Education for Sustainable Development at the problem-posing nexus of re-appropriated heritage practices and the science curriculum

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Abstract

Indigenous knowledge is approached as an adaptive and responsive sphere of Mother Tongue meaning-making and innovation, an indigenous epistemic capital that has been marginalised by continuing colonial modernity and an associated urbanisation in Africa. The exclusionary and epistemicidal impacts of colonialisation and the hegemony of meanings imposed in a westernised curriculum have played out as a double blow impeding many learners from relating knowledge to the world they live in and achieving their potential in the sciences. Research on indigenous knowledge and schooling is reviewed to critically explore this premise. A dissonance between prevailing theory, changing socio-cultural realities and diversity in urban classroom contexts is also probed. This enabled us to contemplate a Mother Tongue re-appropriation of heritage practices amongst teachers, their learners and parents as urban custodians of indigenous knowledge and to work with this as situated heritage practices for working with the modern scientific knowledge in the school curriculum to contemplate future sustainability. Mother Tongue re-appropriation is thus proposed as a starting point for a research collaboration to enhance epistemological access to decontextualised scientific knowledge in the curriculum and for exploring how this might be achieved in ways that open up a 'third space' of empowering socio-cultural innovation through Education for Sustainable Development (ESD).

Orientating background

Indigenous knowledge systems (IKS) are seldom reflected as a dynamic outcome of situated processes of continuing knowledge generation and innovation in response to changing socio-cultural and ecological conditions (Mavuru & Ramnarain, 2017). According to Mavuru and Ramnarain (2017), incorporation of learners' socio-cultural background creates authentic learning opportunities. It is recognised, however, that many intellectual discourses tend to represent IKS as situated systems that stand opposed to the ongoing hegemony of westernised science. The dialectical relationship here is commonly informed by the dialectic of critical theory and reflects a history of colonial conflict where westernised science appropriated indigenous knowledge, giving rise to global epistemicide (Barreto, 2014; Fataar, 2018). Critical realism, as a recent expansion of the 20th century critical project (Lotz-Sisitka, 2015) notes how different cultures can operate in the same space within a plural knowledge environment. We believe that the plurality of knowledges allows continuing critical projects to represent subjugated knowledges, reflect on epistemicide and contemplate learning across plural epistemic dispositions in a changing world. Plurality also promotes inter-epistemological dialogue, thereby creating epistemological access for indigenous learners and enabling reciprocal valorisation among the different epistemes in areas of resonance (Shava, 2016).

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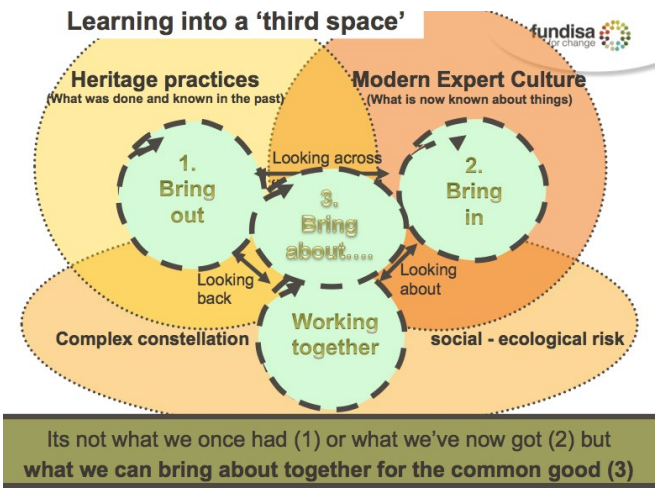
Contemplating a third space

In exploring these insights, we have drawn on Homi Bhabha (1994), who notes that subjugated knowledges can engage western cultural domination in post-modernity in a 'third space'. Following an extensive review of indigenous knowledge practices and social innovations, an open-ended 'third space' became apparent within dialectical processes of social innovation across indigenous knowledge practices and scientific knowledge in complex constellations of risk (O'Donoghue, Shava & Zazu, 2013). Figure 1 below reflects this as an open-ended dialogical process where Mother Tongue participants work together to 'bring out' and explore situated heritage practices. Working with these, they can also 'bring-in' modern institutional knowledge in a bridging process to open up a 'third space' within which to 'bring about' change for the common good (Lotz-Sisitka, 2017).

Figure 1. Adaptive transformation in indigenous knowledge practices



Source: Adapted from O'Donoghue (2015)

Social innovation work in a collaborative sustainability commons project provided insight into the adaptive knowledge systems of indigenous peoples in the Eastern Cape, South Africa. Here it was observed that, within modernist change and despite processes of appropriating marginalisation, many indigenous knowledge practices continue to be dynamic and responsive in changing times. Shava (2000) and Asafo-Adjei (2004) have noted how *imifino* (traditional leafy vegetables) have come to include numerous globally distributed naturalised plant migrants but with an unfortunate reduction in the use of indigenous species (Mtshali, 1994). The same innovative cultural processes are true of most indigenous knowledge practices related to fermentation (Hanisi, 2006; Kota, 2006; Mutanho, 2016), along with traditional composting (*Izala* – Zulu; *Ethuthwini* – Xhosa), as well as similar ways adaptations to climate variability (as in the Xhosa cultivation practice of *gelesha)* (O'Donoghue, Shava & Zazu, 2013).

Epistemicide and lack of epistemological and ontological access as barriers to learning

Alongside this evidence of adaptive knowledge transformation, most indigenous knowledge practices have receded in rural areas and have in many cases been lost to urban indigenous populations due to exposure to western livelihood systems and practices. In this way, current urban indigenous generations have suffered a double blow as a result of the lack of exposure to their knowledge heritage along with the experiential cultural capital to be able to successfully access the abstractions of modern scientific curriculum knowledge. Odora-Hoppers pointed to these intertwined processes of exclusion flowing from colonialism, when she noted to us[1] that one of the major barriers to indigenous students' success in science is their inability to recognise the knowledge as belonging to their socio-cultural and contextual heritage (Mavuru & Ramanarain, 2017; Odora-Hoppers, 2002; Webb, 2013). This invariably points to indigenous students' lack of epistemological access to westernised and decontextualised scientific concepts in formal education processes. Breidlid (2012:7) expands the scope of the problem with reference to the Xhosa by noting that:

> Since Xhosa pupils originate in an environment where knowledge is linked to spirituality, the encounter with modern schooling and the rationality of western epistemic hegemony[2] is often problematic. The potential lack of recognition of their own epistemological and spiritual background impedes the development of the pupils' full potential.

In support of these assertions, it is evident that much of the current ecological and botanical knowledge in the sciences was appropriated by early scientists within early western hegemonic trajectories of knowledge generation in interactions with indigenous peoples' knowledge and practices (Shava, 2008). Most of this epistemicidal appropriation developed with little (if any) acknowledgement and much without a full grasp of important contextual detail (Fataar, 2018). In this way, the full value of indigenous knowledges has been lost to indigenous peoples and the modern sciences, sometimes with an attendant lack of insight that results in a poor grasp of factors that are contributing to some of the current environmental problems that we face in a modern world. For example, *gelesha* (the practice of winter ploughing) was overlooked and reflected as a mystical practice associated with the rise of the Orion Belt rather than being exemplified as a water conservation practice to buffer the late onset of the summer rains.

Emerging dissonance between theory and the modern classroom context

In his study of the Xhosa in the context of the South African curriculum, Breidlid (2012:4) cautious against essentialism and in summary he notes that

> there are certain basic features of Xhosa cultural values, indigenous knowledges and identity construction which reoccur and which seem to cut across location, age group and gender.

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He also states that the findings of his study 'fit well with the literature in the field' (2012:4), so it was notable that his analytical inscriptions did not resonate with being Xhosa for student teachers reading his dialectical analysis of the South African curriculum context since 1994. The dissonance in the student responses surfaced contradictions and tensions across the academic theory and the life and work experiences of young Xhosa students in a changing world. A key point to emerge was that the Xhosa are diverse, that there are notable differences between rural and urban areas, with the latter being most diverse and reflecting change with young people aspiring to be modern and not seeing this in conflict with being Xhosa (Webb, 2013).

The Breidlid discourse was useful for provoking deliberation on a wide number of curriculum and cultural propositions. Here the theory did not fit with the student teacher experiences of schooling or with the challenges of accommodating cultural diversity within complex and changing socio-cultural contexts of their classrooms (Cocks, Alexander & Dold, 2012; Mavuru & Ramnarain, 2017; O'Donoghue, Lotz-Sisitka, Asofo-Adjei, Kota & Hanisi, 2007). To this end, Cocks et al. (2012) propose that there is a need for cultural revitalisation. Masuku van Damme and Neluvhalani (2004) point to the westernised education system creating schizophrenic citizens due to its separation of indigenous learners' lived world and the decontextualised formal learning world processes. This is also alluded to by Lizop (in Ki-Zerbo, Kane, Archibald, Lizop & Rahnema, 1997) and Odora-Hoppers (2001) who describe how the western education system alienates learners from their lived contexts and how westernised schools were western islands within the community trying to erase and denigrate all indigenous knowledges from the minds of autochthonous learners.

Exploratory work on indigenous knowledge in classroom practice

In response to these complex problems of indigenous knowledge epistemicide (loss, exclusion) and educational failure, Maqwelane (2011) conducted an exploratory study on the inclusion of indigenous knowledge for enhancing literacy and learning across school, home and community. This preliminary work was taken into consideration continuing informal research using dialectical critical realism theory in teacher education between 2012 and 2014 (O'Donoghue, 2015). The continuing exploratory work allowed us to open up dialectical epistemic spaces of multi-literacy learning and social innovation around an educational engagement *in* and *with* situated heritage practices (O'Donoghue, Shava & Zazu, 2013). This work has allowed the framing of an urban knowledge re-appropriation partnership that explores indigenous knowledge in relation to the current science curriculum, thereby enabling epistemological access to scientific concepts for indigenous learners and reciprocal valorisation of knowledges in a learning context of plural knowledge representation.

Contemplating a bridging integration into a third space

The emerging epistemological challenge in education is the re-appropriation or representation of IKS in ways that allow scholars to bridge the divide between recovered cultural heritage and knowledge practices and modern scientific knowledge, whilst reviving work with indigenous epistemologies in the academy. An emerging research project will explore these dialectical

processes to enable participants to continue the novel and creative thinking that is evident among indigenous peoples as they shift some of the boundaries of our current knowledge generation processes into a 'third space' to enable the equitable representation and reciprocal valorisation of plural epistemologies in the academy. Open-ended inter-epistemological dialogical processes such as this might enable indigenous learners (researchers, teachers, learners and parents) to uncover/recover indigenous knowledges and engage the modern sciences as indigenous scholars innovating at the nexus of some of the national environmental priorities of biodiversity loss and climate change. For example, the root-wrapping use of *micorrhyza* by the AmaMpondo (Xhosa) on uprooted indigenous plants to be transplanted at new sites can significantly die off due to change in soil environment for replanted indigenous species to restore biodiversity in a region of high rainfall variability. Pre-colonial climate migration and drought mitigation practices might also inform the current need for water conservation farming in a water-scarce region of high seasonal variability entering an uncertain period of climate change.

The exploratory work is engaging urban teachers, learners and parents as co-investigators and custodians of re-appropriated (re-searched) Nguni (Ndebele, Swati, Xhosa and Zulu), Sepedi-Sotho-Tswana, Venda and Tsonga indigenous knowledge practices. The critical pedagogy has participants relating their Mother Tongue knowledge-experience with curriculum science as evident in Ramasike and Ngcoza's (2017) study. Open-ended dialogical processes often open into a 'third space' of innovative knowledge co-generation consistent with the socio-cultural innovation of earlier socio-ecological adaptation amongst indigenous peoples in the Eastern Cape. For example, the expansion of traditional fermentation practices (as used in the making of *amarewu* and *umqombothi*) into the making of sourdough bread (*Isonka*) amongst rural women as part of their struggle against the marginalising intrusion of the apartheid state in the 1970s and 80s.

A process theory of learning for an integrating pedagogy

The proposed integrating dialectical pedagogy is being undertaken in Mother Tongue by learners through engagement with parents and community elders as custodians of indigenous knowledge, to generate data on indigenous knowledge practices that relate to contemporary environmental issues. These are being taken into a deliberative engagement with the science curriculum that enables contextualised epistemological access for indigenous learners and reciprocal valorisation of knowledges in formal education processes. The plural knowledge generated is being dialectically modelled to inform lesson study interventions for assessment of the extent to which participants are successfully learning science and using what they have learned in 'third space' social innovation in relation to pressing environment and sustainability concerns. For example, using *izala* (the Zulu traditional composting practice) or *ithuthu* (Xhosa composting practice) to reduce the solid waste stream through composting of local organic waste to enhance local food production or exploring insulation cooking to save electricity and money.

The critical processes of dialogical meaning-making and expansive learning are reflected in Figure 2 as an open-ended image of learning in the reflexive company of others.

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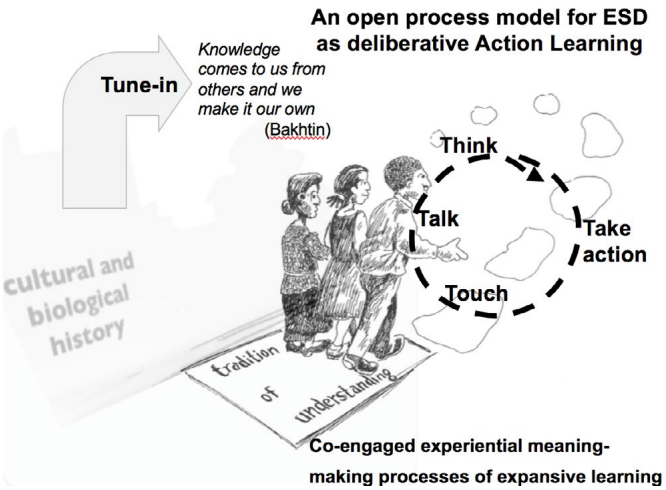
Figure 2. An open process model for ESD as deliberative Action Learning



Source: Adapted from O'Donoghue (2015)

Here most knowledge comes to us from others out of cultural and biological history as we work in contexts of co-engaged meaning-making within open processes of dialogue (Talk), experiential encounters (Touch) and praxiological reflection (Think/Do). New knowledge and innovations are also generated in co-engaged learning interactions in response to emerging changes in the lived environment. In these ways, we have experiences and make meaning in continuing dialogue within open-ended processes of experiential re-semiotisation and expansive learning.

Reflecting on situated, reflexive learning processes in this open-ended way, it is possible to reframe curriculum encounters with science so that learners might pose problems and engage with the scientific knowledge from within expansive cultural practices and propositions for engaged meaning-making (re-semiotisation) with the common good in mind (Lotz-Sisitka, 2017). This curriculum process raises contradictions that might provoke learning towards explanatory insights that resonate with the social realities of the modern world and emerging risk. Here the self-activity and 'critical consciousness' perspective of Paulo Freire (1972:70–71) points to how in a problem-posing and dialogical approach to education, meaning making develops with '[p]ower to perceive critically the way they exist in the world with which and in which they find themselves'.

An open-ended conclusion towards continuing exploratory research

Through this positioning analysis, the research challenge became 'How will we approach exploratory work with indigenous partners with a re-appropriation of indigenous knowledge practices and how might this contribute to learning science with expressions of cultural agency towards a reduction of social-ecological risk and exclusion?' The assumption here is that the succession of curriculum change has not managed to resolve the problem of exclusion

of indigenous knowledges and a lack of epistemological access and relevance, so continuing curriculum change is unlikely to meet the ideal of socio-cultural inclusion. The proposed research trajectory is intended to look into processes of inclusive engagement of plural epistemologies towards enabling epistemological access for indigenous learners by exploring Mother Tongue re-appropriation of situated heritage practices that are foundational for, and that resonate with, the modern sciences in ways that invoke reciprocal knowledge valorisation and that might inform social innovation towards a sustainable future.

Endnotes

1. Pers. Com. UNISA, November 2014.
2. If one overlooks an essentialist bracketing of Xhosa within a fundamental reading that culturally inscribes them outside being modern (a common problem in modern intellectual thought), there is a useful point being made here in relation to a tension between life experience being brought to school and seen in relation to an abstracting reification of scientific ideas that confront learners in the science curriculum.

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