BOOK REVIEW

Postcolonial theories, bicultural research and wanting the best for Kenyan students


Published as Volume 6 in the series ‘Cultural and Historical Perspectives on Science Education: Research Dialogues’, O’Hern and Nozaki’s book fulfils the series’ mandate to inspire dialogue around bridging ‘theory, research, and the practice of science education’. The book’s Kenyan context does not restrict the book’s relevance to most other countries, especially those that promote strict ‘standards’ for science education, policed by narrow regimes of accountability testing that operate within ideologies of positivism. The issues raised by O’Hern and Nozaki are recognisable worldwide. Michael W. Apple wrote a very supportive Foreword, concluding that the book ‘is a very thoughtful contribution to the ongoing construction of more epistemologically and socially responsive models of educational theory and practice’ (p. xi).

The volume offers in-depth, trustworthy, empirical data garnered from a rational selection of teachers and students in three diverse Kenyan secondary schools. These data convey participants’ perspectives on (a) what the authors call ‘natural science knowledge’, defined as ‘ecological, environmental, and natural concepts’, taught as curriculum content in agriculture, biology and geography courses; and (b) what the authors call ‘Indigenous bodies of natural science knowledge’, which means Indigenous practices that relate directly to content called ‘natural science knowledge’.

The research participants’ perspectives shed light on potential resistance to science education policies that aim to connect school science with the culture of students. This is a key topic in many educational jurisdictions, particularly those that are beginning to combine, in one way or another, two cultural knowledge systems, Indigenous knowledge and Eurocentric science (or Western science), both of which rationally and empirically describe and explain our physical world from different cultural perspectives. Importantly, the authors’ recognition of these two cultural knowledge systems does not imply the two are mutually exclusive. On the contrary, we know that the two coexist for people acquainted with (a) epistemological, ontological and axiological features of each knowledge system; (b) the heterogeneity within each system; and (c) the cultural worldviews that underpin each system.

The book’s title mentions three major topics: natural science education, Indigenous knowledge and sustainable development. These are viewed through the authors’ ‘(post)modern’ critical postcolonial lens that attends to, for instance, the
problem of false binaries arising from the construction of mutually exclusive categories when in fact degrees of coexistence fit reality.

Chapter 1 describes or defines some of these topics along with their technical vocabularies, and as well, it contextualises both theoretically and in practice the ethnographic, qualitative, multi-sited and multi-case study undertaken. Chapter 2 reviews the literature related to the theoretical perspectives and research practices that animate the Kenyan study, giving special attention to the terms ‘Western scientific knowledge’ and ‘Indigenous knowledge’, among other terms. Chapter 3 expands in detail on the study’s research methods and methodology, mostly based on the excellent guidance of Glesne and Peshkin’s textbook *Becoming Qualitative Researchers*, among other publications cited. Chapter 3 is a must read for graduate students wanting to learn about or design a cohesive, thoughtful ethnographic case study within a conventional qualitative research paradigm. In Chapter 4, the historical and educational context of Kenya’s secondary education is taken up. This prepares the reader to appreciate the severe professional constraints teachers experience in all Kenyan secondary schools; in particular a highly centralised curriculum and micro-managed instruction, along with a super high-stakes, rigid, comprehensive examination taken at the conclusion of secondary schooling.

Three separate research sites were selected to capture a wide range of geographic, political, social and gender issues in Kenyan society. Each site is given a separate chapter. Chapter 5 deals with an isolated rural school, Forest Secondary School, situated next to the agrarian Taita Hills. Chapters 6 and 7 deal with two schools, Central Boys Secondary School and Uhuru Girls Secondary School, respectively, located in the capital city of Nairobi. All three chapters describe the schools’ diverse contexts and report on the data accumulated from classroom observations, informal discussions, interviews with targeted teachers and students, and an open-ended questionnaire to which targeted teachers and students responded (see Appendices A, B and C, respectively).

Chapter 8, Discussion and Concluding Thoughts, summarises points found in earlier chapters but in a way that makes connections among the three schools. These points and connections lead to some policy conclusions that would certainly improve natural science education for Kenyan students. The authors then stitch together this discussion with theoretical issues such as sustainable development and the dichotomisation of ‘Indigenous and Western bodies of natural science knowledge’.

The agenda for Chapter 8 is to clarify educational theory with the practice the authors envision for Kenyan secondary schools. Such a worthy, ambitious task is a challenge for the chapter’s limited 16-page length. Theory-based advice included, for example:

Critical postcolonial approaches to natural science education for sustainable development … must offer younger generations the chance to know, understand, and work through such a complex, intricate geography and the integrative realities and possibilities it comprises. (p. 147)

For policy-makers, the chapter would have been clearer and more credible had the authors illustrated their advice in more concrete ways. Specificity could be achieved, for example, by composing two or three short vignettes or scenarios, fictitious or not, based on modifications to what was observed in the research sites.
and described in Chapters 5–7. An example of such a vignette or scenario is found in the Bang and Medin (2010) article cited in the book. These authors draw on their vignette to point out key practices and their important connection to education theories, thus illustrating how to bridge theory and practice. As well, there are excellent potential vignettes or scenarios in the literature on African innovations in science education (e.g. Keane, 2008). A vignette or scenario could convey what Chapter 8’s advice might look like in practice. Lengthening the chapter in this way would have immensely helped readers who want to bridge critical postcolonial theory and school practice.

The authors are to be admired for taking on such a worthwhile yet challenging and complex research topic. The ultimate goal of their research agenda is to create a culturally responsive natural science education for Kenyan students, most of whom have family members who are valid sources of Kenyan Indigenous ways of living, knowing and being; in short, Kenyan Indigenous knowledges – the plural form of ‘knowledge’ that emphasises heterogeneity rather than a conventional stereotypic pan-Kenyan Indigenous knowledge system. (This plural use is found in the literature, including O’Hern’s 2010 PhD dissertation upon which this book is based. The singular ‘knowledge’ consistently appears in the present volume, perhaps due to Sense Publishers’ editing.) The proposed culturally responsive education is intended to empower students through their understanding of the power–knowledge nexus within their own community and nation. Empowered Kenyan students would be capable of mastering and critiquing Eurocentric ways of knowing nature (i.e. ‘natural science knowledge’ in this case) without sacrificing their community’s Indigenous ways of knowing, living and being.

This book review continues by addressing the following topics: the false dichotomisation of Indigenous knowledge and Eurocentric science, attending to Indigenous people and communities, sustainable development and conclusions.

**False dichotomisation of Indigenous knowledge and Eurocentric science**

Kenyan students should benefit from being able to choose when and how to walk in their perceived world identified with globalisation and Kenya’s European colonisers, and when and how to walk in their perceived Indigenous worlds that can feed their self-identities, resilience and problem-solving skills. Drawing on the educational principle of students’ intellectual independence, one would encourage students to draw from the strengths of each coexisting knowledge system (Indigenous and Eurocentric); it would not be the teacher’s nor the curriculum’s role to dictate students’ integration of perceived strengths of each knowledge system (Aikenhead & Michell, 2011).

These processes of learning, integrating, and applying Indigenous and Eurocentric knowledge systems have been called ‘two-eyed seeing’ by Canadian Mi’kmaw Indigenous Elder Albert Marshall (Hatcher, Bartlett, Marshall, & Marshall, 2009). A person’s unique perceptions of each type of world, Indigenous and Eurocentric, lead to a unique and personal hybrid type of understanding the physical world, from which people can draw when dealing with a particular circumstance they find themselves in. Two-eyed seeing is a generalised description of practice, not a theoretical explanation. From a two-eyed seeing perspective, there is no Indigenous versus Eurocentric false binary. Instead, the two knowledge systems coexist in ways that make personal sense to a student. Educators can consider various ways people
might enact their own two-eyed seeing. One example is Jegede’s (1995) collateral learning theory that Aikenhead and Jegede (1999) investigated in some detail. An alternative metaphor to two-eyed seeing mentioned in passing by O’Hern and Nozaki (p. 32) is the amalgamation of knowledge among diverse cultures based on an individual’s cultural identity and life experiences (Ogunniyi & Ogawa, 2008, cited in the book). Either Ogawa’s (2002) ‘stratified amalgam model’ or Elder Marshall’s two-eyed seeing metaphor offer promising beginnings to investigating the authors’ key question: ‘How can we develop a discussion of curriculum theories that provides a framework for linking (as opposed to adding to or substituting) Western scientific knowledge and [I]ndigenous knowledge?’ (p. 29).

O’Hern and Nozaki properly concentrate on critical emancipatory theories that eschew false binary thinking: ‘the retention, however nuanced, of epistemological dichotomisation between the oppressor and the oppressed, or the colonizer and the colonized’ (p. 22). Understandably, the binary ‘the oppressor and the oppressed’ is not considered a false binary:

[T]he focus of this volume is the epistemological tensions between, and dichotomisation of, the two kinds of knowledge in the context of Kenyan secondary schools. By investigating these tensions, we seek to unearth their manifestations in policy documents, school curricula and pedagogies, and the voices of teachers and students in regard to natural science education. (p. 23)

Such dichotomisations are indeed unearthed unambiguously at length in Chapters 4–7 and are discussed in Chapter 8.

Without some degree of scholarly clarity, a book’s critical stance edict against binaries rings somewhat hollow when many binaries are found throughout the book. Clarity could have been tightened by using adjectives (e.g. ‘false’ and ‘intended’) so a reader is informed as to the authors’ intent about a binary being false or intended. The authors thoughtfully point out, however, that ‘Drawing the divide and creating mutually exclusive categories is one of the most fundamental ways hegemonic power works’ (p. 145). A science education that reveals and works against such power, a postcolonial science education (Chinn, 2007; McKinley, 2007; Ryan, 2008), explicitly diminishes or extinguishes that power through culturally responsive curricula, pedagogies, assessment strategies and interpersonal classroom interactions; in other words, a decolonising science education.

Chapter 8 advises three general approaches to eliminate false dichotomies: (1) replace the conventional stereotyping of Indigenous knowledge with an emphasis on its heterogeneity; (2) challenge ‘any essentialist views on [I]ndigenous bodies of knowledge’ (p. 146), to which I would add: challenge any essentialist views on scientific knowledge and the enterprise of science itself; and (3) ensure that presenting both Indigenous and scientific ways of understanding nature in school science is for all students, including those who are looking forward to science-related occupations.

A reader might want to modify the dichotomy ‘false versus intended’ into a continuum. For instance, one could consider whether a binary would tend to be more helpful or more harmful to clear thinking or communication, relative to an intended audience and considering the context in which it is found. At one end of the continuum, a helpful binary arises from making an explicit choice about using the binary for a given reason (e.g. for connecting initially with a reader’s likely
notion of a word or phrase, in an intellectually honest way) with no essentialising intended. At the other end of the continuum, a binary harmful to clear thinking or communication arises when someone believes they do not have a choice in its use, and the binary is treated as reality (i.e. it is essentialised) rather than as an intellectual construction. In the context of communicating clearly, there very well may be good reasons to speak intentionally in binary terms, such as Marshall’s ‘two-eyed seeing’.

Attending to Indigenous people and communities
Postcolonial perspectives are crucial to the authors’ ultimate goal of achieving a ‘natural science education that begins with the needs, values, and insights of local people and communities’, [so] it is imperative to listen to the voices of students, teachers, and schools at grassroots levels’ (p. 59, emphasis added). A postcolonial agenda leads to decolonising methods (Tuhiwai Te Rina Smith, 1999, cited in the book) that reduce or eliminate vestiges of Eurocentric hegemony. As documented in the book, serious changes are needed in Kenya’s elite-oriented political, social and educational status quo; a status quo vigorously defended by native Kenyans who have internalised British colonialism and are now inflicting it on fellow Kenyans. Reducing or eliminating the influence of these power-based groups and institutions would require revolutionary changes beyond the purview of most science educators (Stewart, 2010). This issue is acknowledged in Chapter 8 (p. 144) and is discussed towards the end of this review.

Less challenging changes lie within reach of non-Indigenous educational researchers involved with Indigenous people and communities. Non-Indigenous researchers need to be mindful of neocolonial strategies and perspectives that have been unconsciously acquired from Euro-American cultures; strategies and perspectives that can inadvertently add to the marginalisation of Indigenous people.

One such challenge is our use of English. For instance, cultural comparisons are not necessarily dyads such as Indigenous knowledge and Eurocentric science. Aikenhead and Ogawa (2007) investigated a triad: Indigenous ways of living in nature, Eurocentric science and a Japanese way of knowing seigyo-shizen. This same triad, expressed in conventional English, might be written as: Indigenous knowledge, science and Japanese neo-indigenous knowledge. For example, in most North American Indigenous languages, there is no word that means what ‘knowledge’ usually means to English speakers. If, for example, a Canadian Cree First Nations speaker translated ‘knowledge’ into a Cree expression, and then another Cree speaker independently translated that Cree expression back into English, the process is called back-translation. The English-Cree back-translation of ‘knowledge’ is often ‘ways of knowing, living and being’, which is fairly common throughout North America. What is applicable to the Kenyan context is the claim that much is lost in translation between noun-based English and verb-based Indigenous languages:

Therefore, the English expression ‘Indigenous knowledge’ obviously conveys, like a Trojan horse, a Eurocentric noun-oriented epistemology. In this Eurocentric worldview, knowledge (as a noun) is something that can be given, accumulated, banked, and assessed by paper and pencil examinations. In short, knowledge within a Eurocentric worldview is an entity separate from the knower. Such an epistemic concept is totally foreign to most Indigenous worldviews. (Aikenhead & Ogawa, 2007, p. 553)
No back-translations involving Indigenous Kenyan languages are found in the book. Instead, a scientific perspective is superimposed to name a category within a Kenyan Indigenous knowledge system; for example, ‘[I]ndigenous types of natural science knowledge’, ‘[I]ndigenous natural science knowledge’ and ‘natural science-oriented [I]ndigenous kinds of knowledge’ appear in the book. I wonder what the Kiswahili back-translation of ‘Indigenous natural science knowledge’ is in the Taita Hills of Kenya. A reader also finds the phrase ‘traditional knowledge’ transposed into ‘ecological knowledge held by native people’ (p. 25). Here a Eurocentric term (ecological) replaces a more accurate Indigenous term (traditional).

A different type of Eurocentric imposition is evident in defining Indigenous knowledge: ‘contextualised, situated, or experience-informed knowledge of native people (e.g. … Ogunniyi & Ogawa, 2008)’ (p. 26). This 2008 reference actually defines Indigenous science quite differently as ‘a culture-dependent collective rational perceiving of reality’ (p. 178). Ogunniyi and Ogawa’s definition is contextualised by Ogawa’s (1995) superordinate definition of ‘science’ within a multiscience (pluralistic) framework ‘where science is defined as a rational perception of reality’ (p. 178). From this perspective, every major culture has its own culture-based science:

a rational empirically based way of knowing nature that yields, in part, descriptions and explanations of nature. This superordinate concept subsumes the Euro-American cultural perspective (Eurocentric science) and various non-Eurocentric perspectives, including Indigenous and neo-indigenous ways of knowing nature. (Aikenhead & Ogawa, 2007, p. 544)

Moreover, holistic and relational features of Indigenous ways of living do not appear in this section of the book that defines Indigenous knowledge. These fundamental features are alluded to much later; for example: ‘This education aimed to transmit [I]ndigenous knowledge concerning humans and their relationship with the surrounding biophysical environment’ (p. 47, emphasis added), and ‘[I]ndigenous science knowledge and the rituals, practices, and individuals that are closely linked to them’ (p. 122, emphasis added). But even these are worded in a way that anchors Indigenous ways of living in nature to a Eurocentric science perspective (i.e. ‘biophysical environment’ and ‘[I]ndigenous science knowledge’). A discussion of the Kiswahili equivalent to the Zulu concept of ‘Ubuntu’ in South Africa (Keane, 2008) might capture the holistic relational features of Indigenous Kenyan worldviews, thereby clarifying these fundamental features of Kenyan Indigenous knowledges.

Similarly, the intellectual, physical, emotional and spiritual dimensions of Indigenous holistic knowledges generally shared worldwide are given little or no attention. Perhaps the construct of Indigenous natural science knowledge refers solely to the intellectual dimension of Indigenous knowledges. If so, this truncated view of Indigenous knowledge indicates precisely how it is not properly represented in the book, in spite of the term’s appearance in the title.

One perspective on this state of affairs is explained by Aikenhead and Michell (2011, p. 109) in terms of two human traditions of understanding among other traditions (i.e. this is not a dichotomy): the intellectual tradition of Eurocentric thinking promoted by mainstream schools, and the wisdom tradition of thinking, living and being, generally embraced by Indigenous peoples and often represented by the
four dimensions: intellectual, physical, emotional and spiritual. The intellectual tradition is obviously a much narrower type of understanding. A Eurocentric bias in schools affects how students are assessed. Thus, knowledge accumulation within the intellectual tradition of thinking is revered over an Indigenous bias associated with experiential learning within the wisdom tradition. This tension in Kenyan education receives attention from O’Hern and Nozaki by its documentation in the research study (Chapters 5–7) and when the study’s results are discussed in Chapter 8.

It seems to this reader, however, that a paradox exists. On the one hand, the authors’ admirable goal of developing an Indigenous culturally responsive natural science education for Kenyan students is partly associated with a wisdom tradition of understanding; while on the other hand, their English expressions and conceptualisations discussed above tend to convey an allegiance to an intellectual tradition. An articulation of what their goal means from an Indigenous perspective, rather than solely from a ‘critical theories in education’ (p. 29) perspective, would seem to be in order. I am reminded that most emancipatory and critical theories in education originated with scholars associated with Euro-American cultures rather than with Indigenous cultures (Battiste, 2000). A characterisation of postcolonial thinking based on Indigenous scholars’ ideas may be more germane to the authors’ goal for Kenyan education.

In addition to some English expressions marginalising Indigenous ways of living in nature, a key concept in the book adds to that marginalisation. A process of Eurocentric reductionism occurs when a subcategory of Indigenous knowledges is created (i.e. Indigenous natural science knowledge) without the subcategory being defined and named by Kenyan Indigenous Elders or scholars. In the book, the subcategory’s definition arises from criteria important to scientists in ecology, agriculture and geography; that is, concepts directly related to specific Eurocentric topics in agriculture, biology and geography courses. According to Indigenous scholar Garrottte (1999), this process forces Indigenous knowledges into a Eurocentric science framework, with the consequence of severely damaging or destroying its integrity by amputating essential features such as holistic, relational and spiritual components. This inadvertent neocolonial event creates a Euro-American version of Indigenous ways of living and being and then passes it off as a subcategory of Indigenous knowledge. A rationale for such a distortion is not offered, other than the following note about a few teachers’ limited thinking recorded during their discussions of what local Indigenous knowledge they would bring into their classes:

Mr. Mwakisha’s use of local examples – whether they entailed plant or animal specimens or discussion of farming methods or techniques – typically did not incorporate [I]ndigenous ways of knowing or understanding the environment, let alone the customs or the beliefs that were entangled with such understandings. (p. 81)

This quote suggests two conclusions. First, the authors are aware of dimensions of Indigenous knowledge beyond the intellectual dimension; and secondly, the teacher ‘scientizes’ (my invented term) local Indigenous knowledge by restricting it to what Eurocentric science can explain. This exemplifies neocolonial teaching and contradicts a two-eyed seeing strategy.

A pervasive unintended disrespect for Indigenous peoples is conveyed by not capitalising the word ‘Indigenous’ as nearly all Indigenous scholars do, yet the
expression ‘White student’ is capitalised. The fault may likely lie with Sense Publishers’ corporate spelling conventions.

Beginning in Chapter 5, the technical terminology changes from the simple term ‘[I]ndigenous knowledge’ to various terms for the reductionist neocolonial subcategory discussed above. Then in Chapter 8, the expression ‘[I]ndigenous knowledge’ is revived. A reader expects scholarly books to make consistent use of theoretical terms.

Sustainable development

O’Hern and Nozaki’s book title suggests to me that sustainable development will be tied into their research project and into discussions about natural science education and Indigenous knowledge. It would seem, however, that sustainability was not a priority in the research conducted in Kenya, as evidenced by (a) its absence from the interview protocols and questionnaire, Appendices A–C, although ‘environmental issues and concerns’ (p. 151) are included and so students already concerned about sustainable development could initiate the topic into the empirical data base; and (b) its absence in the case studies of the three schools (Chapters 5–7). The authors conclude: teachers in all three schools ‘failed to present sustainability as a concept to be considered’ (p. 140).

A scholarly credible rationale for the importance of sustainable development to humanity’s well-being appears in the introductory pages of Chapters 1 and 2, and reappears in Chapter 8 where sustainability is linked to ‘[I]ndigenous bodies of knowledge [that] can be used to connect information about humans’ natural surroundings and their impacts on those surroundings’ (p. 140). O’Hern and Nozaki mention some African studies and conclude: ‘Indigenous knowledge has been shown to be an important component in the education for sustainable development movement[s] and discussions of sustainable development in formal education settings’ (p. 140). Thus, they make a strong case for including ‘[I]ndigenous bodies of knowledge’ in curricula that aim to nurture sustainability values and practices.

Yet, a more convincing case could have been made, I think, by going into greater depth by analysing both Indigenous knowledges and natural science knowledge in terms of their contributions to ‘environmental stewardship’ (p. 99). For instance, most Indigenous peoples understand that the universe is predominately a holistic web of interrelationships and reciprocal responsibilities (Battiste, 2000). This means that among the animals, plants and what scientists call abiotic material, humans are fundamentally dependent on, and connected with, everything in the physical universe. This is a dependent relational perspective on reality; a key ontological presupposition for most Indigenous peoples. It means that humanity’s importance is less than or equal to the importance of everything else in creation. Another consequence is that humanity and nature are harmoniously one in the same, and a humanity-versus-nature binary does not even exist in such a culture, and therefore it would most likely resist translation into an Indigenous language.

The binary is well established, however, in Eurocentric cultures where a much different ontological understanding is securely held. Known by some as the Judeo-Christian tradition, a hierarchical binary relationship is created between humanity and nature in a way that places the importance of humans above animals, plants and so-called non-living things. As a result, nature can be seen and used as a servant to humanity. Eurocentric science usually subscribes to this anthropocentric
notion of reality, with a few notable paradigmatic exceptions such as deep ecology and theoretical physics. Indigenous ways of living in nature, on the other hand, generally embrace a dependent relational view of reality.

This dependent relational view teaches harmony with nature as a survival principle that seeks to sustain balance among everything in creation; a balance that humans have personal responsibility to foster. This perspective contrasts sharply with an anthropocentric entitlement principle that motivates globalisation’s sense of unfettered progress.

It now becomes clear that Indigenous cultures possess the gold standard of sustainability. Within the wisdom tradition, sustainability has always been taught by Indigenous Elders as the good way of living. I agree with O’Hern and Nozaki (p. 144) that an Indigenous perspective belongs in any rationale for sustainable development; thereby augmenting the social power of Indigenous knowledges in keeping with Freire’s (1970, cited in the book) liberation of the oppressed.

I hasten to point out that within anthropocentric cultures, there are concerned and thoughtful citizens dedicated to specific practices that minimise humanity’s impact on the planet’s various ecosystems. In spite of their altruistic leanings, however, these practices rate a distant second place to the gold standard set by Indigenous teachings.

The disparity between the two cultural perspectives is so great that it would seem reasonable to use two different words to represent dependent relational and altruistic anthropocentric ways of interacting with nature. For instance, we might reserve the term ‘sustainability’ for the Indigenous gold standard and use the term ‘stewardship’ for positive Eurocentric interactions with nature that are nevertheless invariably formulated within an anthropocentric worldview. The two terms, sustainability and stewardship, would signify fundamentally different ontologies underlying ways of dealing with nature: the Indigenous ‘living in a good way’ (sustainable development), and the Eurocentric ‘environmental stewardship’ (minimising humanity’s ecological footprint in certain contexts).

When non-Indigenous researchers are unaware of their own ontological, epistemological and axiological stances, they can subtly express anti-holistic and anthropocentric perspectives that distort, devalue or exclude Indigenous ways of understanding sustainability and what the physical world is. A well-intentioned recent study by American scholars (Quigley, Miller, Dogbey, Che, & Hallo, 2014) on Kenyan science teachers concerning environmental literacy is another case in point. They along with O’Hern and Nozaki convey the humans-versus-nature binary without giving voice to an Indigenous non-binary. Bang and Medin (2010, cited in the book) present an excellent model for what can be expected of researchers:

Native parents said that they want their children to realize that they are a part of nature. In contrast, European American parents described nature as an externality to be taken care of and respected. Native American parents were also more likely to mention spiritual practices and the idea that no creature is more important than or ‘above’ any other creature. (p. 1017)

Conclusions
The book’s research project documented some key challenges to developing a culturally responsive, sustainability focused, natural science education for Kenyan
students. These challenges can be summarised in four points presented as one extended sentence:

- Globalisation’s irresistible addictive attraction for modernising Kenya out of its third world status;
- fuelled by citizens (including most of the research participants) who are imprisoned by their *internalised colonisation* and their desire to climb their country’s social-economic ladder towards a life envisioned to mirror citizens in OECD countries, either by living in Kenya or by escaping to OECD countries through participation in post-secondary education and immigration;
- made possible at the present time only by gaining very high scores on a single, hyper-high stakes, comprehensive Kenya Certificate of Secondary Education exit examination, which is based mainly on students’ regurgitating factoids in a rigidly stylised manner expected by the examiners; and
- tutored by teachers shackled to a centralised national neocolonial Eurocentric science curriculum that dictates the scheduling of daily lessons, thereby leaving little or no room for teachers to initiate lessons that would appeal to students’ interests and identities or that would address issues of sustainable development.

In short, ‘The focus of natural science education was more “development” than “sustainable development”’ (p. 142).

In this pressurised educational milieu, Indigenous knowledges could revitalise natural science education, especially in rural areas as the authors thoughtfully propose. But Indigenous knowledges are generally seen by the teacher and student research participants as ‘antiquated, lacking in technical sophistication, and unusable’ (pp. 136–137). Giving voice to a scientific fundamentalist stance: ‘[I]ndigenous knowledge was described as lacking scientific backing and was thought to contribute to the inability of Kenyans to properly manage their natural resources’ (p. 137).

In the second bullet above, I have rephrased the book’s expression ‘legacy of Western colonisation’ (p. 133) with a more specific expression ‘internalised colonisation’ to characterise students, teachers and other Kenyan citizens. This focuses attention on a key factor for moving forward. Kenyan teachers need to realise emotionally, not just intellectually, that they continue to colonise themselves because of their internalised colonisation, thereby diluting or losing their Indigenous cultural identity and values. Only then, I suggest, can they become open to implementing the strategies of either two-eyed seeing or stratified amalgamation that work against the current ‘hegemonic curriculum’ (p. 144).

The authors’ suggestion for helping ‘to alleviate the educational, economic, and social disparities that characterise modern Kenya’ is to initiate ‘a culturally responsive and contextually effective natural science education for sustainable development’ (p. 140). The suggestion raises a conundrum well-known to educators involved in reforming science education: How do we resolve the tension between two competing roles for schools: schools as extensions of the community, and schools as social change agents (Aikenhead, 2006, cited in the book)? This is not a dichotomy because both coexist. As mentioned earlier, a degree of radical change within the community seems to be necessary for replacing a hegemonic curriculum
with one that addresses social change (Stewart, 2010). The authors do ‘recognise the difficulty associated with such encompassing changes’ (p. 144).

Freire’s (1970) and Connell’s (1993) insights and suggestions should not be ignored, but they seem more applicable to students who would identify as being oppressed by their educational system, a situation not observed in the research case studies. For that reason one might want to initially address Kenyan students’ internalised colonisation, when initiating a Kenyan version of a two-eyed seeing curriculum.

Drawing on Connell’s (1993) critical postcolonial work, O’Hern and Nozaki thoughtfully conclude that ‘one of the chief problems of Kenyan natural science education … can be addressed if [I]ndigenous perspectives, knowledge, and experiences are fully included in all aspects of natural science education, including textbooks, classroom instruction, and practical exercises’ (p. 144). Although a Canadian context is a much different colonial context than Kenya’s, there are lessons that can be transferred. Some provincial science curricula in Canada have been and continue to be renewed to include Indigenous knowledges through collaboration with Indigenous Elders and scholars (Aikenhead & Elliott, 2010). This includes a published science textbook series (grades 3–9) with accompanying teacher resource binders/CDs. These science textbooks present an Indigenous perspective on the physical world where appropriate, as dictated by Elders.

But including this Indigenous content was not enough, however, to diminish neocolonial perspectives. The conventional textbook language describing Eurocentric science needed to be edited in order to describe it more accurately as a set of cultural practices; thus suggesting or acknowledging that both Indigenous and Eurocentric knowledge systems are culture-based (Bang & Medin, 2010, cited in the book). This introduces the nature of science concept ‘culture of science’ to teachers and students (Aikenhead, 2006, cited in the book). For example, the textbook statement, ‘The world is comprised of living and non-living things’, would be edited to: ‘Scientists understand the planet as being comprised of living and non-living things’. This naturally invites an Indigenous perspective: ‘Elders understand everything in Mother Earth as being alive …’. The two statements read as coexisting ways of understanding; each reflecting a different cultural tradition. This opens the way to two-eyed seeing.

Admirably, the authors would include Indigenous perspectives, knowledges and experiences in natural science school textbooks. However, this innovation needs to be accompanied with a reconceptualisation of school science content as belonging to the culture of Eurocentric science, thereby establishing an egalitarian epistemic status between the two culture-based knowledge systems.

In addition to publishing this science textbook series, a teacher professional development model was produced for teachers beginning their journey into culturally responsive science teaching (Aikenhead et al., 2014). This model holistically encompasses six interrelated aspects: (a) the cultural resources that students (Indigenous and non-Indigenous) bring to the classroom; (b) a relevant Eurocentric science and Indigenous knowledges curriculum mediated by local Indigenous Elders and knowledge keepers; (c) culturally appropriate teaching methods based on students’ various recurrent learning strengths; (d) culturally valid student assessment; (e) patterns of interpersonal classroom interactions (teacher–student and student–student); and (f) a learning environment experienced by students holistically.
These curriculum and classroom changes were able to be initiated only since 2008 when Canada officially entered an historic era of reconciliation with its colonised and oppressed Indigenous peoples, many of whom survived government and religious attempts at cultural genocide. This era of reconciliation represents a degree of radical change within Canadian society, a change that tipped the power-knowledge balance towards school science enhanced with Indigenous knowledges. Some degree of social-political change needs to occur in Kenya before much educational change will take place. In the meantime, I believe that enhanced school science curricula and culturally responsive teaching should be developed wherever possible, ready to be scaled up when Kenyan society is ready. Curriculum development is, in part, a political process. Critical postcolonial and curriculum theories are understandably silent on specifics concerning this issue.

As quoted above, postcolonial perspectives are crucial to achieve a ‘natural science education that begins with the needs, values, and insights of local people and communities, [so] it is imperative to listen to the voices of students, teachers, and schools at grassroots levels’ (p. 59). Two important consequences arise from this quote. The first point is to acknowledge the researchers’ reasonable decision to delimit their study to students and teachers rather than include local people and communities. The latter could be the next research project. Researchers who take that path might want to read about an Indigenous community-based, Elder-guided, curriculum research and development project, ‘Rekindling Traditions’, which bridged theory and practice by producing a process that results in teaching units that integrate Eurocentric science into an Indigenous knowledge framework chosen by Indigenous community members who also collaborate with teachers’ instruction (Aikenhead, 2000, 2001). Rekindling Traditions seems to be one example of beginning with local people and communities to accomplish what the authors envision for Kenyan students.

Secondly, participating teachers’ and students’ needs, values and insights were not conducive to supporting a natural science curriculum envisioned by the authors. It is our experience in Canada that teachers’ conducive needs, values and insights are never successfully enacted through their intellectual understanding of Indigenous issues such as postcolonial education, but instead, teachers first require an emotion-based or spiritually informed understanding gained through a culture immersion led by Indigenous Elders and communities (Chinn, 2007) and captured by the phrase ‘the brain needs the heart’ (Aikenhead et al., 2014, p. 107).

The book’s advice, to give emphasis to paying attention to local people and communities, would need to be fleshed out quite differently than it was for paying attention to teachers and students. Non-Indigenous researchers and policy-makers must demonstrate a degree of credibility in understanding Indigenous perspectives. While I understand the intellectual content and rationales found in the book’s claims and proposals, they seem rather limited to Eurocentric perspectives at the expense of engaging with Kenyan Indigenous worldviews, given the bicultural nature of those claims and proposals. For example, their excellent design of the qualitative research study was a Eurocentric design and would not be acceptable to Indigenous scholars and researchers as amenable to local Indigenous people and communities (Bishop & Glynn, 1999; Tuhiwai Te Rina Smith, 1999, cited in the book).
Because critical, social science, educational theories have often arisen within Euro-American cultures, they are powerful constructs with which to properly interrogate the power-knowledge nexus that reproduces social and economic inequalities in Euro-American models of schooling, for example, in Kenya. As O’Hern and Nozaki do, Indigenous scholars have critiqued some published efforts that included Indigenous knowledges in a Euro-American school science setting. The efforts were critiqued for providing ‘a superficial reading of differences that makes power relations invisible and keeps dominant norms in place’ (McKinley, 2001, p. 75); in short, efforts that mask power with intentional or uninformed innocence. Given the Euro-American context of invention and application of critical, social science, educational theories, they may seem rather foreign to some Indigenous Elders in a very different culture (Battiste, 2000). Thus, to engage local Indigenous people and communities will require much different research perspectives and protocols. For example, authors of such bicultural research routinely craft a description of who they are with respect to the culture of those with whom they engage. This bicultural engagement includes collaborating from the very beginning of the research project by negotiating its agenda, protocols, practices and consequences to the participating community.

Although the book presents credible theoretical frameworks drawn from sociology and anthropology of education literature and applies them to a Euro-American science education, the book omits articles found in a highly relevant international journal, Cultural Studies of Science Education, which focuses on such theories and applications but gives voice to Indigenous perspectives missing in the book. Accordingly, the present volume seems conceptually limited concerning specific areas discussed in this book review.

Memo to Sense Publishers: never publish an academic book without a rich index. Without an index, O’Hern and Nozaki’s book will be difficult to study, even though it is well written and organised for very easy reading. An index allows scholars to focus on specific topics of professional interest across several books.

On the one hand, I appreciate the intellectual content and rationales offered by the book, and I recommend them to readers. On the other hand, that content seems unnecessarily Eurocentric by not sufficiently engaging with, and conveying aspects of, Kenyan Indigenous worldviews relevant to the teacher and student participants. When bridging theory, research and practice in science education, a bicultural curriculum proposed in the book calls for bicultural theory and research, for the sake of coherence and for minimising what otherwise gets lost in translation between those two cultures.

O’Hern and Nozaki do move us toward critical postcolonial curriculum policies and practices as their subtitle promises. But I would have enjoyed a more in-depth journey.

References


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