrial, military, economic and political systems and that in turn mathematics relies on these systems for the material bases of its continuing progress. It is important to question the role of mathematics and mathematics education in arriving at the present global predicaments of humankind. (D’Ambrosio, 2010, p. 51)

Whereas mathematics has been used in the creation of both “wonders” and “horrors” it is neither good nor bad in itself – at least when considered in a decontextualized manner. Mathematicians have a particular responsibility to avoid contributing to the horrors, in particular through participation in the military-industrial-academic complex. Prominent in educational-political consciousness and media coverage, in the United States and elsewhere, is an ongoing hegemonic struggle that goes by the term “Math Wars” that has intensified since the publication of Principles and Standards for School Mathematics (National Council of Teachers of Mathematics, 1989) but has a much longer history and clear parallels in other disciplines. At the risk of simplism, the difference lies between those who pre-eminently value fluent and error-free performance of decontextualized mathematical procedures and those who attach more importance to conceptual understanding. The former group comprises an unholy alliance of certain mathematicians, certain mathematics
educators, many experimental psychologists who address mathematics education, the corporatocracy, politicians, and policy-makers. As an example of this coalition in action, they dominated any traces of progressivism among the mathematics educators on the National Mathematics Advisory Panel.

NCTM represents what we could call the “enlightened mainstream.” For example, in a section of *Principles and Standards* (NCTM, 1989) that has since undergone sustained criticism, it declared in favor of giving increased attention to number sense, meaning of fractions and decimals, use of calculators for complex computation, actual measuring, problem-solving strategies, and justification of thinking (selected from a list of 37 recommendations), and decreased attention to isolated treatment of division facts, paper-and-pencil fraction computation, use of clue words to determine which operation to use [in word problems], and rote memorization of rules (selected from 18 recommendations) (NCTM, 1989, pp. 20–21).

NCTM also proclaims a strong commitment to equity, but, upon examination, this seems to mean essentially that non-majority students should have access to unexamined mathematics education, not that it be examined in relation to its relevance to, and value for, such students – as Piaget might have put it, assimilation without accommodation. Within the statement of the Equity Principle (NCTM, 1989) the section headed “Equity requires accommodating differences to help everyone learn mathematics” in no way addresses the nature of the mathematics to be learned. We need to “[make] problematic the there in *How do we get There?*” (Martin, 2003, p. 18). The very considerable body of writing on equity and mathematics education is fundamentally flawed because of its internal gaze, mostly ignoring the systemic problems in capitalistic society (Roth, 2008).

Likewise, it is necessary to deconstruct the superficially appealing (and intentionally so) slogan “Mathematics for all” (Martin, 2003) which underlies a project predominantly aimed at economic competitiveness – to whose benefit? (Gutstein, 2009). In official rhetoric, mathematics and science education are seen as essential to the competitive accumulation of human capital, which is really about how people can be exploited by the wealth-making class. The Nobel laureate in economics, Amartya Sen, has proposed an alternative that he terms “human capability” by which he means “[focusing] on the ability of human beings to lead lives they have reason to value and to enhance the substantive choices they have” (Sen, 1997, p. 35).

In general, mathematics education suffers from the same morbidity as education as a whole, in which the forces for the status quo have the upper hand. Thus, “[t]he more educational research finds out, the less educational policy changes, as it plays up to the powerful who tend to desire the reproduction of the status quo rather than to bring about changes of life conditions that lead to differences that make a difference” (Roth, 2008, p. 371). Critical surveyors of the scene (Pais, 2012) comment on the apparent lack of progress; little accumulates. As an example, the treatment of fractions may be taken as paradigmatic of the failure of research in mathematics education to accumulate wisdom that can be cashed at the educational bank, except insofar as it underpins many career trajectories. How many studies of
children struggling with fractions can be done? How much more do we now know about teaching/learning fractions than we did 10, 20, 30 … years ago? Many totally functional adults “who could never do mathematics” first hit “the wall” with fractions. Why don’t we ask why carpenters and others, when measuring length, use fractions of an inch such as ½, ¼, ⅛ (Roth, 2008) so that, for example, the question of finding least common denominators does not arise?

How often does anyone in mathematics education ask a fundamental question such as why do people need to know how to compute with fractions? Division of a fraction by a fraction is notoriously difficult to illustrate in a meaningful context, as is illustrated by an example in the Common Core Standards for Mathematics for sixth grade. Under the heading “Apply and extend previous understandings of multiplication and division to divide fractions by fractions” we find the example: “How many ⅓-cup servings are in ⅔ of a cup of yogurt?” And the reader might ask herself/himself: Why should I now (or a young student) be able to compute ⅗ + ¾? Note that we are not saying there are no justifications for the need to have this ability, but rather that we should articulate more carefully what those reasons are, and talk to the students about them.

There are alternative approaches to the study of the conceptual field of multiplicative structures that are grounded in students’ experience. The phenomenology of fractions and the diversity of situations that they model are extremely complex, a complexity typically ignored in standard pedagogies (Freudenthal, 1983). Culturally based approaches are possible, as illustrated at many points in this book. The position taken in this book, and by the emerging groups of practitioners, researchers, and activists who self-identify as critical mathematics educators, goes well beyond that of “the enlightened mainstream” in insisting on the historical, social, cultural, and political situatedness of mathematics education, and the diversity that characterizes mathematical practices as much as any other human activity. Arguably the most pervasive and damaging aspect of mathematics education as it is typically practiced in schools is the lack of relevance and connection to students’ lived experience. One mathematics educator who had lived through four very different political regimes in Palestine commented on this state of affairs in this way:

What is startling about the math curriculum is – with the exception of some changes at the technical level – how stubborn and unchanging it has remained under the four completely different realities in which I have lived, studied, and taught; how insensitive and unresponsive it has been to the drastic changes that were taking place in the immediate environment! When something like this is noticed, it is only natural to ask whether this is due to the fact that math is neutral or that it is actually dead! (Fasheh, 1997, p. 24)

Mathematics education as a research field predominantly shows a similar insensitivity to the circumstances in which students live. This is apparent in the following reflection on a visit to a school in a South African township where the physical learning obstacles were obvious:
How is it that the research in mathematics education has not noticed this hole in the roof? … Black children are simply treated completely differently, and their future has been spoiled by the apartheid regime. To ignore this fact is a political act. (Skovsmose, 2005, p. 20)

The same willful ignoring is apparent in educational research in the US on children living in poverty (Berliner, 2006). On the basis of extensive data analysis, the author concludes that “the most powerful policy for improving our nation’s school achievement is a reduction in family and youth poverty” (p. 949).

In sketching a program for critical mathematics education research, one fundamental form of diversity that demands greater attention is the variety of sites for learning mathematics (Skovsmose, 2012). Skovsmose points out that the discourse of the field has been dominated by what he calls the “prototype mathematics classroom,” an idealization that ignores the global diversity of circumstances in which people learn mathematics in schools.

For critical mathematics educators, equity is not a matter of merely “giving” people access to unreconstructed mathematics education, but rather a matter of valorizing the diversity of mathematical practices that are intimately bound up with forms of life. Particularizing the declaration that “the intellectual activity of those without power is always characterized as non-intellectual” (Freire & Macedo, 1987, p. 122), the position that we seek to undermine is that the mathematical activity of those without power is always characterized as non-mathematical.

In positive vein, it is increasingly possible to point to manifestations of cultural resilience and resistance, and assertions of agency and identity, of which the ethnomathematics program is an important part. To adapt Spivak’s famous phrase, the subaltern can speak mathematics. An essential form of this resistance comes in the form of alternative practices. As illustrated by several of the contributions to this book, serious attempts are being made to integrate knowledge of cultural mathematical practices into school mathematics, not as a peripheral activity, and with no implication of inferiority (Pinxten & François, 2011), illustrating another form of diversity, namely the variety of educational possibilities (Skovsmose, 2012). Serious work is being done to actualize Freirean principles of emancipatory education and advance social justice through mathematics education (Gutstein, 2006). Indeed, in that Gutstein and his students work around generative themes that come from their lived experience and the political reality of their milieu, this work could be considered a manifestation of ethnomathematics, in its wider sense, being integrated into mathematics education.

Meaningful integration of culturally based knowledge into school mathematics inevitably creates a strong tension. Acknowledging that “an understanding of [academic] mathematics and a world-language such as English … [represent] access to communication, further educational opportunities, employment, and development’ (Barton, 2008, pp. 167–168), the author points to the dilemma of what and how to teach mathematics to students who “learn mathematics in a distinct cultural-linguistic context – how can they study an international subject while retaining the integrity of a minority world view?” (p. 142).
A possible way out of this dilemma already has been proposed (Pinxten & François, 2011). These authors embrace a characterization of ethnomathematics as “the generic category of all mathematical practices, with academic mathematics as a particular case” (p. 264). They also invoke the Freirean principle of the oppressed learning the language of the oppressor, hence that “everyone is entitled to ‘access’ to academic mathematics because it is the best position from which you can criticize the Master discourse” (p. 264). On these foundations, they propose a concept of “multimathemacy” that reconciles the honoring of alternative forms of mathematical knowledge and practices with pursuing academic mathematics as a choice of the student, and taking into account his or her circumstances.

An overarching theme that we suggest the reader should be attuned to when reading the book is that of humanization (a consistent theme in the work of Paulo Freire). Mathematics and mathematics education continue to be dehumanizing in many respects, including the following:

– A pervasive thread in mathematics-as-a-discipline, historically, has been the search for the Holy Grail of absolute certainty and precision. Even though results of Gödel and others have shown this to be an illusion, there is still a powerful desire to perfect a formal architecture of mathematics – which really becomes pernicious when the attempt is made to force mathematics education into that mold.

– There is no essential reason why mathematics-as-a-school-subject should be taught in a fashion that inflicts psychological damage on students, but that is, too often, the case. Taking such positions as that there is only one right answer (untrue as soon as mathematics is applied to reality) or only one right way to carry out a computation or express a proof (totally untrue) affords authoritarianism.

– Mathematics is often presented as existing independently of the people who do it, and independent of their bodies, senses, desires, emotions, and aesthetics – everything that makes a person flesh and blood. Thus, “mathematicians … have increasingly chosen to flee from nature by devising theories unrelated to anything we can see or feel” (Mandelbrot, 1983, p. 1).

– In terms of mathematics education as a research domain, we can simply point to research that reduces people to values on a few variables (the methodological straitjacket that forces everything to be a factor so that statistical rituals can be performed) or scores on (generally ill-conceived) tests. Likewise, when carrying out interviews, the pervasive image of brains as containers of knowledge from which dumps can be made (the ever-present brain-as-computer metaphor).

To (re)humanize mathematics and mathematics education it is necessary to:

– Connect with students’ lived experience, their bodies, their immediate experiences, their emotions, needs, and desires. Which implies activity with hands and eyes, interacting directly with our physical and social worlds, not just through symbolic mediations on pages and computer screens.

– Celebrate mathematics as a pan-cultural activity, acknowledging the whole of humanity and its diversity.
CELEBRATING DIVERSITY, REALIZING ALTERNATIVES

– Understand that mathematics, like any human activity, is inherently social. Education is, fundamentally, about interpersonal relations between students and teachers.

Let us also make clear that we do not reject the glories of mathematics as intellectual achievements of humankind – giving appropriate acknowledgment to the contributions of all cultures by deconstructing the Eurocentric narrative of the history of academic mathematics – just as much as literature, music, or art (which are also pan-cultural activities). Although mathematicians and teachers often appear to go to extraordinary lengths to disguise the fact, mathematics is creative and aesthetically deep. Learning mathematics in school, instead of too often being a form of intellectual child abuse, should be an intellectually exhilarating experience.

To return to how we began, we are allowed to think about alternatives; the world can be other than what is the case.

NOTES

1 “Realizing” is deliberately ambiguous, as it can mean both “becoming aware of” and “making happen.”

2 The essence of a thing does not reveal itself when subject to the theoretical gaze that isolates it from everything else; rather, the essence reveals itself in practical use (Heidegger, 1927/1977). In praxis, mathematics is part and parcel of politics and therefore inherently bound up with value.

3 Giroux (2007, pp. 14–15) points out that this was the original formulation in the retirement speech of President Eisenhower in which he warned of the dangers of the military-industrial complex.

4 This is a pernicious metaphor for several reasons. It diminishes suffering in actual wars, potentiates symbolic violence by invoking nationalism, and encourages the media to frame the discussion as a confrontation between extremes.

5 This crucial point has been argued very forcefully in a very penetrating critique of research on equity within mathematics education (Pais, 2012).

6 www.corestandards.org/assets/CCSSI_Math%20Standards.pdf (p. 42)

7 A parallel point can be made about research in psychology being most often restricted to middle-class groups from the richer part of the world (where students are available and obedient) yet still claiming that its results constitute scientific truths (Pinxten & François, 2011).

8 The civil rights activist Bob Moses, who now works in mathematics education, characterizes such access as a civil right.

9 Not addressed in this book, yet a matter of extreme importance, is the generally impoverished nature, from our point of view, of mathematics education at the university level.

10 It is worth noting that many mathematicians have urged that alternative epistemologies, such as Navajo conceptions of space, could be a rich source for suggesting innovative extensions to academic mathematics.

REFERENCES


GREER, MUKHOPADHAY, AND ROTH

PART I

MATHEMATICS AND POLITICS OF KNOWLEDGE
It is unfortunate but true that there is not a long tradition within the mainstream of mathematics education of both critically and rigorously examining the connections between mathematics as an area of study and the larger relations of unequal economic, political, and cultural power. (Apple, 2000, p. 243)

The chapters in this section of the book interrogate political dimensions of mathematics as a domain of knowledge. Relating to both historical and contemporary contexts (and not forgetting the historical continuity that links these contexts), the authors here highlight how mathematics has been used as a weapon of cultural violence in the service of oppression.

The introductory quotation remains true for the mainstream. However, increasingly perturbing the mainstream is an emerging group of self-identifying critical mathematics educators (for an overview, see Greer & Skovsmose, 2012). In the same spirit, the chapters in this section deal with central issues within the nexus of knowledge and power in relation to mathematics and mathematics education, namely: the role of mathematics in cultural hegemony in the colonial past and in the neo-colonial present; curricular hegemony that negates alternative world-views, such as those of American Indians in the United States; the discourse of contemporary educational “reform” that perpetuates deficiency models under elaborate disguises; and the role of language, both in parallel, and in interaction with, mathematics education as a tool of cultural violence. There is a fundamental ideological fault-line, slicing through all aspects of intellectual and political life, between those who promote a single dominant model of humanity and see diversity as a problem, and those who celebrate human diversity in all its forms.

Despite attempts to protect them, mathematics and mathematics education are part of, indeed in many important respects central to, this hegemonic debate. A fundamental principle opening up mathematics to critique is that it is “a human activity, a social phenomenon, part of human culture, historically evolved, and intelligible only in a social context” (Hersh, 1997, p. xi). That characterization of mathematics implies recognition of the pan-cultural nature of mathematical practices beyond the academic (Bishop, 1988). In a subsequent paper, the author examined the deployment of mathematics in the project of European colonization, not in the most obvious sense of underpinning technological advances offering military supremacy, but in the less tangible, but ultimately more pervasive, form of contributing to a worldview, one based on particular notions of rationality, thus “the secret weapon of cultural imperialism” (Bishop, 1990, p. 51).
In chapter 1, Gary Urton begins by summarizing the key points of Bishop’s paper. Urton then exemplifies the “weapon” in action by describing how Spanish systems for accountancy were imposed upon the Inkas, replacing the sophisticated and functional system that they had already developed. Beyond describing the forced replacement of one cultural system by another, Urton makes the point that mathematics, particularly in the form of accounting, has been used for millennia, and in many civilizations, as a weapon of statecraft to control populations.

Urton makes the point that European colonizers did not impose political and economic systems – and, most generally, worldviews – on blank slates, but rather strove to suppress and replace existing systems. In his book *Culture and Imperialism*, Edward Said (1993) analyzed how European culture (in particular, literature) both reflected, and contributed to, the framing of minds of both colonizers and colonized. To our knowledge, no parallel treatment in depth of mathematics in this respect exists, but the works of Bishop and Urton certainly represent an important contribution in this direction.

The next two chapters deal with the contemporary educational context of the USA, against the background of the history of education as a weapon for oppression. To illustrate how essential is a perspective of historical continuity, consider the following analysis (Lomawaima, 1999). Having identified four tenets common to colonial education of Native Americans, including the assumption that “specific pedagogical methods were needed to overcome deficits in mental, moral, and physical characteristics”, she proceeded to show how these tenets are still far from eliminated in contemporary practices. As with the imposition of the Spanish system on the Inkas, the “unnatural history of American Indian education” (p. 3) demonstrates an implicit belief in “the white man’s burden” of granting civilization to peoples that did not have any. This fallacy is exposed in chapter 2 by Greg Cajete, in which he illuminates the worldview, cultural richness, and forms of social organization of North American indigenous peoples. In this chapter, Cajete focuses on three main issues. The first is that, after centuries of oppression in which education (notably through linguicide) has played a major part, indigenous Americans deserve an education that respects and reflects their traditional values, beliefs, and worldview – hardly an outrageous demand, but one that is not being adequately addressed. Secondly, American Indian students need to have access to the educational and economic opportunities afforded by mainstream education; integrating that access with the point just made involves a complex balance. Third, there is emerging resistance, and indeed, solidarity among indigenous peoples worldwide. There is pushback against the pedagogy of the oppressed – Cajete refers to Paulo Freire as an inspiring example. Increasingly, scholars from indigenous groups are prepared to take on the hegemony on its own ground (e.g. Deloria, Foehner, & Scinta, 1999).

The history of education of African Americans in the USA is also an indispensable part of any analysis of the current situation (Ladson-Billings, 2006). In place of standard ahistorical rhetoric about “achievement gaps” interpreted simplistically as a static descriptor of differences in standardized test scores among
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In chapter 3, Delaina Washington, Zayoni Torres, Maisie Gholson, and Danny Martin present an analysis of the discourse around achievement gaps, specifically the way in which the phenomenon is framed in terms of “crisis”. As George Lakoff, in particular, has argued, the framing of popular conceptions through language has become a highly skilled art/business, one mastered much better in general by the right than by the left in American politics. Since Orwell’s seminal essay “Politics and the English language” the expertise of persuasion has grown enormously. The discourse around “achievement gaps” affords a clear example. It is arguable that even using that term is already conceding a major part of the argument, since the term frames the discourse within a connotation of deficiency. Starkly put, “Quantitative tests of aptitude and achievement have given U.S. education a way to sort children by race and social class, just like the old days, but without the words ‘race’ and ‘class’ front and center” (McDermott & Hall, 2007, p. 11). The requirement of No Child Left Behind to report test scores by ethnic groups had a superficial logic that many educators bought into. In conjunction with requirements for “adequate yearly progress,” it was supposed to leverage schools into improving performance. But what happened? At the time of writing, no substantial improvement in performance has been reported, and 82% of schools are failing to meet the required standard (not to mention the hysterical demand that all students be proficient in mathematics and reading by 2014).

A particularly interesting example of crisis rhetoric was presented at an AERA meeting (Winerip, 2003). Using a model of the “issue attention cycle”, the paper summarized by Winerip documented coverage in The Ann Arbor News over the period 1984–2001 of the differences in test scores between black and white students. The analysis shows that the

… news media and public ignore a serious problem for years; for some reason, they suddenly notice, declare it a problem and concoct a solution; next they realize the problem will not be easily fixed and will be costly; they grow angry, then bored; finally, they resume ignoring the problem. (Winerip, 2003)

The historical analysis by Washington et al. makes it clear that crisis rhetoric in relation to education in general and mathematics education in particular has a long history, and it has been a tool for the achievement of particular political ends. A comparable thesis in relation to geopolitical economics was presented in The Shock Doctrine: The Rise of Disaster Capitalism (Klein, 2007). Washington et al. also point to the dangers of researchers, however motivated, accepting the framing of crisis. Researchers, however well-intentioned, need to be wary of contributing to the problems they purport to be trying to solve (McDermott & Varenne, 2006).

The use of language as a weapon of cultural violence (in particular, within education) is, in many ways, more obvious than that of mathematics. There are striking parallels between the two contexts of cultural hegemony, to the extent that Greer and Mukhopadhyay (in press) were able to take many excerpts from The
Hegemony of English (Macedo, Dendrinos, Guanari, & Dendrinos, 2003) and simply replace “language” by “mathematics.” Consider also this point:

[Countries in the postcolonial world need the “indispensable global medium” for pragmatic purposes, even for survival in the global economy. On the other hand there is the fact that the medium is not culturally or ideologically neutral, far from it, so that its users run the “apparently unavoidable risk of co-option, of acquiescing in the negation of their own understandings of reality and in the accompanying denial or even subversion of their own interests. (Kandiah, 2001, p. 112)

This quotation is about English, but a precisely similar dilemma obtains in relation to academic mathematics.

As well as such clear parallels, the politics of power relations relating to teaching of languages and of mathematics interact wherever children are taught mathematics in other than their home language, as is examined by Marta Civil and Nuria Planas in chapter 4. The contexts they work in are those of Latino/a immigrants in Arizona faced with increasingly Draconian laws of cultural violence, and immigrants in Barcelona from South America, Asia, and elsewhere faced with a strong policy of Catalan as language of instruction (and against a backdrop of English gaining dominance throughout Europe). Similar research and analyses have been carried out in many contexts worldwide. Civil and Planas describe complex situations circumscribed by legal and educational policies that are politically and ideologically situated. These circumstances have significant cognitive effects on children’s learning of mathematics and represent cognitive violence through suppression of non-dominant languages and a framing in terms of bi- or multi-lingualism as a deficit rather than cultural and cognitive enrichment. On a more positive note, the authors document considerable resilience, resistance, and strategic sophistication among the students as they navigate their milieus and negotiate access to mathematical learning.

NOTES
1  How mathematics is used is a human choice. It acquires its political color depending on whose interests it is being used to advance. So, it can be a weapon of liberation as well as of oppression.
2  The growth of the formal theory of statistics (the word itself is etymologically close to “state”) is intertwined with politics and theories of the nature of human societies.
3  Despite an increased attention to unpacking and understanding academic achievement gaps as social construction from sociological, cultural, and political perspectives, mainstream mathematics education still tends to ignore how the cultural and economic aspects of lives of many – mostly minorities and poor – play a crucial role in school performance (Marable, 2000).

REFERENCES
INTRODUCTION


GARY URTON

1. MATHEMATICS AND ACCOUNTING IN THE ANDES BEFORE AND AFTER THE SPANISH CONQUEST

In an article entitled “Western mathematics: The secret weapon of cultural imperialism,” the author argues that Western European colonizing societies of the 15th to 19th centuries were especially effective in imposing on subordinate populations the values of rationalism and “objectivism” – defined as a way of conceiving of the world as composed of discrete objects that could be abstracted from their contexts – primarily through “mathematico-technological cultural force” embedded in institutions relating to accounting, trade, administration, and education (Bishop, 1990). Thus,

mathematics with its clear rationalism, and cold logic, its precision, its so-called “objective” facts (seemingly culture and value free), its lack of human frailty, its power to predict and to control, its encouragement to challenge and to question, and its thrust towards yet more secure knowledge, was a most powerful weapon indeed. (p. 59)

The question to be addressed in this article is whether or not Western societies were unique in the use of mathematics, especially when employed in state accounting, as what Bishop terms a “weapon” of statecraft. A wealth of literature produced by critical accounting historians over the past several decades has elucidated the role of accounting as a technology of and a rationale for, governance in state societies. Accounting and its specialized notational techniques are some of the principal instruments employed by states in their attempts to control and manage subjects. It is suggested that

[r]ather than two independent entities, accounting and the state can be viewed as interdependent and mutually supportive sets of practices, whose linkages and boundaries were constructed at least in their early stages out of concerns to elaborate the art of statecraft. (Miller, 1990, p. 332)

In this chapter I examine the policies and procedures of political arithmetic as employed in Western Europe in the early Renaissance period and in the contemporary, Inka Empire of Pre-Columbian South America. I argue that state accounting, as realized in the practices of alphanumeric, double-entry bookkeeping in Europe and in khipu (knotted-string) record-keeping in the Inka empire constituted highly effective strategies for the exercise of social control in the two

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settings. In addition to examining pre-conquest mathematical practices in the two separate settings, I consider the encounter between Spanish written (alphanumeric) record-keeping practices and Inka knotted-string record keeping following the European invasion and conquest of the Inka empire, in the sixteenth century. I begin with a brief overview of the rise of double-entry bookkeeping and the use of Hindu-Arabic numerals in accounting systems that emerged in the early Renaissance mercantile states of Western Europe.

ACCOUNTING AND NUMERATION IN EUROPEAN DOUBLE-ENTRY BOOKKEEPING

Two almost simultaneous developments in European mathematics and commercialism during the fourteenth-fifteenth centuries are critical to the picture of accounting and recordkeeping practices of Spanish colonial administrators in the sixteenth century. These developments were the invention of double-entry bookkeeping and the replacement of Roman numerals by Hindu-Arabic numerals. The earliest evidence for double-entry bookkeeping dates from the 13th century when the method was put to use by merchants in northern Italy. The first extended explanation of double-entry bookkeeping appeared in a treatise on arithmetic and mathematics written by the Franciscan monk Frater Lucas Pacioli in 1494. The invention and implementation of double entry went hand-in-hand with the replacement of Roman numerals by Hindu-Arabic numerals, which had been introduced into Western Europe almost five hundred years before their eventual acceptance into accounting practice, in the 15th century.

The cities of northern Italy that were the centers of commercial activities from the 14th to the 16th centuries also became centers of learning in arithmetic and mathematics. It was in these cities – Venice, Bologna, Milan – that Hindu-Arabic numerals were first linked with double entry to form the basis of modern accounting science. It was here as well that abacus or “reckoning” schools grew up that were patronized by the sons and apprentices of merchants throughout Europe. The masters of those schools, the maestri d’abbaco, taught the new arithmetic, or arte dela mercadanta, “the mercantile art” (Swetz, 1989). It was in northern Italy as well where, a couple of decades prior to the publication of Pacioli’s exposition of double-entry bookkeeping, the first arithmetic textbook, the so-called *Treviso Arithmetic*, was published in 1478. While not discussing the double-entry method itself, the *Treviso Arithmetic* proclaimed itself from the opening passage as intended for study by those with an interest in commercial pursuits. Double-entry bookkeeping employing Hindu-Arabic numerals spread throughout Western Europe in the century or so leading up to Spanish adventures in the New World.

From virtually the earliest years following the invasion of the Andes, European administrators – toting accounting ledgers filled with columns of Hindu-Arabic numerals and alphabetically written words and organized in complex formats – came into contact with Inka administrative officials wielding bundles of colorful knotted cords. These local administrators – known as *khipukamayuq* “knot-keepers/makers/organizers” – were, oddly enough, speaking the language (in
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Quechua) of decimal numeration and practicing what may have looked for all the world, to any Spaniard trained by the reckoning masters of northern Italy, like double-entry bookkeeping.

THE KHIPU AND ITS METHODS OF INFORMATION REGISTRY

Khipus are knotted-string devices made of spun and plied cotton or camelid fibers (Fig. 1.1). The colors displayed in khipus are the result of the natural colors of cotton or camelid fibers or of the dyeing of these materials with natural dyes. The “backbone” of a khipu is the so-called primary cord – usually around 0.5 cm in diameter – to which are attached a variable number of thinner strings, called pendant cords. Khipus contain from as few as one up to as many as 1,500 pendants (the average of some 420 samples studied by the Harvard Khipu Database project is 84 cords). Top cords are pendant-like strings that leave the primary cord opposite the pendants, often after being passed through the attachments of a group of pendant strings. Top cords frequently contain the sum of values knotted on the set of pendant cords to which they are attached. About one-quarter of all pendant cords have second-order cords attached to them; these are called subsidiaries. Subsidiaries may themselves bear subsidiaries, and there are examples of khipus that contain up to six levels of subsidiaries, making the khipu a highly efficient device for the display of hierarchically organized information.

The majority of khipus have knots tied into their pendant, subsidiary and top strings. The most common knots are of three different types, which are usually tied in clusters at different levels in a decimal place system of numerical registry (Fig. 1.2). The most thorough treatment to date of the numerical, arithmetic, and mathematical properties of the khipus is Mathematics of the Incas: Code of the
Quipus (Ascher & Ascher, 1997). The Aschers have shown that the arithmetic and mathematical operations used by Inka accountants included, at a minimum, addition, subtraction, multiplication, and division; division into unequal fractional parts and into proportional parts; and multiplication of integers by fractions.

What kinds of information were registered on the khipus? In addressing this question, it is important to stress that – although we are able to interpret the quantitative data recorded in knots on the khipus – we are not yet able to read the accompanying nominative labels, which appear to have been encoded in the colors, twist, and other structural features of the cords. The latter would, were we able to read them, presumably inform us as to the identities of the items that were being enumerated by the knots. Thus, in discussing the identities of objects accounted for in the khipus, we are forced to rely on the Spanish documents from the early years following the European invasion.

According to the Spanish accounts, records were kept of censuses, tribute assessed and performed, goods stored in the Inka storehouses, astronomical...
periodicities and calendrical calculations, royal genealogies, or historical events. The overriding interest in the recording, manipulation, and eventual archiving of quantitative data in the khipus was the attempt to control subject peoples throughout the empire. This meant to be able to enumerate, classify, and retain records on each subject group. The most immediate use to which this information was put was in the implementation of the labor-based system of tribute. Tribute in the Inka state took the form of a labor tax, which was levied on all married, able-bodied men (and some chroniclers say women as well) between the ages of 18 and 50. In its conception and application to society, Inka mathematics appears to have taken a form remarkably like the political arithmetic of seventeenth-century Europeans. In sum, the decimal place system of recording values – including zero – of the Inka knotted-cords was as precise and complex a system of recording quantitative data as the written Hindu-Arabic numeral-based recording system of Europeans at the time of the conquest, although the records of the former were not as rapidly produced, nor as easily changeable, as those of the latter.

Accounting has long been one of the principal institutions and administrative practices involved in maintaining and legitimizing the status quo in western European nation-states. Can this be said of khipu accounting in the pre-Hispanic Andes as well? We gain a perspective on this question by looking at two accounts of how censuses were carried out in the Inka state. As in other ancient societies, census taking was a vital practice in the Inka strategy of population control, as well as serving as the basis for the assessment and eventual assignment of laborers in the mit’a (taxation by labor) system (Julien, 1988; Murra, 1982). The first account of census taking is from a famed mid-sixteenth century soldier and traveler:

the nobles in Cuzco told me that in olden times, in the time of the Inka kings, it was ordained of all the towns and provinces of Peru that the head men [señores principales] and their delegates should [record] every year the men and women who had died and those who had been born; they agreed to make this count for the payment of tribute, as well as in order to know the quantity of people available to go to war and the number that could remain for the defense of the town; they could know this easily because each province, at the end of the year, was ordered to put down in their quipos, in the count of its knots, all the people who had died that year in the province, and all those that had been born. (Cieza de León, 1967 [1551], p. 62, my translation)

Some forty years after Cieza wrote down the information cited above, Martín de Murúa gave an account of Inka census taking that varies somewhat from Cieza’s understanding of this process and that contains interesting details concerning the actual procedures involved in local population counts.

They sent every five years quipucamayos [khipu-keepers], who are accountants and overseers, whom they call tucuyricuc. These came to the provinces as governors and visitors, each one to the province for which he was responsible and, upon arriving at the town he had all the people brought together, from the decrepit old people to the newborn nursing babies, in a
field outside town, or within the town, if there was a plaza large enough to accommodate all of them; the tucuyricuc organized them into ten rows ["streets"] for the men and another ten for the women. They were seated by ages, and in this way they proceeded [with the count]. (Murúa, 2004 [1590], p. 204, my translation)

Late sixteenth-century drawings of these male and female census accounting events from the chronicle of Martín de Murúa are shown in Figures 1.3 and 1.4.

In Inka census taking, people were ordered into public spaces to be counted and classified. Although resistance and evasion may have been common in such proceedings, from what the Spanish chroniclers and administrative officials tell us, Inka censuses were accomplished using non-coercive measures – that is, local people apparently were compliant with the claims of authority coming from local officials and state administrators. Thus, as much as an accounting tool, the census khipu was an instrument for the performance and display of state authority and
power within local communities. The census data collected by local record-keepers were knotted into khipus, copies were made of each record, and the data were subsequently reported to higher-level accountants in regional and provincial administrative centers. Two issues arise with respect to these procedures: one concerns the practice of making one or more copies of khipu records, the other concerns the training and education of state record-keepers.

Whereas there are a number of references in the Spanish chronicles to khipu copies, the study of such copies in the corpus of extant khipus has proceeded slowly. Recent advances have come about, however, following the development of a searchable database – the Khipu Database (KDB). From searches of 420 or so samples included in the KDB, some 12–15 examples of copies of accounts have

Fig. 1.4 Conducting census count of women, by Age-Grade (Murúa, 2004, p. 116v)
been identified. While referred to as duplicate, or “matching” khipus, we could also consider “pairs” of khipus to represent an original and a copy.

Copies (or matching) khipus occur in three different forms. First, there are examples in which the numerical values on a sequence of strings on one sample are repeated exactly on another khipu. In some samples of this type, we find that while the pair of khipus bears the same knot values, the colors of the strings may vary. The second type of matching khipus, which I have termed “close matches,” involves instances in which two different samples contain not exactly matching sequences of numbers, but rather ones in which the values are similar (e.g., those of one sample varying a small amount from those on another sample). And, finally, we have examples in which a numerical sequence recorded on one cord section of a khipu are repeated exactly, or closely, on another section of cords of that same khipu.

Duplicate khipus may have been produced as a part of a system of “checks and balances.” However, duplicates seem as well to possess most of the requisite elements of double-entry bookkeeping in which “all transactions were entered twice, once as a debit and once as a credit … [T]he debit side pertained to debtors, while the credit side pertained to creditors” (Carruthers & Espeland, 1991, p. 37). Close matches would be accounts in which the debits and credits sides of the ledger were not in balance. On pairs of khipus having identical numerical values on sequences of strings but in which string colors vary (Urton, 2005), color could have been used to signal the statuses of credits and debits in the matching accounts. In the Inka state, debit/credit accounting would have been employed primarily in relation to the levying of labor tribute on subject populations.

The principal information that we lack in order to be able to confirm whether or not duplicate khipus might have been produced and used as double-entry-like accounts are the identities of the objects recorded on the khipus. Since we still cannot read the code of the khipus, we are unable to determine whether paired accounts were simply copies made for the purposes of checks-and-balances or if they might represent a relationship between a debit for an item on one account and the credit for that same item on another account. Research into this matter is ongoing.

What can we say about the individuals who became khipu-keepers for the state? How were these individuals recruited and trained? What role did they play in exercising authority and maintaining social and political control in the Inka state? A late 16th-century chronicler provided the following account of a school that was set up in the Inka capital of Cusco for the training of khipu-keepers.

The Inca … he set up in his house [palace] a school, in which there presided a wise old man, who was among the most discreet among the nobility, over four teachers who were put in charge of the students for different subjects and at different times. The first teacher taught the language of the Inca … and upon gaining facility and the ability to speak and understand it, they entered under the instruction of the next [second] teacher who taught them to worship the idols and the sacred objects [huacas]. … In the third year the
next teacher entered and taught them, by use of quipus, the business of good government and authority, and the laws and the obedience they had to have for the Inca and his governors. ... The fourth and last year, they learned from the other [fourth] teacher on the cords and quipus many histories and deeds of the past. (Murúa, 2001, p. 364, my translation)

The curriculum for these young administrators-in-training aimed at engendering loyalty and adherence to the values, policies and institutions of the Inka state. The khipu studies component of the administrative curriculum fulfilled the common objective of accounting education, which is producing “governable persons” who themselves would go on to serve as provincial administrators. The curriculum and examination promoted discipline and proper accounting practices in a way that rationalized institutional arrangements in the interest of the state and, ultimately, transformed the bodies and minds of the apprentice administrators.

The situation outlined above was not to last for long, however, as less than half a century after the school of administration was set up a cataclysmic event brought the school, not to mention the entire imperial infrastructure, crashing down; this event was the Spanish conquest.

CONQUEST, COLONIZATION, AND THE CONFRONTATION BETWEEN KNOT- AND SCRIPT-BASED TEXTS

The story of the conquest of the Inka empire by the Spaniards, which was undertaken by Francisco Pizarro and his small force of around 164 battle-hardened conquistadores, beginning in 1532, has been told too many times – in all its astonishing, entrancing and appalling details – for me to add much to the telling in the space available here (Hemming, 1970). The events of the conquest and the processes of colonization that are relevant for our discussion here are the following. The initial battle of conquest, which occurred in November 1532 in the Inka provincial center of Cajamarca, in the northern highlands of what is today Peru, resulted in the defeat of the Inka army and the capture and execution of Atahualpa, one of two contenders for succession to the Inka throne. Pizarro then led his small force southward arriving in the Inka capital city of Cuzco in 1534. The Spaniards and their native allies were soon forced to defend Cuzco against a rebellion led by the Spanish-installed puppet-king Manco Inca. This gave rise to a decades-long war of pacification of the rebels, which finally came to an end in 1572 with the execution of the then rebel leader, Tupac Amaru.

Three years prior to the capture and execution of Tupac Amaru, a new – the fifth – Viceroy of Peru Francisco de Toledo had arrived in Peru with a mandate to put down the rebellion and to transform the war- and disease-ravaged land of the former Inka empire into an orderly and productive colony for the benefit of the king of Spain Philip II. Viceroy Toledo instituted a set of reforms that were in some respects a continuation of certain of the processes of pacification, reorganization and transformation that had been on-going since the earliest days following the initial conquest. In other ways, Toledo’s reforms represented
something completely new, different and profoundly transformative in their effects on Andean life-ways (Stern, 1993, pp. 51–79).

The end result of the Toledan reforms, the clear shape of which became manifest by the mid-to late 1570s, included, most centrally, the following institutions: encomiendas – grants of groups of Indians to Spanish encomenderos “oversseers” who were charged with the care and religious indoctrination of the natives and who, in exchange, had the right to direct native labor for their personal benefit but without the right (after the Toledan reforms) to levy tribute demands on them; corregimientos – territorial divisions for the management and control of civil affairs, including (theoretically) oversight of the encomenderos; reducciones – newly-formed towns that were laid out in grid-like ground plans to which the formerly dispersed natives were transferred for their surveillance, control and indoctrination; doctrinas – parish districts staffed by clergy who attended to the religious indoctrination of the natives within the reducciones and who received a portion of the tribute for their own maintenance; and mita – a form of labor tax based on the Inka-era mit’a, which supplemented what was, for Andeans, a new kind of tribute imposed on them by Toledo: specified quantities of agricultural produce, manufactured goods (textiles, sandals, blankets), and coinage.

The census was a critical institution for reorganizing Andean communities. Spanish censuses were carried out by administrative visitadores “visitors” who produced documents, known as a visitas, which were detailed enumerations of the population in the reducciones broken down (usually) into household groupings. Each household member was identified by name, age and – in the case of adult males – ayllu “social group” affiliation (Guevar-Gil & Salomon, 1994; Urton, 2006). The visitadores were usually joined in their rounds by the kurakas “local lords” and often by the local khipukamayuqs. The khipu-keepers could supply historical, corroborating information on population figures and household composition (Loza, 1998). It is important to stress that participation by the native record-keepers was not primarily for the benefit of the Spaniards, rather, it was to ensure that the natives would have their own, khipu-based accounts of the enumeration in the event – which seems always and everywhere to have come to pass – that disputes arose over the population count, the amount of tribute levied, or other administrative questions.

There are two contexts in which Andeans encountered Old World mathematical principles and practices: the manner of collecting information for the censuses, and the striking and circulation of coinage. These practices were closely linked to new forms of tribute, as well as to what was, for Andean peoples, a completely new form of communication: writing – that is, the inscribing of marks in ordered, linear arrangements on paper, parchment, or some other two-dimensional surface. Such a medium and associated recording technology were unprecedented in the Andean world.

Central to the Spanish attempt to establish an orderly colony in the former Inka territories, from the 1540s through the 1570s, was a program of enumerating the native population, investigating its form(s) of organization, and beginning to sketch out its history. One form that this process took was to call the khipu-keepers
before colonial officials and have them read the contents of their cords (Loza, 1998). These recitations were made before a lengua “translator”; the Spanish words spoken by the translator were written down by a scribe. This activity resulted in the production of written transcriptions in Spanish alphanumeric script of the census data and other information previously jealously guarded by the khipu-keepers in their cords.

Many of the khipu transcriptions discovered to date have been assembled in an important collection, entitled *Textos Andinos* (Pärssinen & Kiviharju, 2004). The Spaniards were at least initially respectful of the khipus and their keepers, as the khipus were the primary sources of information on the basis of which Spanish officials began to erect the colonial administration. However, once the information was transferred from khipus to written texts, the locus of textual authority, legitimacy and power began to shift toward the written documents.

Whereas many native Andeans learned how to read and write alphabetic script and how to manipulate Hindu-Arabic number signs, only a handful of Spaniards appear to have achieved any degree of familiarity with the khipus (Pärssinen, 1992); it appears that no Spaniard became truly proficient at manipulating and interpreting the cords. What this meant was that, rather than contests over interpretations of information contained in the two sets of documents coming down to reciprocal readings of the two sets of texts, what emerged between the 1540s and the 1570s were separate, contested readings by the keepers of the two different text types before a Spanish judge. As disputes intensified, and as more and more original data were recorded uniquely in the written documents, the khipu texts became both redundant and increasingly troublesome for the Spaniards (Platt, 2002). By the end of the tumultuous sixteenth century, khipus had been declared to be idolatrous objects – instruments of the devil – and were all but banned from official use.9

The circulation of coins is another area in which Andeans were confronted with a completely new and unfamiliar terrain of political relations, economic activity and shifting relations of authority over the course of the early colonial period. The first mint in South America was formally established in Lima in 1568, just 36 years after the events of Cajamarca. The royal decree that controlled the weights, fineness, and the fractional components of the coins to be struck in Lima were issued by Ferdinand and Isabella in 1479, which was amended by Charles V in 1537. The first coins struck in Lima bore a rendering of the Hapsburg coat of arms on the obverse and a cross with castles and lions on the quartered face on the reverse.

The two initial coin types were the real, a silver coin, and the gold escudo. Each of these coin types was broken down into subunits valued in relation to a general, unified standard of valuation known as the maravedi. The maravedi was used to coordinate values between different types of coins as determined by material differences and subdivisions of standard units (for example, the silver real = 34 maravedis; the gold escudo = 350 [from 1537–1566] or 400 [after 1566] maravedis). From this primary coordinating function, the maravedi served as a
common denominator that permitted the interrelating of heterogeneous monetary values pertaining to gold and silver (Craig, 1989).

From almost the earliest years following the conquest, Spanish officials in the countryside (the encomenderos) had been levying tribute in kind, which in some places included a demand for plates of silver and bars of gold, and translating the value of these items into Spanish currency values. Spanish officials regularly produced documents translating the quantities of items of tribute in kind into values in pesos ensayados (a unit of value in silver currency). This was the main context within which the kurakas “local lords” in communities would have begun to encounter translations of the use-value of objects, which they were familiar with in their local non-monetized economies, into exchange-values stated in terms of currency equivalents (Spalding, 1973). Furthermore, the Viceroy Francisco de Toledo introduced in the mid-1570s a new tribute system, which included not only produce and manufactured goods but also coins; the sum to be given yearly by each tributary was four-to-five pesos ensayados (that is, coinage in plata ensayada “assayed silver”). Tribute payers were designated as male heads of households between the ages of 18–50. The native chronicler Guaman Poma de Ayala (1980) drew several images of native people paying their tribute using what appears to be coinage bearing the quartered reverse face of the cuatro reales (Fig. 1.5).10

People in the newly built reducciones were able to acquire coins to pay their tribute from forced work in the mines (a component of the Toledan tributary system), as well as from marketing and wage labor. The engagements with currency that resulted from these activities required people to begin to think about the different units of coinage, shifting equivalencies between coinage units, as well as to accommodate themselves to fluctuations in currency values in the periodic currency devaluations and the debasement of coinage that took place during the colonial period. The act of “devaluing” currency is a claim of authority on the part of some entity (e.g., state) over the exchange-value of the coinage one holds in one’s own purse. One’s subsequent use of that same coinage according to the newly announced rate of exchange represents compliance with the claim by the entity in question to control the value of one’s currency. Although we have almost no data on the basis of which to consider how Andean peoples responded to such changes, these were some of the processes that were transpiring on the front lines of the confrontation between Old and New World mathematics entailing new and transformed notions of legitimacy, rationality, and authority in the early colonial Andes.

CONCLUSIONS

I began this exploration by asking about the relevance and salience of a characterization of mathematics as “the secret weapon of cultural imperialism” (Bishop, 1990). Having now looked at several aspects of arithmetic, mathematics, and accounting in Western Europe and the Andes during the period leading up to and a century or so beyond the fateful encounter between Pizarro and Atahualpa in Cajamarca in 1532, we return to ask: In what sense was mathematics linked to state
power and governmental legitimacy in this historical conjuncture? I argue that much as critical historians writing near the end of the last century found in terms of the writing of history in colonial contexts, truth in history is usually the preserve of the conqueror. This is not necessarily because the conqueror knows what is, in fact, true; rather, it is because the conqueror possesses the power to speak, to produce conventionalized written accounts, and to represent and establish the rules of globalized statecraft. This is the case not only in terms of narrating and writing the events of history and explaining their causes, but also in taking the measure of the world and accounting for those measurements – geographic, demographic, economic and so on – for as long as the dominant group holds power.

Power and the exercise of authority take many forms. In its most extreme and, paradoxically, weakest form, power is maintained by force. As Foucault has shown more clearly than any recent political theorist, the most effective species of power is that which takes shape as individuals and groups become complicit with and participate in institutions of the state, such as in censuses, regulatory and corrective institutions, and accounting. What is the place of mathematics in this Foucauldian, ‘genealogical’ conception of power and authority? I think that here we must return to the question of the certainty of mathematics, and of how that certainty relates to truth and, ultimately, to power. I suggest that the critical observation on these matters for our purposes here is that mathematics may be made to serve, although it itself is not responsible for giving rise to, regimes of power. A “regime of power” may be a particular method of bookkeeping, an accounting procedure, or a state militia.
NOTES

1 According to my own inventory, there are some 850+/- khipu samples in museums and private collections in Europe, North America and South America. While many samples are too fragile to permit study, almost 450 samples have been closely studied to date. Observations may be viewed at http://khipukamayuq.fas.harvard.edu/ and http://instruct1.cit.cornell.edu/resear4ch/quipu-ascher/.

2 For general works on khipu structures and recording principles, see Arellano, 1999; Ascher & Ascher, 1997; Conklin, 2002; Radicati di Primeglio, 2006; Urton, 1994; 2003.

3 Approximately one-third of khipu studied to date do not have knots tied in (decimal-based) tiered arrangements. I have referred to these as ‘anomalous khipu’ and have suggested that their contents may be more narrative than statistical in nature (Urton, 2003).

4 I summarize here from a range of my studies. Readers find more detailed information in Urton, 2006 and 2009.

5 Guevara-Gil and Salomon (1994) have discussed what were similar procedures, and results, in the censuses undertaken by Spanish visitadores (administrative ‘visitors’) who were responsible for counting, classifying and (re-)organizing local populations in the early colonial Andes.

6 The Khipu Database project (KDB), located in the Department of Anthropology, Harvard University, is described fully on the project website <http://khipukamayuq.fas.harvard.edu/>. I gratefully acknowledge the following research grants from the National Science Foundation, which made the creation of the KDB possible: #SBR-9221737, BCS-0228038, and BCS-0408324. Thanks also to Carrie J. Brezine, who served as Khipu Database Manager from 2002 to 2005.

7 It is interesting to note that in early Chinese bookkeeping, red rods signified positive numbers while black rods were used for negative numbers. As Boyer noted, “[f]or commercial purposes, red rods were used to record what others owed to you and black rods recorded what you owed to others” (cited in Peters & Emery, 1978, p. 425).

8 Three articles published in the 1960s-70s by economists and accounting historians contain a lively debate not only about whether or not the khipus contained double-entry bookkeeping, but about the claim made by one of the disputants (Jacobsen) to the effect that the Inkas may in fact have invented the technique (Buckmaster, 1974; Forrester, 1968; Jacobsen, 1964). There is not space here to review the arguments made in these three articles. Suffice it to say that, while interesting for historical purposes, these articles are all poorly informed about the nature of the khipus, about what the Spanish documents say about their use, as well as about Inka political and economic organisations.

9 The khipus were declared idolatrous objects and their use was severely proscribed by the Third Council of Lima, in 1583 (Vargas Ugarte, 1959). However, the khipus continued to be used for local recordkeeping purposes – in some cases down to the present day (see Mackey, 1970; Salomon, 2004).

10 See the fascinating study by Salomon (1991) of one of the few references we have in the colonial literature to the engagement with coinage (la moneda de cuatro reales) by a native Andean during the colonial period. Salomon argues that the story, which appears in a well-known manuscript from Huarochari (Salomon & Urioste, 1991), is concerned with the internal conflicts of a man due to the competing religious sentiments he experiences over loyalty to a local deity (huaca) and the Christian deity. The narrative plays on the precise symbolism of images, as well as the lettering, on a quartered Spanish coin.

REFERENCES


GREGORY A. CAJETE

2. CONTEMPORARY INDIGENOUS EDUCATION

**Thoughts for American Indian Education in a 21st-Century World**

The perspectives, orientations, ideas, models, interpretations, and belief presented in this chapter are a *personal synthesis* based on my own creative process as an Indian educator. This work is a reflection of my particular understanding of the “shared metaphors” which American Indians hold in common with regard to tribal education. It is a general exploration of the *nature* of Indigenous education and the creative possibilities inherent in the introduction of an Indigenous frame of reference toward the development of a contemporary philosophy of American Indian education. As a whole, this work illustrates a dimension of the body of understanding that underlies American Indian tribal orientations to learning and teaching.

This work is also an open letter to Indian educators and those involved with Indian education issues. My approach has been that of a teacher exploring the dimensions of Indigenous teaching and learning in creative ways. The description of this journey, this “curriculum,” has taken the form described here. Teachers create “curricula” (circles of learning and teaching) through constantly creating models and applying them to actual teaching situations. Ideally, teachers constantly adjust their models to fit their students and the constantly changing realities of educating. Through such constant and creative adjustment, teachers and students engage in a symbiotic relationship and constantly form feedback looks around what is being learned. In this way, teachers are always creating their stories even as they are telling them. This work explores a “culturally informed alternative” for thinking about and enabling the contemporary education of American Indian People. It is a translation of traditional Indian concepts and foundational principles into a contemporary framework of thought and description. It advocates the development of a contemporized, community-based education process that is founded upon traditional tribal values, orientations and principles, but simultaneously utilizes the most appropriate concepts and technologies of modern education.

The content presented represents only a small portion of what is available in the vast sea of research related to American Indian cultures. Indeed, American Indian cultures are among the most studied anywhere in the world. Access to this vast sea of content, facilitated by Indian educators and scholars, is an essential step to the

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creation of a contemporary epistemology of Indian education. This access to, and revitalization of, the Indigenous bases of education must occur not only in the contemporary classroom, but must include all dimensions of Indian communities as well. All Indian People, young and old, professional and grassroots, must consider themselves participants in a process of moving forward to the Indigenous basics of education. Indian People themselves must introduce contemporary expressions of tribal education to their own people. Ultimately, it is up to each community of Indian People, whether they live in an urban setting or reservation, to decide how their needs regarding cultural maintenance or re-vitalization may be addressed through education. It is up to each community of Indian People to decide what is appropriate to introduce through the vehicle of modern education and what should be imparted within the context of appropriate traditional mechanisms in the community.

Modern education and traditional education can no longer afford to remain as historically- and contextually-separate entities. Every community must learn to integrate the learning occurring through modern education with the cultural bases of knowledge and value orientations essential to the perpetuation of a community and its way of life. A balanced integration must be created. Over time, the emphasis on only modern education and Western-oriented curricula will by their nature and predisposition tend to erode an Indigenous way of life. In their embracing of modern education, Indian educators and tribal leaders must understand that the unexamined application of modern education and its models essentially conditions People away from their cultural roots not toward them. Modern education provides tools essential to the survival of Indian People and communities, but this education must be contextualized in a greater whole. In support of cultural preservation, Indian educators and tribal leaders need to advocate culturally-based education as one of the foundational goals of self-determination, self-governance, and tribal sovereignty. Indigenous education offers a highly creative vehicle for thinking about the evolving expressions of American Indian cultures as they enter the 21st century.

THE CONTEMPORARY DILEMMA OF AMERICAN INDIAN EDUCATION

The exploration of Indigenous education presented in this chapter is a “culturally-informed alternative” which includes the expression of the “universals” of the educational process as viewed from the perspective of traditional American Indian thought. Its foundation of credibility lies in the applicability of the perspectives and models presented to the whole process of teaching and learning, not just that of American Indians. The universals, which are explored, may be viewed as “archetypes” of human learning and as part of the Indigenous psyche of all Peoples and cultural traditions, including those of Western civilization. All relevant sources of thought and research and educational philosophy, regardless of cultural source, have been considered to fully illuminate the future possibilities of a contemporary education that mirrors Indigenous thought and its primary orientation of relationship with the natural world.
A pervasive problem affecting the contemporary vision of American Indian education stems from the fact that its contemporary definition and evolution has always been largely dependent on the prevailing winds of American politics. Much of that which characterizes Indian-education policy is not the result of research predicated upon American Indian philosophical orientations, but the result of “Acts of Congress,” the history of treaty-rights’ interpretation through the courts, and the historic Indian/White relations unique to each tribal group or geographic region. Historically, the views guiding the evolution of modern Indian education have been predicated upon assumptions that are anything but representative of Indian cultural mindsets (Deloria, 1990). In spite of such policy orientations, traditional educational processes paralleling mainstream education have continued to take place within the context of many Indian families and communities. While there has been progress in the last thirty years, the integration of these two approaches to education has been practically non-existent.

The basis of contemporary American education is the transfer of academic skills and content that prepares the student to compete in the social, economic, and organizational infrastructure of American society as it has been defined by the prevailing political, social, and economic order of vested interests. American educational theory is, therefore, devoid of substantial ethical or moral content regarding the means that are used to achieve its ends. The ideal curriculum espoused by American education ends up being significantly different from the experienced curriculum internalized by students and the real workings of much of American society. The American society that many minority students experience is wrought with contradictions, prejudice, hypocrisy, narcissism, and unethical pre-dispositions at all levels including the schools. As a result, there have been educational conflicts, frustration, and varying levels of alienation experienced by many Indian People due to their encounters with mainstream education.

A fundamental obstacle to cross-cultural communication continues to revolve around significant differences in cultural orientations to the world and to the fact that Indian People have been forced to adapt to an educational process that is essentially not of their own making. Traditionally, Indians view life through a different cultural metaphor than that of mainstream America. It is this different cultural metaphor that frames the exploration of the Indigenous educational philosophy that is presented in this chapter.

Traditional Indian education represents an anomaly for the prevailing theory and methodology of Western education since what is implied in the application of “objectivism” is the assumption that there is one correct way of understanding the dynamics of Indian education, one correct methodology, one way of understanding the reality of Indigenous educational philosophy, and that there is one correct policy for Indian education. And that one way is the way of mainstream America. The mindset of “objectivism,” when applied to the field of Indian education, excludes serious consideration of the “relational” reality of Indian People, the variations in tribal and social contexts, and the processes of perception and understanding which characterize and actually form its expressions (Peroff, 1989).
Objectivist research has contributed a dimension of insight, but it has substantial limitations in the multi-dimensional, holistic, and relational reality of the education of Indian People. It is the affective elements – the subjective experience and observations, the communal relationships, the artistic and mythical dimensions, the ritual and ceremony, the sacred ecology, the psychological and spiritual orientations – that have characterized and formed Indigenous Education since time immemorial. These dimensions and their inherent meanings are not readily quantifiable, observable or easily verbalized, and as a result, have been given little credence in mainstream approaches to education and research. Yet, it is these very aspects which form a profound orientation for learning through exploring and understanding the multi-dimensional relationships between humans and their inner and outer worlds.

For Indian educators, a key to dealing with the conflict between the objective and relational orientations, the cultural bias, and the cultural differences in perception lies in the kind of open communication and creative dialogue that challenge the “tacit infrastructure” of ideas that have guided contemporary Indian education.

Education is essentially a communal social activity. Educational research that produces the most creatively productive insights involves communication within the whole educational community, not just the “authorities” recognized by mainstream educational interests. Education is a communication process and plays an essential role in every act of educational perception. There must be a “flow” of communication regarding the educational process among all educators as a result of individual internal dialogue, interactions among educators, publication, and discussion of ideas. Unfortunately, a serious blockage of communication and fragmentation of educational thought continues to be the rule rather than the exception, and communication related to Indian education is no exception (Bohm & Peat, 1987).

Most educators have embraced many ideas based on the established “tacit infrastructure” of mainstream American education religiously. This situation, as it pertains to Indian education, limits creative acts of perception. A free play of thought and opening up of the field – one that is not restricted by unconsciously determined social pressures and the inherent limitations of the currently established paradigms of Indian education – needs to occur. It is only in realizing that there is a “tacit infrastructure” and then questioning it that a high level of creative thought regarding the possibilities and potentials of Indigenous educational philosophy can become possible. And only in realizing that American Indian perceptions of education have traditionally been informed by a different “metaphor” of teaching and learning can more productive insights into contemporary Indian education be developed. These traditional “metaphors” of education derived their meaning from unique cultural contexts and interactions with natural environments. In turn, the collective experience of Indian People and their elegant expressions of cultural adaptations have culminated in a body of shared metaphors and understandings regarding the nature of education and its “essential ecology.”
In this exploration of Indigenous education, I attempt to develop insights into the community of shared metaphors and understandings that are specific to Indian cultures, yet reflective of the nature of human learning as a whole. Ultimately, an exploration of traditional Indian education is an exploration of nature-centered philosophy. Traditional Indian education is an expression of environmental education par excellence. It is a environmental education process which can have a profound meaning for the kind of modern education required to face the challenges of living in the world of the 21st Century. It has the potential to create deeper understanding of the collective role as “caretakers” of a world that Americans have been largely responsible for throwing out of balance.

The thesis presented here is essentially a continuation of my dissertation, *Science: A Native American Perspective* (A Culturally Based Science Education Curriculum Model) produced under the auspices of the New Philosophy Program of the International College. The perceived needs that motivated the writing of my dissertation continue to form the impetus for this work. These needs can be summarized as follows:

- The need for a contemporary perspective of American Indian education, which is principally derived and informed by the thoughts, orientations, and cultural philosophies of Indian People themselves. The articulation and fulfillment of this need is, I believe, an essential step in Indian educational self-determination.
- The need for exploration of alternative approaches to education that more directly and successfully address the needs of Indian populations during this time of “educational and ecological crisis.” During such a time of “crisis,” it is essential to open up the field and to entertain the possibilities of new approaches in a creative quest for more viable and complete educational processes.
- The need to integrate, synthesize, organize, and give focus to the enormous amount of accumulated materials from a wide range of disciplines about Indian cultures and Indian education toward the evolution of a contemporary philosophy for American Indian education that is Indigenously inspired and ecologically based.

The purpose of contemporary American Indian education, as it is currently interpreted, has been to assure that Indian People learn the skills necessary to be productive – or at least survive – in the midst of the post-industrial American society. American Indians have been taught to be consumers in the tradition of the “American dream” and all that that entails. We have been encouraged to use modern education to “progress” by being participants in the “system.” We have been conditioned to seek the rewards and benefits that success in the world modern education purportedly provides. We are enticed from every direction to pursue careers in law, medicine, business, and the sciences, which form the pillars of Western thought and conditioning. Yet, in spite of the many Indian People that have succeeded by embracing Western education, Indian People must question the effects modern education has had on our collective cultural, psychological, and ecological viability. What has been lost and what has been gained by participating in a system of education that does not stem from, or really honor, our unique Indigenous perspectives? How far can we go in adapting to such a system before
that system literally educates us out of cultural existence? Have we reached the limits of what we can do with mainstream educational orientations? How can we re-vision and establish once again the “ecology of education” that formed and maintained our tribal societies?

Ironically, a number of the most creative Western thinkers have embraced what are essentially Indigenous environmental-education views and are vigorously appropriating Indigenous concepts to support the development of their own alternative models. For example, cultural historian and philosopher Thomas Berry (1999) proposes a new context for education which is essentially a re-invention of the roles and contexts that are inherent to Indigenous education:

The primary educator as well as the primary lawgiver and primary healer would be the natural world itself. The integral earth community would be a self-educating community within the context of a self-educating universe. Education at the human level would be the conscious sensitizing of humans to the profound communications made by the universe about us, by the sun, the moon, and the stars, the clouds, the rain, the contours of the earth and all its living forms. All music and poetry of the universe would flow into the student, the revelatory presence of the divine as well as insight into the architectural structures of the continents and the engineering skills whereby the great hydrological cycle functions in moderating the temperature of the earth, in providing habitat for aquatic life, in nourishing the multitude of living creatures would be as natural to the educational process. The earth would also be our primary teacher of sciences, especially biological sciences, and of industry and economics. It would teach us a system in which we would create a minimum of entropy, a system in which there is no unusable or unfruitful junk. Only in such an integral system is the future viability of humans assured. (p. 64)

Berry’s comments mirror what might be termed a contemporized exposition of the Indigenous education processes of tribal societies. It is exactly within the light of such a vision that this story must unfold for Native and non-Native alike. If our collective future is to be one of harmony and wholeness, or if we are to even have a viable future to pass to our children’s children, it is imperative that we actively envision and implement new ways of educating for ecological thinking and sustainability. The choice is ours, yet paradoxically we may have no choice.

AMERICAN EDUCATION FROM A TRIBAL PERSPECTIVE

Learning is always a creative act. We are continuously engaged in the art of making meaning and creating our world through the unique processes of human learning. Learning for humans is instinctual, continuous, and simultaneously the most complex of our natural traits. Learning is also a key to our ability to survive in the environments that we create and that create us.

Throughout history, human societies have attempted to guide, facilitate, and even coerce the human instinct for learning toward socially defined ends. The
complex of activities for “forming” human learning is what we call “education” today. To this end, human societies have evolved a multitude of educational forms to maintain their survival and as vehicles for expressing their unique cultural mythos. This cultural mythos also forms the foundation for each culture’s “guiding vision,” that is, a culture’s story of itself and its perceived relationship to the world. In its guiding vision, a culture sets forth a set of “ideals” which guide and form the learning processes inherent in its educational systems. In turn, these ideals reflect what that culture values as the most important qualities, behaviors, and value structures to instill in its members. Generally, this set of values is predicated on those things it considers central to its survival.

This narrative is a journey into the realm of cultural ideals from which the learning, teaching, and systems of education of Native America evolved. As such, these ideals present a mirror for reflecting on the critical dilemma of American education. For, while the legacy of American education is one of spectacular scientific and technological achievement, resulting in abundant material prosperity, the cost has been inexorably high. American prosperity has come at the expense of the environment’s degradation and has resulted in unprecedented exploitation of human and material resources worldwide.

American education is in crisis as America finds itself faced with unprecedented challenges in a global community of nations desperately struggling with massive and profound social, economic, and cultural change. American education must find new ways of helping Americans learn and adapt in a multi-cultural, 21st-Century world. It must come to terms with the conditioning inherent in its processes and systems of educating which contribute to the loss of a shared integrative metaphor of Life. The loss of such a metaphor, which may ultimately lead to a social/cultural/ecological catastrophe, should be a key concern of every American.

The orchestrated “bottom-line, real world” chorus sung by many in business and government has become the all-too-common refrain of those who announce they lead the world. Yet, what underlies the crisis of American education is the crisis of modern man’s identity and his collective cosmological disconnection from the natural world. Those who identify most with the “bottom line” more often than not suffer from image without substance, technique without soul, and knowledge without context: the cumulative psychological results of which are usually unabridged alienation, loss of community, and a deep sense of incompleteness.

In contrast, traditional American Indian education historically occurred in a holistic social context that developed a sense of the importance for each individual as a contributing member of the social group. Essentially, tribally contextualized education worked at sustaining a life process. It was a process of education that unfolded through mutual, reciprocal, relationships between one’s social group and the natural world. This relationship involved all dimensions of one’s being while providing both personal development and technical skills through participation in the life of the community. It was essentially an integrated expression of environmental education.

Understanding the depth of relationships and the significance of participation in all aspects of life are the keys to traditional American Indian education. “Mitakuye
Oyasin” (we are all related) is a Lakota phrase that captures an essence of tribal education because it reflects the understanding that our lives are truly and profoundly connected to other People and the physical world. Likewise, in tribal education, knowledge is gained from first-hand experience in the world and then transmitted or explored through ritual, ceremony, art, and appropriate technology. Knowledge gained through these vehicles is then used in the context of everyday living. Education, in this context, becomes education for “life’s sake.” Education is, at its very essence, learning about life through participation and relationship to community, including people as well as plants, animals, and the whole of Nature.

This ideal of education directly contrasts with the predominant orientation of American education that continues to emphasize “objective” content and experience detached from primary sources and community. This conditioning for being a marginal participant and perpetual observer, involved with only objective content, is a foundational element of the crisis of American education and the alienation of modern man from his own being and the natural world. In response to such a monumental crisis, American education must forge educational processes that are for life’s sake and honor the Native roots of America. A true transition of today’s American educational orientations to more sustainable and connected foundations requires serious consideration of other cultural, life-enhancing, and ecologically viable forms of education.

Traditional American Indian forms of education must be given serious consideration as conceptual wellsprings for the “new” kinds of educational thought capable of addressing the tremendous challenges of the 21st Century. Tribal education presents examples of models and universal foundations for the transformation of American education and the development of a “new” paradigm for curricula that will make a difference for life’s sake in the world of 21st Century.

To begin such a process, orientations of American education must begin to move from a focus on only specialization, to holistically contextualized knowledge; from a focus solely on structures, to understanding of processes; from objective science, to systemic science; and from building, to “networking” as a metaphor for knowledge (Capra, 1982).

American education must rededicate its efforts to assist Americans in their understanding and appreciation of “spirituality” as it relates to the Earth and the “place” in which we live. It must engender a commitment to “service” rather than competition as an espoused social value. It must promote practiced respect for individual cultural and biological diversity. It must engage students in learning processes that fully facilitate the development of their human potentials through creative transformation.

American Indians have struggled to adapt to an educational process that is not their own with its inherent social, political, and cultural baggage. Yet, American Indian cultural forms of education contain seeds for new models of educating which can enliven American education as a whole, as well as allow American Indians to evolve contemporary expressions of education tied to their cultural roots.
For American Indians, a new circle of education must begin which is founded on the roots of tribal education and reflective of the needs, values, and sociopolitical issues as Indian People themselves perceive them. Such a new circle must encompass the importance Indian People place on the continuance of their ancestral traditions; emphasize a respect for individual uniqueness in the diversity of expressions of spirituality; facilitate a strong and well-contextualized understanding of history and culture; develop a strong sense of place and service to community; and forge a commitment to educational and social transformation which recognizes and further empowers the inherent strength of Indian People and their respective cultures (Hampton, 1988).

To understand how to accomplish this, Indian People must begin to exploit all avenues of communication open to them and establish a reflective dialogue about a contemporary theory for Indian education that evolves from them and their collective experience.

In the past, Indian education has been defined largely by non-Indian educators, politicians, and institutions through a huge volume of legislative acts at the state and federal levels, which for decades have entangled Indian leaders, educators and whole communities in the morass of the federal government’s social/political bureaucracy.

Indeed, Indian education stems more from the U.S. Government’s self-serving political/bureaucratic relationship with Indian tribes than any truly culturally contextualized process rooted in tribal philosophies and social values. In fact, no contemporary theory of Indian education exists which can be said to guide the implementation or direction of educational curriculum development. Instead what is called “Indian education” today is really a “compendium of models, methodologies and techniques gleaned from various sources in mainstream American education and adapted to American Indian circumstances, usually with the underlying aim of cultural assimilation” (Deloria, 1990).

It is time for Indian People to define Indian education in their own voice and in their own terms. It is time for Indian People to allow themselves to explore and express the richness of their collective history in education. Among American Indians, education has always included a visionary expression of life. Education has been, and continues to be, a grand story, a search for meaning, and an essential food for the soul.

INDIGENOUS APPROACHES TO EDUCATION ARE VIABLE ALTERNATIVES

Alienation from mainstream approaches to education has been one of the consistent criticisms leveled against modern education by Indian students. They have been given relatively few choices of school curricula that truly address their alienation beyond compensatory programs, remediation, and programs that attempt to bridge the social orientations of students with those of the school. Rather, most of the attempts at addressing such issues have revolved around refitting the problematic Indian student to the very “system” that caused their alienation and failure in the first place. Too often, the Indian student is viewed as the problem
rather than the inherent and unquestioned approaches, attitudes, perspectives, and curricula of the educational system. The knowledge, values, skills, and interests that Indian students possess are largely ignored in favor of strategies aimed at enticing them to conform to mainstream education. Few comprehensive attempts have been made to create a body of content and teaching models that are founded upon contemporized expressions of American Indian educational philosophy. The inherent worth and creative potential of Indian students and Indian perspectives of education have not been given serious consideration by mainstream education. Many of the brightest and most creative Indian students continue to be alienated from modern education.

The alienation of Indian students from education and the resultant loss of their potentially positive service to their communities need not continue if we revitalize and reclaim our own deep heritage of education. Indigenous approaches to education can work if we are open to their creative message and apply a bit of “Gadugi” – a Cherokee way to say working together – to find ways to revitalize and reintroduce their inherently universal processes of teaching and learning. Indigenous educational principles are viable whether one is learning leadership skills through community service, learning about one’s cultural roots through creating a photographic exhibit, or learning from Nature by exploring its concentric rings of relationship.

The creative potential of building upon and enhancing what students bring with them culturally has been explored at a number of Indian educational institutions. The development of tribal community colleges and the evolution of “contract” schools governed by tribes offers one of the most plausible areas for the ongoing development of this nature.

INDIGENOUS EDUCATION AND ITS ROLE IN INDIVIDUAL TRANSFORMATION

In the context of development of a basic conceptual framework of a viable Indigenous educational philosophy, it is essential that the relationship of Indigenous education to establishing and maintaining individual and community wholeness be seriously considered. Much of Indigenous education can be called “endogenous” education in that it revolves around a transformational process of learning by bringing forth illumination from one’s ego center. Educating and enlivening the inner self is the life-centered imperative of Indigenous education embodied in the metaphor, “seeking life” or for “life’s sake.” Inherent in this metaphor is the realization that ritual, myth, vision, art, and learning the “art” of relationship in a particular environmental context facilitates the health and wholeness of individual, family, and community. Education for wholeness, by striving for a level of harmony between individuals and their world, is an ancient foundation of the educational process of all cultures. In its most natural dimension, all true education is transformative and Nature centered. Indeed, the Latin root
educare, meaning, “to draw out,” embodies the spirit of the transformative quality of education.

A transformational approach to education is distinctly universal, integrative and cross-cultural because it is referenced to the deepest human drives. From this viewpoint all human beings concern themselves with self-empowerment and with whatever enables them to transform their lives and the conditions in which they live; such a viewpoint engenders the intent of people striving to create whole, happy, prosperous, and fulfilling lives. (Faal, 2010)

The goals of wholeness, self-knowledge and wisdom are held in common by all the traditional educational philosophies around the world. Indeed, even through medieval times all forms of European education were tied to some sort of spiritual training. Education was considered important in inducing or otherwise facilitating harmony between a person and the world. The goal was to produce a person with a well-integrated relationship between thought and action. This idealized outcome was anticipated as following naturally from the “right education.”

The “right education” is, of course, a culturally defined construct, one of whose main criteria is socializing the individual to the collective culture of a group. However, this sort of socialization is only one dimension of education, a first step in a lifelong path of learning. In reality, “right” education causes change, which in time creates a profound transformation of self. This transformation is a dynamic creative process, which brings anything but peace of mind, tranquility and harmonious adaptation. The exploration of self, and relationships to inner and outer entities, requires a tearing apart in order to create a new order and higher level of consciousness. Harmony is achieved through such a process but it lasts for only a short period of time before it again has to be revised as people and their circumstances change. This is the endogenous dynamic of tribal education (Fig. 2.1).

The process begins with a deep and abiding respect for the “spirit” of each child from before the moment of birth. The first stage of Indigenous education therefore revolves around learning within the family, learning the first aspects of culture, and learning how to adapt and integrate one’s unique personality in a family context. The first stage ends with gaining an orientation to place.

Education in the second stage revolves around social learning, being introduced to tribal society, and learning how to live in the natural environment. The second stage ends with the gaining of a sense of tribal history and learning how to apply tribal knowledge to day-to-day living.

The third stage revolves around melding individual needs with group needs through the processes of initiation, the learning of guiding myths, and participation in ritual and ceremony. This stage ends with the development of a profound and deep connection to tradition.

The fourth stage is a midpoint in which the individual achieves a high level of integration with the culture and attains a certain degree of peace of mind. It brings the individual a certain level of empowerment and personal vitality and maturity. But it is only the middle place of life.
The fifth stage is a period of searching for a life vision, a time of pronounced individuation and the development of “mythical” thinking. This stage concludes with the development of a deep understanding of relationship and diversity.

The sixth stage ushers in a period of major transformation characterized by deep learning about what is subconscious. It is also a time of great turmoil, disintegration, wounding, and pain, which paves the way for an equally great reintegration and healing process to begin in the final stage. The pain, wound, and conflict act as a bridge to the seventh stage.

In the seventh stage deep healing occurs in which the self “mutualizes” with body, mind, and spirit. In this stage deep understanding, enlightenment, and wisdom are gained. This stage ends with the attainment of a high level of spiritual understanding which acts as a bridge to the finding of one’s true center and the transformation to “being a complete man or woman in that place that Indian People talk about.”

These stages of inter-relationship form a kind of creative continuum, “life way,” which helps us to become more fully human as we move through the stages of our life. Indigenous education traditionally recognized each of the most important

Fig. 2.1 The Indigenous stages of developmental learning
inter-relationships through formal and informal learning situations, rites of passage, and initiations.

Inherent in Indigenous education is the recognition that there is a knowing Center in all human beings that reflects the knowing Center of the Earth and other living things. Indian elders knew that coming into contact with one’s inner Center was not always a pleasant or easily attainable experience. This recognition led to the development of a variety of ceremonies, rituals, songs, dances, works of art, stories, and traditions to assist individual access and utilize the potential healing and whole-making power in each person. The connecting to that knowing Center was choreographed through specific ritual preparation to help each individual on their journey to their own source of knowledge. Through this process the potential for learning inherent in each of the major stages of a person’s life was engaged and set about the task of connecting to one’s knowing Center. This was the essential reason for the various rites of passage associated with Indian tribes and various societies within each tribe.

Since the highest goal of Indigenous education was to help each person to “find life” and thereby realize a level of completeness in their life, the exploration of many different vehicles and approaches to learning was encouraged. This was done with the understanding that each individual would find the right one for itself in its own time. But the process of finding one’s self and inner peace with its usual implications of being “adjusted,” as it is called in modern circles today, was not the central focus of Indigenous education. Seeking peace and finding self was seen to be a by-product of following a path of life, which presented significant personal and environmental challenges, obstacles, and tests at every turn. This “individuation,” as Jung called it, did not come easy. It had to be earned every step of the way. But in the process of earning it, one learned to put forward the best that one had, one learned the nature of humility, self-sacrifice, courage, service and determination. Indian People understood that the path to individuation is riddled with doubt and many trials. They understood that it was a path of evolution and transformation.

Individuation is a work, a life opus, a task that calls upon us not to avoid life’s difficulties and dangers, but to perceive the meaning in the pattern of events that form our lives. Life’s supreme achievement may be to see the thread that connects together the event dreams, and relationships that have made up the fabric of our existence. Individuation is a search for and discovery of meaning, not a meaning we consciously devise but the meaning embedded in life itself. It will confront us with many demands, for the unconscious, as Jung wrote, “always tries to produce an impossible situation in order to force the individual to bring out his very best. (Sanford, 1977, p. 22)

There are elemental characteristics, which exemplified the transformational nature of Indigenous education. The following are a few of the most important elements that may provide points of reference for learning goals and the development of content areas.
First, was the idea that learning happens of its own accord if the individual has learned how to relate with his/her inner Center and the natural world. Coming to learn about one’s own nature and acting with accord to that understanding was a necessary preconditioning which prepared the individual for deep learning.

Second, there was the acceptance that, at times, experiences of significant hardship were a necessary part of an individual’s education and that such circumstances provided ideal moments for creative teaching. A “wounding” or memory of a traumatic event and the learning associated with such events provide a constant source for renewal and transformation which enlarged the consciousness if individuals were helped in understanding the meaning of such events in their lives.

Third, that empathy and affection were key elements in learning. Also, direct subjective experience combined with affective reflection is an essential element of “right” education. Therefore mirroring behavior back to learners became a way that they might come to understand for themselves their own behavior and how to use direct experience to the best advantage.

Fourth, an innate respect for the individual uniqueness of each person which gave rise to the understanding that ultimately each person was their own teacher as far as understanding and realization of their process of individuation. Indigenous education integrated the notion that there are many ways to learn, many ways to educate, many kinds of learners, many kinds of teachers, each of which had to be honored for their uniqueness and their contribution to education.

Fifth, that each learning situation is unique and innately tied to the creative capacity of the learner. When this connection to creative learning and illumination is thwarted, frustration and rigidity follow. Learning therefore had to be connected to the life process of each individual. The idea of life-long learning was therefore a natural consideration.

Sixth, that teaching and learning are a collaborative cooperative contract between the “teacher” and learner. In this sense the teacher was not always human but could be an animal, a plant, or other natural entity or force. Also, based on this perception, the “teachable” moment was recognized through synchronistic timing or creative use of distractions and analogies to define the context for an important lesson. The tactic of distract-to-attract-to-react was a common strategy of Indigenous teachers.

Seventh, learners need to see, feel, and visualize a teaching through their own and other People’s perspectives. Therefore, telling and retelling a story from various perspectives and at various stages of life enriched learning, emphasized key thoughts and mirrored ideas, attitudes or perspectives back to learners for impact. Re-teaching and re-learning, are integral parts of complete learning. Hence, the saying, “every story is retold in a new day’s light.”

Eighth, that there are basic developmental orientations involved with learning through which we must pass toward more complete understanding. Learning through each orientation involves the finding of personal meaning through direct experience. The meaning that we each find is always subjective and interpretive based on our relative level of maturity, self-knowledge, wisdom, and perspective.
Ninth, that Life itself is the greatest teacher and that each must accept the hard realities of life with those that are joyous and pleasing. Living and learning through the trials and pains of life are equally important as learning through good times. Indeed, life is never understood fully until it is seen through difficulty and hardship. It is only through experiencing and learning through all life’s conditions that one begins to understand how all that we do is connected and all the lesson that we must learn are related.

Tenth, that learning through reflection and sharing of experience in community allows us to understand our learning in the context of greater wholes. In a group there are as many ways of seeing, hearing, feeling, and understanding as there are members. In a group we come to understand that we can learn from another’s experience and perspective. We also become aware of our own and other’s bias and lack of understanding through the process the group. We see that sometimes People do not know how to take or use real innovation and that many times People do not know how to recognize the real teachers or the real lessons. We see that a community can reinforce an important teaching or pose obstacles to realizing its true message. It is not until, as the Tohono Odum phrase it, “when all the People see the light shining at the same time and in the same way,” that a group can truly progress on the path of knowledge.

SOCIAL CONSCIOUSNESS AND INDIGENOUS EDUCATION

Paulo Freire, a Brazilian social reformer and educator, introduced a notion of education which closely parallels the role of Indigenous education in the transformation of the social consciousness of American Indians as they strive to “self determine” themselves in the face of the challenges of the 21st century. His thesis is founded on the notion that critical consciousness of cultural-historical roots of a people – as expressed and understood from the perspective the people themselves – is the foundation of a people’s cultural emancipation. The modern struggle of Indigenous peoples throughout the world has been characterized by an attempt to maintain the most cherished aspects of their ways of life, their relationship to their lands, their consciousness of themselves as a distinct People. They are constantly engaged in a dynamic struggle to retain “the freedom to be who they are” in the midst of subtle and at times overt oppression by modern societies (Freire, 1970).

Freire’s central message about education is that one can only learn and understand to the extent that one can establish a direct and participatory relationship with the natural, cultural, and historical reality in which one lives. This is not the same as the Western schooled authoritarian style of problem solving, where schooled “experts” observe a reality or situation from the outside and at a distance, then develop a solution or dictate an action or policy. This approach decontextualizes the problem from the totality of human experience and leads to a distorted perspective of the problem as an event that has relationship only to itself and to nothing else. This form of ultra-objectification denies the reality of interrelationship and reduces participation and learning to only an intellectual
exercise of applying a preconceived objective method or model. The result is a perpetuation of dependence on an “outside” authority and the maintenance of the political power brokers behind such authority. Indigenous People who are “administered” education, extension services, and economic development in these terms usually remain oppressed and gradually become dependent on the “authority.” In these circumstances, Indigenous Peoples’ ability to revitalize and maintain themselves culturally, socially, and economically through a self-determined process of education is significantly diminished, if not outright destroyed.

Freire’s approach is to begin with the way a group communicates about their world and their experiences in their social contexts. Then “generative” words, metaphors, or proverbs are identified which evoke thought, feelings, or reveal a historical perspective that have intrinsic meaning to people and their cultural way of life. These words or phrases are then translated into a variety of meaningful images and discussed with the People themselves to “unpack” their meaning. This process evolves through various stages of dialogue through structures called “culture circles.” In the “culture circle” a group reflects on key generative words and symbols facilitated by a coordinator who helps form the dialogue. Since the words and symbols being used come from the language, cultural, or historical experience of the group, the people begin to reflect on their own collective stories in ways that stimulate new insights about themselves, their situations, and solutions to problems, which they face. Motivation, meaning, and “re-searching” of their cultural roots for possible models for viewing their problems are built into the “culture circle.” The group learns by telling and retelling their stories, reflecting on their meaning, and reinforcing the vital elements of their cultural orientation. This process of learning stimulates the thinking of “People submerged in a culture of silence to emerge as conscious makers of their own cultures.” The group learns how to create new meanings and apply insights derived directly from their own culture, history, and social experience to their contemporary life. What they learn about themselves through themselves forms the basis for authentic empowerment and the beginning of release from imposed authority through a process of education that has become their own. Through such a process the group can truly cease being “objects” for outside political, economic or educative manipulation. Instead, they become subjects in the making of their own stories for the future and controllers of their own destiny.

Freire’s method has had a profound effect on increasing the literacy and the social consciousness of not only rural peoples in Brazil, but also millions of people in third-world nations. It works primarily because it acts to release what is essentially an Indigenous response to learning by fostering authentic dialogue about what is important to people in contexts of social and political situations that directly affect them. Relevancy of what is being learned and why it is being learned becomes readily apparent because it is connected to the cultural orientations, as the people themselves perceive them. The democratization of knowledge and the educational process perpetuated by Freire’s approach mirrors that which occurs in Indigenous education. A new relationship between Indigenous
People and modern education and knowledge bases is made possible. The knowledge and educational orientation of modern educators is changed from an expert-recipient relationship to one of mutually reciprocal learning and co-creation. What is established is essentially a more ecologically sound and sustainable process of education. A kind of education is engendered which frees teachers, learners, and community to become partners in a mutual learning and becoming process.

Freire’s method mirrors, at a social level, the ecologically inspired orientation of Indigenous education, which I have called “natural democracy.” There is a direct communication between all individuals engaged in the educative process. The implicit paternalism, social control, and non-reciprocal orientation between experts and recipients of education give way to authentic dialogue which generates a high level of critical consciousness and the kind of educational empowerment that allows Indigenous People to become agents of transformation in their own social and cultural contexts.

The history of American Indian education has largely been characterized by a policy of assimilation combined with covert attempts at modernization of American Indian communities to “fit” them into the mainstream profile of American life. This has been, for the most part, a technical process of development, combined with intense indoctrination in the political and bureaucratic ways of the federal government. Educational development, like other extensions of “federal aid,” has occurred through the actions of technicians, bureaucrats, and political manipulators who act to keep real decision-making power outside the parameters of the tribes and individuals affected. Many Indian educators, social reformers, businessmen and politicians continue to perpetuate this federal and mainstream paradigm either because they have never questioned their own educational conditioning within this system or because they have not found or explored alternatives. This situation has largely prevented Indian People from being the subject and beneficiaries of the exploration of their own transformative vision and educational process. As a result, Indian tribes are still relegated to having to “react” to “their” administration by the federal government because of continued dependence on federal aid and extension services. Rather than being “proactive” and truly self-determined in their efforts to educate themselves through themselves, Indian People continue to struggle with modern educational structures which are not of their own making and are separated from, and compete with, their traditional forms of education. There continues to be a kind of educational “schizophrenia” in the reality of Indian education today. Indian People continue to be one of the most educationally disadvantaged and “at risk” minorities in America today. This reality exists in spite of the enormously profound and elegant expressions of traditional education and philosophy. The essential question is what needs to happen to reclaim and rename this enormously important heritage not only for Indian People but also as a contribution to the educational development of all future generations?

The next phase of the development of Indian education requires the collective development of transformative vision and educational process based on authentic
dialogue. This kind of development requires that “new structures” and “practices” emerge from old ones through a collective process of creative thought and research. An ongoing and unbiased process of critical exchange between modern educational thought and practice and the traditional philosophy and orientations of Indian People can only generate these kinds of new structures and practices.

A new kind of educational consciousness, an “ecology of Indigenous education,” must be forged which allows Indian People to explore and express their collective heritage in education and to make the kinds of contributions to global education that stem from such deep ecological orientations. The exploration of traditional Indian education and its projection into a contemporary context is much more than just an academic exercised. It illuminates the true nature of the ecological connection of human learning and helps to liberate the experience of being human and being related at all its levels.

From this perspective, education takes on the quality of a social and political struggle to open up the possibilities for a way of education that comes from the very “soul” of Indian People. It also brings to the surface the extent and the various dimensions of the conditioning of modern educational processes that have been “interjected” into the deepest levels of their consciousness. They become critical observers of the modern education to which they have had to adapt and which demands conformity to a certain way of education that more often than not has been manipulated to serve only certain “vested interests” of American society. Through the exploration of Indigenous education they learn how to demystify the techniques and orientations of modern education. This understanding allows them to use such education in accord with their needs and combine the best that it has to offer with that of Indigenous orientations and knowledge. They cease to be “recipients” of modern education and become active creators of their own education.

At a more inclusive level, exploration of Indigenous education liberates the Indian learner and educator to participate in the kind of creative and transforming dialogue that is inherently based on equality and mutual reciprocity. This is a way of learning, communicating, and working of relationship that mirrors those ways found in Nature. It also destigmatizes the Indian learner as being “disadvantaged” and the educator as the “provider of aid.” Rather, it allows both the learner and educator to co-create a learning experience and mutually undertake a pilgrimage to a new level of self-knowledge. The educator enters the “cultural universe” of the learner and no longer remains an outside authority. By being allowed to co-create a learning experience, everyone involved generates a kind of critical consciousness and enters into a process of empowering one another. And with such empowerment, Indian People become significantly “enabled” to alter a negative relationship with their learning process. Ultimately, with the reassertion, contemporary development, and implementation of such an Indigenous process at all levels of Indian Education, Indian People may truly take control of their own history by becoming the transforming agents of their own social reality.

In the final analysis, Indian People must determine the future of Indian education. That future must be rooted in a transformational revitalization of our
own expressions of education. As we collectively “Look to the Mountain” we must truly think of that seventh generation of Indian children for it is they who judge whether we were as true to our responsibility to them as our relatives were for us seven generations before. It is time for an authentic dialogue to begin to collectively explore where we have been, where we are now, and where we need to go as we collectively embark on our continuing journey “to that place that Indian People talk about.” I hope that this work will stimulate that kind of dialogue.

NOTES

1 This chapter is a reprint of and excerpts from the introduction and the final chapter of Cajete (1994).

REFERENCES