

Recovering traditional ecological knowledge (TEK): is it always what it seems?

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Introduction

Globalisation and its attendant acknowledgment of diversity has meant that Traditional Ecological Knowledge (TEK) as a form of Indigenous Knowledge (IK) is becoming increasingly prominent in many educational disciplines including that of science education. Snively and Corsiglia (2001) define TEK as the “timeless traditional knowledge and wisdom of long-resident, oral peoples” (p. 8), acquired over thousands of years of direct human contact with local environments. They emphasise the ecological depth of the knowledge, its persistence, consistency and reliability, its specificity, its holistic view of an interconnected world, and its moral and spiritual nature. They also describe its narrative base, where encoded metaphoric stories were often used “to compress and organise important information so that it can be readily stored and accessed” (p. 23), and “solutions to problems can be carefully preserved, refined and reapplied” (p. 13).

Snively and Corsiglia’s (2001) take on TEK comes from their article “Discovering indigenous science: implications for science education” which was one of three lead articles in the special 2001 edition of the highly respected journal *Science Education*. The edition focused on TEK, cultural diversity and multiculturalism within science education. Responses were sought to these articles from six prominent scholars with lead authors then able to rejoin, prompting Corsiglia and Snively (2001) to reply with, “Rejoinder: infusing indigenous science into Western modern science for a sustainable future”. In essence, Snively and Corsiglia (2001) argue for the broadening of conceptualisations of science to include the significant contributions of indigenous cultures’ TEK in ways that promote inclusivity, and provide ecological and sustainability knowledge to address the environmental devastation caused by Western forms of science and development. As such, they further argue for school science to include TEK and other IK alongside Western science to “better serve the needs of all students, both mainstream and multicultural students, who must solve problems during times of environmental crisis” (Corsiglia & Snively, 2001, p. 85). Their five-step process of science curriculum development includes Western science and indigenous perspectives of a topic “to develop scientific thinking and to enable students to examine their own assumptions by distinguishing between the relative merits of different sciences” which can offer complimentary views of the world not available in the other knowledge system (Corsiglia & Snively, 2001, p. 85). While Snively and Corsiglia’s (2001) and others desire to promote TEK as a way of broadening conceptualisations of science and science education, progress inclusivity, and to work towards ecological sustainability is admirable, not all is as it seems.

This paper is in two main parts. Part 1 describes and analyses Snively and Corsiglia’s (2001) argument for TEK suggesting the picture is far more complex and that we must be vigilant to avoid new forms of imperialism that may flow from how TEK is, at least textually, appropriated and represented. This critique has already begun to be developed elsewhere (see



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Carter, 2006; 2004). Here, the analysis utilises the two constructs of *binaries*, and *translation and appropriation* (after Huggan, 2001), useful in postcolonial theory and discourse analysis to delve into the often unconscious assumptions underpinning theorisations of culture and difference used by multicultural science education scholars like Snively and Corsiglia (2001). Postcolonial theory is a unique discourse or field of inquiry that describes transcultural global processes, systematically reflecting on the dominant and subordinate relations formed by encounters with hegemonic forces, and providing new tools with which to think about the present. While science education to date has been reticent to engage with powerful discourses like postcolonialism (exceptions are McKinley, 2001; Ninnes, 2001), it has the potential to offer science education a different vantage point from which to investigate the questions of cultural diversity including TEK used, but under explored, within the field.

Part 2 of this paper goes on to investigate some of the newer theorisations available within postcolonial scholarship, specifically ideas on borders, border thinking, hybridity, and border epistemologies (for example Beck, Bonass & Lau, 2003; Mignolo, 2007; Shields, 2006; Visvanathan, 2006), to see how they may contribute to the thorny issues of TEK, IK and Western science, particularly in the theoretical shortcomings of multicultural science education. Borders and boundaries already feature prominently in the field, and leading theorist Glen Aikenhead, has developed a number of assumptions about what they are and how they function (see Aikenhead, 1996, 1997, 2001; Aikenhead & Jegede, 1999; Jegede & Aikenhead, 1999). In summary, these assumptions include:

- (1) Western science is a cultural entity itself, one of many subcultures of Euro-American society;
- (2) people live and coexist within many subcultures identified by, for example, language, ethnicity, gender, social class, occupation, religion and geographic location;
- (3) people move from one subculture to another, a process called "*cultural border crossing*;"
- (6) most students experience a change in culture when moving from their life-worlds into the world of school science; therefore,
- (7) learning science is a cross-cultural event for these students;
- (8) students are more successful if they receive help negotiating their *cultural border crossings*; and
- (9) this help can come from a teacher (a culture broker) who identifies the *cultural borders* to be crossed, who guides students *back and forth across those borders*, who gets students to make sense out of cultural conflicts that might arise, (Aikenhead ,2001, p. 340 my italics).

In Aikenhead's terms, borders can be identified and crossed, and guides (usually the teacher) can facilitate the passage and help negotiate any cultural conflicts that might arise; in short, clear borders exist between different subcultures like TEK and Western science. An effective culture-broker would be highly skilled in identifying "the cultures in which students' personal ideas are contextualized" and able to introduce "another cultural point of view, that is, the culture of Western science, in the context of Aboriginal knowledge (TEK)" (Aikenhead, 2001). Unproblematised as they are, these constructs of 'cultural border crossing' and 'cultural border' have become highly influential in the multicultural science education literature including texts like Snively and Corsiglia's (2001) as a type of taken-for-granted commencement point. Clearly, postcolonial thinking can help reconceptualise ideas on borders within the scholarship of those like Snively and Corsiglia (2001) and Aikenhead (2001), and hence, extend multicultural science education in ways that better honour TEK.

Part 1: Analysing Snively and Corsiglia's (2001) discussion of TEK

Binary thinking

The first point on which to review Snively and Corsiglia's (2001) texts is their continual, if unconscious, binary representation of TEK and Western science. Although they acknowledge and discuss the long colonising history of indigenous peoples by the West, their repetitive conceptualisations and interpellation of TEK and Western science suggest a more traditional, bounded and unitary view of culture and knowledge that is inwardly cohesive and outwardly delineated (Welsch, 1999). There is a sense of both systems side by side so that their separation seems natural and preordained rather than the differentiated relations produced and negotiated in complex material and social fields of historical processes (see Fuller, 2000; Huggan, 2001). For example, Snively and Corsiglia (2001) "distinguish between 'Western modern science' which is the most dominant science in the world and 'indigenous science' which interprets how the world works from a particular cultural perspective" (p. 8). Once the boundaries and differences between TEK and Western science have been rhetorically normalised by texts like Snively and Corsiglia's (2001), the need for Aikenhead's (2001) border-crossing strategies becomes apparent.

Binary thinking also emerges in the familiar nature referent Snively and Corsiglia (2001) use to represent TEK. They define TEK in spatial terms that Fuller (2000) regards an extension of a location in nature wholly consistent with restricted colonial representations of Natives. Representing TEK as nature knowledge by repeatedly invoking associations of long-resident ecological understanding, places it on a timeline that precedes Western science, making "the difference between 'us' and 'them' a matter of timing rather than culture" (Fuller, 2000, p. 84). Such descriptions are not only essentialising but form a preconstituted spatialised culture, where the "pregiven other ... are construed as locked into stasis with their environment" (Fuller, 2000, p. 87). Fixed in nature with reference to Western science on the evolutionary timeline where TEK precedes Western science, TEK cannot help but be constructed as Western science's binary other, and consequently, inferior. This is apparent for example, when Snively and Corsiglia (2001) suggest that teachers recognise "indigenous knowledge or worldview in a way that creates a *need to know* Western science" (p. 27, my italics). In other words, TEK is used as the motivational device to interest students in the more 'important' knowledge.

Translation and appropriation

Snively and Corsiglia's (2001) texts can also be reviewed against the postcolonial idea of cultural translation. Huggan (2001) describes cultural translation tethered to notions of representation and difference, as the superimposition of the dominant perspective onto the colonised, so that Otherness, in this instance Snively and Corsiglia's (2001) TEK, is translated in ways that makes it familiar, comprehensible predictable and controllable. It configures the cultural difference as alternative forms of sameness to be appreciated as cultural pluralism by the dominant group in whose cultural forms the difference has been constructed.

The desire to promote environmental sustainability both at the school level and beyond, through the inclusion of TEK within science curricula, requires such a double move from Snively and Corsiglia (2001). They translate the difference between TEK and Western scientific and ecological knowledge at the same time as they attempt to establish and appropriate the scientific and ecological worth of TEK. The difference allows for potential solutions to the West's environmental problems to be found within TEK, echoing Huggan's

(2001) point that the Other's knowledge and cultural traditions always act as reservoirs for Western needs. If TEK "is not timeless, eternal, identified with space rather than time, traditional and untouched by the corruptions of Western culture" (Fuller, 2000, p. 88), then it would not be available as a knowledge store to help recast the West's approach to the environmental sustainability. However, the legitimacy of these solutions can only be accepted if, paradoxically, TEK's ecological and scientific worth in Western terms is established.

Hence, much of the rhetorical energy of Snively and Corsiglia's (2001) texts is taken up with these moves of translation and appropriation. Establishing the ecological worth of TEK is partly achieved Fuller (2000) has observed, by linking it to nature. Snively and Corsiglia (2001) argue that TEK is "closely tied to place" (p. 16) with complex skills and a great deal of "exceptionally detailed knowledge of local plants and animals and their natural history" (p. 16). As such, it is an extension of nature, in harmony with it. Yet, most of the examples Snively and Corsiglia (2001) give have been interpreted, translated and reported via Western researchers (both scientists and anthropologists), so that a "very considerable number of scientists have "decoded", transcribed, and interpreted significant quantities of precise indigenous science knowledge" (p. 23). Huggan's (2001) cultural translation as the superimposition of the dominant way of seeing, speaking and thinking onto the colonised is apparent in their TEK configured by Western researchers. TEK cannot help but then be imbued with Western perspectives, becoming accessible, even predictable, to the dominant group in whose cultural forms the difference is expressed. For Fuller (2000), the "privileging of Native science anchored in the construction of the Native as a natural complement to their environment is thus a compounding of, rather than a resolution of problematic discourse" (p. 89).

TEK's scientific worth must also be established within the text alongside its ecological merit if it is to be taken seriously. The rhetorical strategies Snively and Corsiglia (2001) use to develop TEK's scientific value include citing past contributions to Western science, and its usefulness for developing new knowledge. They make several references to the way TEK has helped "medicine, agriculture, engineering, pharmacology, agronomy, animal husbandry, fish and wildlife management, nautical design" and so on (p. 13), and to its contribution as "highly desired information" (p. 21) readily available that could otherwise "take years for modern researchers to assemble ... using conventional means" (p. 20). They advance TEK's significance in contemporary dietary and medicinal contexts, genetic research and the development of databases for information on biodiversity. And they note the growing 'official' recognition by "working scientists (who) are increasingly acknowledging TEK" (p. 10) "to solve important biological and ecological problems" (p. 8). Moreover, Snively and Corsiglia (2001) go onto claim a type of scientific legitimacy for TEK with its apparent ability to meet some of Western science's own epistemological tests. "Large numbers of indigenous people observe, interpret, and orally report nature exhaustively" (p. 23) and "most proponents of indigenous and multicultural science would agree that objects and events occur in consistent patterns" (p. 22).

But representing and justifying TEK in terms of its Western scientific usefulness is highly problematic in postcolonial terms as it exposes the way TEK has been, and still is, assimilated and appropriated by Western scientific interests. It effectively assigns some universality and generalisability to TEK that take it beyond the very localness Snively and Corsiglia (2001) themselves paradoxically note, is its "particular cultural perspective" (p. 8).

Separating out Western science and TEK

This albeit brief discussion of Snively and Corsiglia's (2001) texts exposes the unconscious assumptions and subtle forms in which colonialism/imperialism can still articulate itself within multicultural science education scholarship, despite explicitly articulated intentions to the contrary. While Snively and Corsiglia's (2001) desire to include TEK within school science curricula not only has the potential to contribute to growing understandings of ecological sustainability at a time of environmental crisis as well as trouble the categories of Western science, care must be taken. Unwittingly, their texts seem to have accomplished Huggan's (2001) dialectical process of familiarisation and estrangement that maintains the boundaries between TEK and Western science, even as they valorise the discourses of TEK. We see here the paradox of exclusion and inclusion at one and the same time, in the need to establish the scientific and ecological worth of TEK just as discursive practices of binary thinking are adopted to keep them separate. These rhetorical devices work as technologies of containment and separation, regulating the borders and boundaries, making power relations invisible and keeping dominant norms in place, thus preserving the integrity and authority of Western science. The Other's ecological knowledge has been effectively translated into familiar cultural forms in ways that construct it as possessing knowable characteristics able to be apprehended, and consequently controlled. For Huggan (2001), this paradox also exemplifies the irreconcilable tension within Western epistemology that sees all difference conceived of as particularist while the particulars of the dominant canon are taken to be universal.

As we have seen, the notion of boundaries and borders of the type espoused by Aikenhead (2001) is apparent within Snively and Corsiglia's (2001) discussion on TEK and Western science. From a postcolonial perspective, borders and boundaries are deeply implicated in Western thinking with the regulation of space by physical boundaries/borders a metonymy for the regulatory practices of Western epistemology itself (Ashcroft, 2001). Once established, *b/orderings* (after Van Houtum, Kramsch & Zierhofer, 2005) of all types work to fix stable systems of guaranteed boundaries that differentiate not only territories but also social spheres, categories like nature and culture, the rational and the irrational, the human and technological, the civilized and uncivilized, and between the scientific and unscientific. Van Houtum et al. (2005) cleverly use the term '*b/orderings*' to encode both the demarcation and delimitation purpose of borders, and their functional role of creating order. As a verb, it also alludes to the continuous processes of boundary construction.

Undoubtedly, there is a need to look again at borders and border thinking used implicitly or explicitly within multicultural science education scholarship, like that of Snively and Corsiglia's (2001) and Aikenhead's (2001). In Part 2 then, I explore postcolonial views on borders and on border epistemologies to see how they may be used to think again about TEK and Western science and extend ideas that have been so influential in science education. Some of this thinking has been explored elsewhere (see Carter, under review) but much remains to be done.

Part 2: Exploring border thinking

Borders, boundaries and their study have always been of interest to social scholars for many decades. Newman (2006) tells us that the discipline of border studies originated with the fields of physical and human geography, and political science, and that border scholars of the first half of the twentieth century saw borders as the physical consequences of political power. They were hence, largely concerned with their description and categorisation for purposes of



security and sovereignty. From the early 1960s, the field began to focus on the functional characteristics of borders and transborder contact. In the 1990s, border studies opened up to interdisciplinary approaches, and became interested in boundary-drawing practices and discourses (Berg & Van Houtum, 2003; Paasi, 2005). The field now lies at the ‘border’ of cultural studies, ethnic studies, multicultural studies, and postmodern anthropology, and in addition to its traditional cartographic preoccupations, it is concerned with the contemporary conceptual questions of disciplinarity, identity, and cultural politics. Indeed, two very recent special editions of prominent cultural studies journals have focussed on borders and border zones. They are the *European Journal of Social Theory* Volume 9 Number 2 from 2006, and the October 2007 edition of *Globalizations*.

For many theorists (see Mignolo, 2007; Santos, 2007; Shields, 2006; Van Houtum et al., 2005), the production of political and epistemological borders was essential to the Occidental colonising project of constructing and signalling the European and separating out the Other. Borders allowed what was inside to become known, understood, ordered, controlled whereas what was constructed as outside, to be left un**ordered**, unknown, threatening, wild or chaotic. Borders also allowed modernity’s subject to subsume and know the b/**ordered** object within the definitional bounds of foundational knowledge. While a belief in their territorial and conceptual binding power for shaping the world remains as the lingering legacy of borders, newer interpretations however, have revealed boundaries/borders, epistemological, ideological, political, physical and even biological, to be profoundly more ambivalent constructs. Boundaries/borders meet at different places, they are momentary locations in transition beyond which one attempts to move, they are in-between sites that are simultaneously complex articulations of binaries, and they are able to disturb conventional thinking in traditional notions in border crossings (Ashcroft, 2001; Mignolo, 2007). Boundaries/borders are messy and multifaceted notions consisting of, and slipping between, physical infrastructures, institutional practices and socially constructed meanings that Soja (2005) suggests, are life’s spatial regulators. Indeed, two themes seem to emerge out of the current scholarship on borders that are worth considering here.

Firstly, Bauman (2001) and Beck, Bonass & Lau (2003) are among those who point to the pluralisation and mobility of borders, and the attempts to draw them, as key characteristics of contemporaneity. While describing the attributes of reflexive modernity, Beck et al. (2003 p. 19) argue that:

1. Boundaries cease to be given and instead become choices. Drawing boundaries becomes optional;
2. Simultaneous with that, there is a multiplication of the plausible ways in which boundaries can be drawn, as well as the ways in which they can be brought into doubt;
3. The existence of multiple boundaries changes ... the nature of boundaries themselves. They become not boundaries so much as a variety of attempts to draw boundaries.

Beck et al. (2003) apply this thesis specifically to the boundaries of the sciences, and argue that as a consequence of the critiques of science studies and the inclusion of previously excluded knowledges, the authority for scientific boundary drawing has moved beyond the scientific academy itself (also Gieryn, 1999). “The boundaries of knowledge – that is, the boundaries between scientific and unscientific, between science and politics, and between experts and layman – have now been drawn in several places at the same time” (p.20) ... making it “abundantly clear that every given is in fact a choice, and that at the level of fundamental propositions, such ultimate starting points can only be normatively grounded, or

defended as useful a priori constructs” (p.16). “The foremost public task of science is no longer to silence controversies, but rather to enable them, that is, to enable different public voices to be heard and to make themselves count” (p. 21). Hence, for Beck et al. (2003), the legitimising of all knowledge, particularly science, under the messy complexities of contemporaneity only occurs when communally agreed procedures and criteria produce constantly revisable, reflexive and practical knowledge that distinguishes better solutions from worse. This means that Beck et al. (2003), and Bauman (2001) view contemporary “boundaries ... as fluid as the power balances whose projections they are” (p. 141), while Shields (2006) notes that as boundary-drawing is less taken for granted, we must be prepared to accommodate the consequent increased contestation.

Secondly, newer types of border studies research reconceptualises the spatiality of borders and boundaries. In this view, borders become zones or interfaces (also called hybrid, liminal and interstitial spaces) where potentially contradictory discourses overlap and discrepant kinds of meaning-making converge, encoding unpredictability at the edges of stability. The border “reveals that it is a sort of virtual and semiotic force field which translates, connecting and disconnecting the codes of adjacent systems and forms willy-nilly” (Shields, 2006, p. 229). Shields (2006) discusses the internal dynamism and flux with border spaces both material and abstract, concluding that it is the productive performance within the space that is generative of many possibilities. Hence, borders he argues, are active translation technologies which mediate between the adjacent fields. “In other words, interfacial boundaries have their own specific rules and semiotic orders, distinct from the fields or systems which they lie between (p. 230)”. This idea of a dynamic border zone has been postulated by others, most notably by postcolonial scholar Homi Bhabha with his idea of hybridity and hybrid spaces (see Bhabha. 1994). Like Shields (2006), Bhabha (1994, p. 7) views border situations as “not part of the continuum of past and present,” but where identities are performed and “create a sense of the new as an insurgent act of cultural translation”. Those who live border lives are empowered argues Bhabha (1994), to actively intervene and transform their knowledges and practices into new and unexpected hybrids that are never total and complete, and always in the act of becoming, open to change, and desirous of pursuing errant and unpredictable paths.

The recognition of the historical and social contingency of borders and boundaries, and of the limits imposed by current epistemic orders has been, argues Nederveen Pieterse (2000), a profound moment of postmodern reflexivity. This makes boundaries of knowledge critical, as the capacity to renegotiate and replace boundaries as epistemological limits is deeply implicated in transformative global processes now operating in a wide variety of circumstances (Ashcroft, 2001) including that of Snively and Corsiglia’s (2001) TEK and Western science.

Summary

My main purpose here has been to draw attention to the need for a more complicated view of borders, border zones and border thinking in multicultural science education discourses that wish to utilise TEK to extend approaches to ecological sustainability amongst other purposes. I want to trouble the taken-for-granted construct of ‘border-crossing’ that abounds within the multicultural science education, and unintentionally keeps the dominant position of Western science intact while it seems to be valorising TEK. And I want to caution about the very use of TEK in a simplistic manner, appealing though it may be. Offering a more problematic and complicated of view of borders and TEK helps us to be vigilant to the possibilities of ongoing modernity/coloniality agendas within our own scholarship as we approach complex and contentious issues of the global world.



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