Dialogue between epistemologies as quality education. Integrating knowledges in Sub-Saharan African classrooms to foster sustainability learning and contextually relevant education

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A B S T R A C T

The article aims to contribute to the ongoing debate on quality education with regard to *Sustainable Development Goal (SDG) 4*. The authors suggest that heterogeneity and plurality of epistemologies in Sub-Saharan African classrooms are not drawbacks, but important resources with regard to both student learning and sustainable development. The majority of Sub-Saharan African children grow up navigating between indigenous and so-called Western knowledge systems, which may be one reason for their low performances in Westernised education systems. Arguing that quality education needs to be responsive to students' epistemically diverse life realities, the authors introduce *dialogue between epistemologies* as an approach to integrating indigenous knowledge systems (IKS) with Western knowledge in education. This approach allows for critical and constructive engagement of knowledges. The article's theoretical proposals are discussed by means of a case using qualitative data from a participatory action research (PAR) study that explored the integration of IKS in science education in Makhanda, South Africa. Learning to employ, and combine, knowledges is proposed as an essential aspect of quality and sustainable education in the 21st century.

There is a need here for communication between the various knowledge systems, not by opposing everything Western knowledge systems and education represent, but by creating dialogue between different concepts and practices of knowledges. (Breidlid, 2013, p. 35)

1. Introduction: sparking functional literacy and sustainability learning though indigenous knowledge integration

With this article, the authors aim to contribute to the ongoing debate on quality education in relation to Sustainable Development Goal (SDG) 4.[1] We do so by connecting the quality debate to the issue of epistemic diversity in education and the overarching goal of sustainable development that is central to all SDGs.

The Millennium Development Goal (MDG) era starting in 2001 focused on *achieving universal primary education*. While considerable progress was made in terms of access, the learning of both basic and functional literacy skills in sub-Saharan Africa has not made substantial progress after the introduction of the MDGs. More than half of the children and adolescents worldwide do not meet the minimum proficiency standards in reading and mathematics and the situation is even worse in Sub-Saharan Africa (UN Statistics Division, 2019). As a response to the postulated global "learning crisis" (UNESCO, 2013/14; World Bank, 2018), the matter of educational quality returned to the forefront of international development discourses. Within the 2030 *Agenda for Sustainable Development*, SDG 4 pursues the ambitious goal to *ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.* Whereas there is unanimous agreement on the importance of educational quality, it has been debated what *quality* actually means and how it should be operationalised within the universal sustainable education goals. There is, for example, scholarly concern about the international focus on benchmarking and

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standardised testing and a narrow input-output understanding of education quality as well as about the UN agencies' lacking engagement with pedagogy as a central aspect of education quality (Alexander, 2015; Bartlett, Dowd, & Jonason, 2015; Buckler, 2015; Schweisfurth, 2015; Shiza, 2010). Within the debate on quality education, the issue of epistemic diversity in the classroom has been strikingly absent but should be moved to the centre stage in the light of the prevailing learning and ecological crises as well as the recent global Covid 19 pandemic. Soudien (2011) criticises that "the standard reading and writing regiments in the schools of the world … are based on unproblematised idealisations of what constitutes 'good education'" (p. 137). These standards, he argues, are not truly universal, as they "have served to marginalize the knowledge systems of large swathes of the globe" (p. 137). Sayed and Ahmed (2015) draw attention to the question of who sets the global agenda in international education discourses. Referring to King and Palmer (2013), they point out that the consultation processes leading up to the SDGs were mostly driven by powerful stakeholders from the Global North, whereas there was limited interest from many countries in the South. Sayed and Ahmed ask *which* of the Southern voices were actually heard and if the global agenda is not rather set *for* than *with* marginalised peoples. They conclude that when the consultation processes with the Global South involved only a privileged group that is already connected to the global policy community, the universal "education agenda may not accurately reflect the concerns of the most marginalised" (Sayed & Ahmed, 2015, p. 333). The fact that indigenous knowledges are neither mentioned in the SDG education chapter nor in the overall SDG document indicates clearly that epistemic issues are not on the SDG's agenda (Breidlid, 2020).

In this article, we argue that epistemic heterogeneity and plurality in Sub-Saharan African classrooms are indeed central for 21st century quality education. We call for the integration of indigenous and Western knowledges in education both to adapt the curriculum to students' lived realities and to enable sustainable development. We suggest *dialogue between epistemologies* as an approach to knowledge integration that allows critical and constructive engagement with knowledge systems in the classroom. The scholarly calls for the integration of knowledge systems in education are far from new, but have been voiced for over three decades (Abdi, 2006; Breidlid, 2013; Odora Hoppers, 2002; Ogunniyi, 1988). The problem is, as we have noted with the SDGs, that these calls have until very recently been ignored by the international mainstream education discourses. This has changed in the most recent Human Development Report (HDR) (UNDP, 2020). Written under the impact of the ongoing global Covid 19 pandemic, the report adopts a humble tone, recognising the pandemic as a result of "the pressures people put on planet Earth" (UNDP p. iii) in the era of the Anthropocene. For the first time, the most central mainstream development report acknowledges

> that indigenous peoples' knowledge systems reflect sophisticated governance practices that advance human wellbeing while maintaining biocultural diversity. They open our eyes to the risks of reproducing the same socially, politically, culturally and economically engrained ways that have put pressures on the biosphere. They give us an opportunity to better weave knowledge systems together (UNDP, 2020, p. 34).

This is a remarkable shift in rhetoric. Yet, both the HDR and the latest Education for All Global Monitoring report (GMR) (UNESCO, 2020) fail to relate the envisioned interweaving of knowledge systems to education as a central arena for such epistemic interaction. The HDR problematises the reproduction of practices that put pressure on the biosphere, but does not recognise education as a core space for both being socialised into, and disrupting, such reproduction. The 2020 GMR, in turn, is devoted to the issue of diversity, but – as all previous GMRs – overlooks the issue of epistemic diversity. Instead, both reports continue to frame education as a universal concept that indicates "more of the same

medicine, i.e. the promotion of a Western educational discourse" (Breidlid, 2020, p. 24), which contradicts the above evoked epistemic togetherness in the name of human wellbeing and biocultural diversity.

2. Indigenous knowledge systems, epistemic relevance and sustainable development

IKS are in this article understood as systems of knowledges "developed by local/indigenous peoples over generations as a result of sustained occupation of or attachment to a place", which leads to these peoples' "understanding of the relationship of their communities to their surrounding natural and social environments." (Dei & Asgharzadeh, 2006, p. 54) Thereby, IKS are neither static nor free from external influences, but "fluid and constantly changing, being subject to ongoing negotiation between people and their environments" (Sillitoe, 2000, p. 247). Indigenous knowledges are often practical in nature, both affirming cultural heritage and ensuring peoples' flourishing and survival (Seehawer, 2018a; Vargas, 2000). There are both commonalities and contradictions between IKS and so-called Western scientific knowledge, but one basic difference is the underlying epistemological assumptions about what valid knowledges are and how valid knowledges are generated.[2] IKS are holistic in that they recognise the interconnectedness of the spiritual and the secular spheres (Goduka, 2000). In the Western world, the Cartesian divide undermined this holism in the advent of modernity and the rise of modern science (Breidlid, 2013).

It has been noted that the low performance in science and mathematics education is especially high among indigenous or so-called non-Western students – thus, among a group that constitutes the majority of students worldwide (see Brayboy & Castagno, 2008; Kim, 2017; Meaney & Evans, 2013). Undoubtedly, the proclaimed learning crisis and the low performance of non-Western students are due to multiple factors. Some of these factors are acknowledged in the SDGs that explain the "lack of quality education" with a "lack of adequately trained teachers, poor conditions of schools and equity issues related to opportunities provided to rural children" (SDG 4, 2015). While these aspects are important and repeated *ad infinitum*, we claim that an additional central reason for the low performance among students in Sub-Saharan Africa is the gap between what is taught in school and the students' cultures, epistemologies and life realities (Breidlid, 2013; Gwekwerere, 2016; Hewson, 2012). Thereby, the problem is not the plurality of knowledges that students bring to class, but that these knowledges and underlying epistemologies are not recognised, appreciated or utilised in the classrooms. Despite the existence of "multiple worldviews, cultures, and sciences", with which students enter school, curricula worldwide have "become standardised with western science worldview" (Kim, 2017, p. 606). This leads to students' "educational disengagement" (Fataar, 2012, p. 55) and alienation, as well as to a perception that school education is irrelevant, sustaining the internalised colonial inferiority complex that regards everything non-Western as worthless. It is this complex "epistemological shock" (Breidlid, 2013, p. 55) in the classroom, that creates learning problems. Integrating students' own indigenous knowledges into education has been suggested both as a means to ease students' learning difficulties by building a bridge to access Western classroom knowledge and as an end in itself, contributing to a contextualised, culturally responsive education that is relevant for the students' daily realities (Fataar, 2012; Mawere, 2015; Seehawer, 2018a).

The potential of indigenous knowledges systems for sustainable development (see also Battiste, 2008; Breidlid, 2009, 2013; Glasson, Mhango, Phiri, & Lanier, 2010) is materialised in the abovementioned holistic nature and interconnectedness of IKS that cater for the sustainability of many indigenous practices. In Southern Africa, the ethics

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[2] See Seehawer (2018b) for a discussion of similarities and differences in indigenous and Western knowledge generation.

of *Ubuntu* implies living in harmony both with fellow humans and with the surrounding environment and the universe. Ubuntu's interconnectedness comprises "ecological togetherness" (Murove, 2009, p. 317), whereby human beings are not separate from nature, but an integral part of it (Goduka, 2000; LenkaBula, 2008). The implications of IKS are thus an epistemological response to the "rapid depletion of the earth's natural resources" (Odora Hoppers 2002, p. 8) and to global warming. Admittedly, this does not mean that all indigenous practices are sustainable and there is therefore a need to caution against overenthusiasm or regarding IKS a magic bullet to development (Briggs & Sharp, 2004; Klein, 2011). What we call for in this article, is a critical and constructive engagement of different knowledges in education, in short, a *dialogue between epistemologies*.

3. Dialogue between epistemologies

3.1. A 'both/and approach'[3]

Northern American Onondaga scholar David Newhouse (2008), who writes about the desire of modern indigenous societies to use IKS "as a key-informing basis of contemporary life", emphasises that ignoring other knowledges would, in fact, "be inconsistent with traditional teachings about what it means to be an educated person" (p. 188). On the contrary, "many Indigenous Elders insist that we learn and engage with the knowledge of others" (p. 188). Elders in the northern American Mi'kmaw Nation speak about *Two-Eyed Seeing*, which "refers to learning to see from one eye with the strengths of Indigenous ways of knowing and from the other eye with the strengths of Western ways of knowing and to using both of these eyes together." (Hatcher, Bartler, Marshall, & Marshall, 2009, p. 146). The principle of *Two-Eyed Seeing* is useful in the African educational context as well. African scholars note that reclaiming IKS should not be misinterpreted as the wish to "a return to a mystic past or the adoption of new imperialist knowledge" (Matemba & Lilemba, 2015, p. 171), but as renegotiating knowledges and developing multiple ways of knowing to make sense of today's world. Within education, indigenizing the curriculum is an act of epistemic decolonization and resistance "against the dominance of Western ideological power that is still prevalent in postcolonial education" and that "has failed to address the specific needs of the African masses" (Matemba & Lilemba, 2015, p. 171, referring to Dei, 2011). Brayboy and Castagno (2008) emphasize that none

> … of the scholarship on culturally responsive schooling indicates that Indigenous youth should learn tribal cultures and languages at the expense of learning mainstream culture and the typical 'academic' subjects generally taught in schools. This is an important point because the shared assumption by most scholars, parents, and educational leaders is that schools should facilitate the acquisition of all of these knowledges and skills—what we might call **a both/and approach rather than an either/or approach** (our emphasis). What this amounts to is the need and desire for Indigenous youth to become fluent in multiple ways of knowing and being and the important role of the school in facilitating that process (p. 734).

While the article focuses on Sub-Saharan Africa, the integration of indigenous knowledges and *Two-Eyed seeing* might be beneficial not just for non-Western, but for all students, and particularly so in relation to the SDGs. Sustainable development requires different types of knowledges, Western and indigenous, in order to complement each other (Aikenhead & Elliott, 2010; Odora Hoppers, 2002; Rist & Dahdouch-Guebas, 2006). Our claim is in line with Vargas (2000):

> Sustainability dictates utilization of various types of resources and knowledge; indigenous or traditional knowledge as well as modern

knowledge. … the policy and scientific literature on sustainable development transcends the dichotomy. Instead of such a polarization, it supports the integration of both forms of knowledge as necessary to attain a sustainable future (pp. 378–379).

3.2. Dialogue between epistemologies in education

Navigating between different knowledge systems is a daily reality for many children in Sub-Saharan Africa. Jegede and Aikenhead (1999, referring to Giroux, 1992) have coined the term *cultural border crossing* to describe students' efforts to bridge the abovementioned gap between their home cultures and what is taught in school. For some students, the epistemological and ontological threshold might indeed run between home and school, as envisaged in an earlier version of the South African science curriculum that assumes "that learners … think in terms of more than one world-view. Several times a week they cross from the culture of home, over the border into the culture of science, and then back again." (DBE, 2002, p. 12). For others, such as the grade 6 students in the below discussed case, the borders are not as clear-cut, but they grow up with both indigenous as well as so-called Western influences present in their homes. Acknowledging only one of these knowledge systems as currently done, is both an educational shortcoming and environmentally short-sighted. Instead of practicing *one-eyed seeing* that delimits students' choices and possibilities, we understand quality education as being responsive to, and taking advantage of, the plurality of epistemological and ontological realities that inform students' daily lives. As Mawere (2015) points out, integrating IKS with Western knowledges will present students with an "opportunity to compare and contrast different forms of knowledges for their own good and that of the society of which they are part" (p. 62). *Dialogue between epistemologies* is more than a transition from one knowledge system into the other as conceptualised in the above quoted South African curriculum. Moreover, it goes beyond co-existence of knowledges in the same educational space, but aims at knowledge systems complementing, challenging and enriching one another. Being able to make sense of, and apply, knowledge systems according to what fits best in the given context, provides students as (future) world citizens with a larger repository of strategies for sustainable livelihoods than drawing on so-called Western knowledge only.

Francina Schabort's (2011) study from North-West province, South Africa, is a case in point. In collaboration with a rural school's science teacher, Schabort operationalised the integration of IKS into a grade 7 curriculum unit on HIV/AIDS – a central issue for the students, many of whom were orphaned through the disease. Besides the science teacher, also traditional healers, community members and a medical nurse provided input to the lessons, which alternated between indigenous and Western content, allowing the different knowledges and worldviews both to inform and complement as well as to contradict each other. For example, the class consulted both traditional healers and a nurse about HIV treatment measures and compared the respective treatments. When students suggested witchcraft as cause for the illness, the teacher contrasted this view with the scientific explanation, exposing the students "to an alternative perspective to understand and make sense of the disease" (Schabort, 2011, p. 140). Concerning the nutritious needs for HIV patients, the students felt frustrated and disadvantaged due to their impoverished, rural livelihoods. They were surprised to learn that their community's IKS, which they know "from birth" (p. 142) was relevant, as local plants and animals such as the protein rich Mopane worm would provide for a healthy diet.

Initiating dialogues between epistemologies in education is complex and carries with it a number of concerns, such as the danger of tokenistic, instrumentalised or simplified integration of IKS (Ahenakew, 2017). The integration of knowledges necessitates inquiries into appropriate teaching and assessment methods and aligning the holistic nature of IKS with the compartmentalised nature of Western school

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[3] Term borrowed from Braybory and Castagno (2008, p. 734).

subjects (Seehawer, 2018a). Taken seriously, integrating knowledges entails engaging with questions about the nature and purposes of education as such. Most importantly, the skewed power relation between the knowledges involved needs to be addressed where IKS have been and are marginalised and subjugated. Dialogue between epistemologies is not the search for a common ground as the basis for an ahistorical exchange (Odora Hoppers, 2002), but meets the need for an educational space in which no knowledges are valued over the other, but in which it is carefully examined what both knowledge systems can offer and what they may learn from one another. As Schabort's (2011) above presented study, our case below discusses a lesson of knowledge integration in a science class.

4. Integrating knowledges in a grade 6 science lesson in Makhanda. A case study

The case is singled out from a qualitative and participatory action research (PAR) study on the *integration of indigenous and Western knowledges in South African science education*. The study was initiated and facilitated by the first author and conducted together with a research team of five science teachers in Makhanda, Eastern Cape province, South Africa, between July and November 2015 and in February/March 2017. Here, we focus on science teacher Sipho Nuntsu[4] and his experience of integrating IKS into a grade 6 science lesson. We supplement with the other teachers' experiences where applicable.

4.1. Data collection methods

This section accounts for the sources of data used in this article. Details about sampling of the research team, data analysis and validity in this study as well as critical reflection on methodology, participation and positionality are provided elsewhere (Seehawer, 2018a, 2018b).

Participatory Action Research. The research team consisted of the first author, three primary and two secondary school science teachers from four public and one Christian school in Makhanda. Between July and November 2015, the team met on a weekly basis for a total of 15 60–90 min workshops that followed an action research cycle in which the teachers planned, taught, and evaluated lessons that integrated indigenous knowledges with regular curriculum content. All workshops were audio recorded and transcribed. In this article, we use data from the latter two phases of the research cycle, *action* (i.e., the teaching of lessons that integrated IKS with the curriculum) and *evaluation* of these lessons.

Classroom observation: Between August and November 2015, the first author observed eight grade six science lessons taught by research team member Sipho Nuntsu. In the classroom, she adopted a moderately participant role in that she interacted with the class upon Mr. Nuntsu's invitation (e.g. answering students' questions about her home country or staying with the students when the teacher was called into a meeting), but otherwise remained an observer. Additionally, she spent time in the school during breaks and participated in the school's celebration of a public holiday, so that both teachers and students became used to her presence. During all observed lessons, notes were taken and all lessons were audio recorded; the lesson presented below was transcribed.

Interview and focus groups. A one hour semi-structured interview with Sipho Nuntsu was conducted in October 2015, to learn about his professional background, his understanding of the role of the teacher and his stance on indigenous knowledges. Three approximately half-hour unstructured focus groups with two to seven grade six students from Mr. Nuntsu's school were conducted with the aim to learn about the role that indigenous and Western knowledges played in students'

lives. The interviews were unstructured because most of the children were unfamiliar with terminology such as *indigenous* or *Western*, but mentioned both indigenous and Western practices when asked about different aspects of their daily lives. The focus groups were conducted in October 2015 and in March 2017, which means that grade six students from two different cohorts were interviewed. All interviews were audio recorded and transcribed.

4.2. Ethical considerations

Ethical clearance was given both by the Norwegian Centre for Research Data (NSD) and the Grahamstown District Office. Written informed consent was obtained from the five co-researching science teachers, from the principals of their respective schools as well as from the interviewed and observed students' parents. The interviewed students themselves gave either written or oral assent after having received information about the study, planned publications and the measures to protect their identities.

Indigenous knowledges are often connected to the person holding the knowledge. Sharing knowledge with a researcher is a honour that builds on a relationship of reciprocity and trust (Lavallée, 2009). Thus, while the anonymization of research informants is a standard ethical measure in Western academia, in other cultural settings disconnecting the knowledge from the knower can be an affront and has contributed to the perception of indigenous peoples' knowledges being *stolen* by Western researchers (Smith, 1999). Following local ethic protocols while aiming to publish in fora that require conventional international ethics procedures can create dilemmas of double-accountability for researchers, which have to be solved individually from case to case. In this study, all five co-researching science teachers wished to appear by their real names in all resulting publications. Moreover, Sipho Nuntsu and his students featured in a filmed documentary on the presented research project which is publicly available on YouTube (Mthombeni & Miles, 2017). This means that not only the school, but also some of the school's students are identifiable. Nevertheless, it was decided to safeguard the identity of all minors mentioned and quoted in the publications relating to the study. To that end, this article omits any detail that could lead to their identification, such as age or sex. Instead of referencing the year of the interview, the focus groups are numbered 1, 2, and 3.

4.3. Research site, teacher and students

Makhanda, formerly called Grahamstown, is a relatively small city of about 77.000 citizens in Eastern Cape Province, South Africa. The city centre is inhabited by the still predominantly white and English speaking upper middle class and dominated by buildings from the British colonial period, including Rhodes University and various private schools. The townships surrounding the city centre are home to the majority of Makhanda's inhabitants, most of whom never enter any of the prestigious educational institutions downtown.

The primary school in which Sipho Nuntsu had taken over as principal and science teacher in July 2015 is located within a township with high poverty and unemployment rates. According to Mr. Nuntsu, many of the school's students grow up with their grandparents, as their parents have moved to Cape Town or Johannesburg in search for work (Interview Oct. 20, 2015). In 2015, Mr. Nuntsu looked back at 18 years of teaching experience. Similar to the scholars cited in the section on a *both and approach*, his stance is that indigenous and Western knowledges "must go together, they must marry each other" (Interview Oct. 20, 2015). Formulating his own version of *Two-Eyed seeing*, Mr. Nuntsu believes that

> as an African, to become a full person, you must have local knowledge and fuse it with outside knowledge. If you use indigenous knowledges only, you will lack something. If you are only westernized … you will also lack something. … What we have is the

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[4] Sipho Nuntsu and the other participating teachers chose to be presented by their real name, an issue to which we return below in the section on research ethics.

traditional knowledge, we must value that and mix it together with the European, the Western knowledge. By doing so, we will be full and matured people. But without [both of] them, the scale will not be in equilibrium … [we will not lead] a balanced life (Interview Oct. 20, 2015).

Mr. Nuntsu's students grow up with both so-called Western and indigenous influences. For example, grade 6 children wished to become doctors, scientists or pilots (Focus group 3). At the same time, they emphasised the importance of traditional healers who base their treatment on IKS, because "it's really helpful. The fancy medicines [from the pharmacy] just help a little bit" (Focus group 3). Some children spoke about their favourite TV shows or favourite international soccer players with the same enthusiasm as about traditional ceremonies such as "when your grandfather dies, they have to slaughter a cow for him to rest in peace … [as a way of] saying thank you" (Focus group 1). The influences of different epistemologies and ontologies might vary from family to family. However, even children who said there was little mention of e.g. ancestors at home, reported about initiation rites, their parents' brewing the traditional beer, *Umqombothi*, or using plants as medicine (Focus group 2). Practices based on indigenous knowledges are thus an essential part of the students' daily lives, but these knowledges are disregarded in the South African curriculum that largely "ignores this African knowledge" and focuses "on the Western knowledge." (Mr. Nuntsu, Interview Oct. 20, 2015).

4.4. A grade 6 science lesson

The South African science curriculum acknowledges IKS and invites teachers to integrate indigenous knowledges as long as these directly relate to specific curriculum content (DBE 2011a; DBE 2011b). However, with no available teaching materials, hardly any specifications of IKS in the curriculum and pressure to teach to exams that are entirely based on Western knowledge, teachers rarely, if ever, follow this invitation (Seehawer, 2018a). The grade six science lesson that is presented in the following, was part of a two-and-a-half-week curriculum unit on *The Solar System* within the strand on *Natural sciences: Planet earth & Beyond* (DBE 2011a, p. 61) and was taught on October 15, 2015. As in most of the South African science curriculum, IKS are not part of the unit on the solar system. However, the curriculum work sheet that Mr. Nuntsu used suggested discussing the danger of harmful sunrays (e-classroom, 2014). Mr. Nuntsu considered this a suitable topic to integrate IKS, because he assumed that indigenous ways of sun protections were practiced among his students' families. The lesson is described in some detail with much of the original dialogue in order to convey a good insight into the lesson's dynamics.

Some days prior to the lesson, Mr. Nuntsu had assigned his students to inquire with their communities about different measures to protect against the sun. At the start of the 45 minutes lesson he introduced the day's topic, the sun, planets and the moon, and spent some minutes on the question why the moon was sometime invisible, before turning to the matter of sun protection. "Alright", he began, "the sun has very harmful sunrays. Sometimes, when there is a lot of …", "sunlight", one student offered, "… the sunrays are harmful to your skin", the teacher continued. "They can make you burn", a second student pointed out. Mr. Nuntsu and the two students discussed that too much sun could cause skin cancer or "make you rash" (second student), but that the sun also provided vitamin D, as the first student knew.

Until this point, the lesson had been a typical dialogue between the teacher and two out of 13 present students, the same two students who contributed actively to all observed lessons while the rest of the class remained mostly passive as usual. This changed when Mr. Nuntsu asked about sun protection measures. The class began to murmur and while the first student suggested "calamine" and "sunscreen", another student took word and offered "*umthoba*". Mr. Nuntsu wrote *sunscreen* and *calamine* on the blackboard and, prompted by the first student, pointed

out that these were products that could be used nowadays and could be purchased at shops or pharmacies. The teacher added that he was also interested in what people "were using before. What did our grandmothers use?" The first student was eager to answer, but Mr. Nuntsu returned to the student who had mentioned *umthoba* and asked what *umthoba* was. Several students started offering different explanations such as "African herb", "a stone", or "you can make it yourself". "Is it a seed from a tree?" the teacher asked. Now there was lively disagreement in the class, children exclaiming both "yes" and "no" and discussing among themselves in isiXhosa. Mr. Nuntsu brought the conversation back together by acknowledging his students' "conflicting ideas. … Some are saying, it's coming from the wood, coming from a tree, others are saying it's a stone" he summarised, writing *umthoba* on the blackboard. "Now tell me, how it is used." The usage of *umthoba* caused further discussion among the class. The first and the second student were still the most vocal, but also other children involved themselves in the discussion. Mr. Nuntsu summarised that *umthoba* was "a traditional herb from a tree or a stone", which was mixed with water to become a paste that could be applied to the skin. His statement was accompanied by vivid further explanations, discussions and responses from the class. There was general agreement on his summary of the knowledge the class had gathered about *umthoba* so far. "How is the colour of the paste?" Mr. Nuntsu asked and got full-throated responses from the class. Many or all students seemed to know *umthoba* and agreed that it was a brownish/yellowish paste.

The exchange about *umthoba* was followed by similar engaged discussions about other measures of sun protection, in which the students switched codes to debate among themselves in isiXhosa, which had been an indicator of students' raised interest also in other observed lessons. Mr. Nuntsu wrote the students' suggestions on the blackboard, clarifying colour, consistence and application of the different substances. For example, the avocado stone or dried bark from the *ummemesi* (Cape onionwood)[5] tree could be pulverised, mixed with water and applied to the skin. Other suggestions for sun protection pastes were to mix *imbhola* (natural red ochre) or other types of local soil such as *ifuta*, (clay) with water. Not all of the suggested practices were known to the teacher, which he acknowledged to the class. "Oh, I didn't know about that", he admitted for example, when a student suggested a paste from *Isibindi* (bracket fungus) and water.

After collecting the students' suggestions, Mr. Nuntsu raised the question who uses which kind of sun protection. "Can you see white people in town with this *umthoba*, avocado, ochre or *Ummemesi*?", he asked. When the class exclaimed "no", he continued to ask whether these pastes were rather used by "black people in townships", which the class affirmed. "If you know it [these sun protection practices] you can use it", suggested the two most active students and added that white people in town rather used sunscreen. "They can afford sunscreen and they don't know about these [indigenous practices]", Mr. Nuntsu elaborated. "But our people here, maybe they cannot afford those [sunscreens], but they still use those [methods of sun protection] that were used by their mothers and grandmothers". He pointed out that all of what the students had suggested, both *Western* and *African* measures, could be used for sun protection.

After the ca. 20-minute exchange on sun protection, the remainder of the lesson was spent on inner and outer planets and their temperature. Only the two students who were always active in Mr. Nuntsu's science lessons were audible and actively participated in this part of the lesson, whereas the rest of the class had again become quiet and unengaged.

In the following, we discuss the presented lesson with regard to the article's main themes: the integration of indigenous knowledges for de-alienation and sustainable development and dialogue of epistemologies as a central aspect of quality education.

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[5] The English translations stem from Dold and Cooks (2012).

5. Discussion

5.1. De-alienation and sustainability through knowledge integration

The point of departure for this article has been the proclaimed global learning crisis and the authors' stance that the discourses on the integration of IKS into education systems in the Global South have received too little attention in the ongoing debates on quality education. Within the knowledge integration discourses, the article builds both on the argument that students in sub-Saharan Africa can be alienated by the standardised Western content of curricula and on the potential of indigenous knowledges for sustainable development. Concerning these issues, the described grade 6 science lesson is interesting in several aspects.

First, the breadth of examples that Mr. Nuntsu's students reported in class shows that IKS indeed exist in the students' homes. In total, his students suggested six different pastes that could be applied to the skin for sun protection. Other teachers in the research team had similar experiences. For example, grade 10 students presented several local indigenous techniques to purify water such as filtering the water through sand or lime stone (observation notes, Oct. 14, 2015). Grade 5 students who were asked to inquire at home about the different uses of the local clay soil offered suggestions ranging from painting houses, making pottery to applying a clay soil water mixture on boys' faces during initiation ceremonies or eating clay soil during pregnancy to support women's growth of breasts (observation notes, Nov. 4, 2015). Second, instead of the usual two engaged students, the whole class had been active in the presented lesson. Mr. Nuntsu related his students' active participation to their familiarity with the reported practices: "They see these things day in and day out. … So, I think … it was easy for them to … take it [this knowledge] to the class" (Workshop 13, October 28, 2015). Mr. Nuntsu believed that the relevance of these practices to the students' lives was increased by the fact that many of them grow up with their grandmothers who might use indigenous practices even more actively than their parents in the far-away megacities (Workshop 13, October 28, 2015). Another research team member similarly reported on his grade 5 students' enthusiasm to present their research on uses of soil (Workshop 14, November 04, 2015). Relating the students' participation to the above discussion of non-Western students being alienated by the content of Western curricula, we suggest that the integration of IKS in Mr. Nuntsu's class did the exact opposite. It de-alienated or familiarised the students with a topic of the curriculum by linking it to their own lived realities – with the result that the students participated actively and showed an interest in science class. "If we have evidence like this", one of the other co-researchers remarked, that "we can get a 100% engagement of learners, why can't we encourage it, you know, that indigenous knowledges be included in the curriculum?" (Margaret Speckman, Workshop 13, October 28, 2015).

Concerning sustainability, it is noteworthy that the sun-protection practices that Mr. Nuntsu's students suggested were based on locally available and renewable natural resources such as mud, avocado or treebark. Many of these resources are available for everyone, some, like the local clay soil is completely free of charge and available in the students' homes. None of procedures of mixing sun-protection pastes included the addition of chemicals and no one-way plastic containers are required to store and distribute the pastes. Similarly, the grade 10 examples about water purification measures did not require chemicals. With regard to the scarcity of drinking water in her students' living area, the teacher, Mrs. Mhlekwa suggested to resort to the water of the nearby dam.

5.2. Dialogue between epistemologies as quality education

We have described dialogue between epistemologies as a critical and constructive interaction that allows knowledges to be expressed, coexist, complement or contradict each other without one knowledge dominating over the other. We suggested dialogue between epistemologies as a core aspect of quality education, because we regard *Two-Eyed-Seeing* and the application of different knowledges in different local and global contexts as relevant skills in complex 21st century realities.

Most of the presented science lesson was devoted to collecting local sun protecting practices. However, towards the end, Mr. Nuntsu initiated a short reflection on the use of different knowledges by asking who practiced which kind of sun protection. As noted, the class thought that *African* ways of sun protection were only employed by *our black people here*, whereas *white people in town* who could afford these products used sunscreen. This suggests that knowledge use in this case was understood as a matter of race, economic means and geographical location. However, students also suggested that if white people knew about indigenous practices, they could use these as well. This is a central point, as it disconnects knowledge from skin colour and points to the benefits of *Two-Eyed Seeing* also for non-indigenous people. Proficiency in different knowledges, e.g. different kinds of sun protection, enables choices about which knowledge is most applicable in a given situation. Such metareflection on knowledges can be part of a dialogue between epistemologies in that it draws students' attention to who uses which knowledges and why.

What kind of dialogue and reflection on knowledges is possible or how knowledges can interact in the classroom, will vary from age group to age group. Co-researcher Mrs. Mhlekwa's grade 10 used scientific experiments to test the quality of water, which the students had cleaned through the indigenous practices they had previously reported in class. This interaction between indigenous and scientific knowledges could be understood as hierarchically problematic in that science was used to test the aptitude of indigenous water purification practices. A different interpretation, however, is that both indigenous and science practices could play out their respective strengths. The indigenous water cleaning methods based on local materials such as sand and lime were both chemistry-free and cost-free, while the scientific test suggested which of the indigenous methods produced the cleanest water, which could help students decide which cleaning method to use in the future. Thereby, the knowledges could complement each other as suggested in the above section on sustainable development. It is important to note that neither Mr. Nuntsu, nor Mrs. Mhlekwa told their students to value one knowledge over the other. Mr. Nuntsu made a point that sun-protection products based on both knowledges "can be used" (16. 10. 2015), depending on preferences or economic means. Instead, the teachers provided a space in which knowledges could interact and facilitate the interaction. Mr. Nuntsu set the topic and maintained the focus of the discussion, but instead of giving knowledge input, he paraphrased, summarised, translated, asked clarifying questions and bundled the information on the blackboard without judging or verifying the knowledge the children offered. For the duration of the sequence on sun protection, the teacher gave up his monopoly on knowledge, and instead became a facilitator and co-learner, acknowledging his own limitations, e.g. when it came to the use of *isibindi* for sun protection. It is this kind of teaching that we regard as a prerequisite for dialogue between epistemologies. Deeper reflections on the role of the teacher as facilitator than this article can provide, would be desirable, for example with regard to Freirean (1970/1996) pedagogy and his ideas of the teacher as a co-learner.

Integrating knowledges that are not prescribed in the curriculum will not result in so-called objective or verified truths. In Mr. Nuntsu's lesson, no conclusion was reached on the ingredients of *umthoba*. With his longstanding interest in Eastern Cape IKS, Mr. Nuntsu recognised many, though not all of the reported practices, while teachers without the background from Eastern Cape IKS might not have been able to

contextualise the students' examples.[6] In the presented case, Mr. Nuntsu could have easily followed up on the composition of *umthoba* and presented a final, correct solution to the class in the next lesson. For example, he considered inviting one of the gardeners who could be observed using indigenous sun protection during their work on the school's premises to the classroom to share their knowledge or, as done in the abovementioned documentary on this study, consult with an assistant at Makhanda's herbalist shop (Workshop 13, October 28, 2015; Mthombeni & Miles, 2017). However, more complex examples of IKS than sun protection might have been difficult to follow-up and verify. From a Western scientific point of view, this is problematic. But IKS do not claim to be universal, but have local, sometimes even personal, relevance and validity (Brant Castellano, 2000). Relatedly, it must be noted that moving indigenous practices such as water purification to the classroom implies their de-contextualisation and that Western scientific testing does not take into account contextual or spiritual meanings that may be attached to indigenous practices. It is one of the complexities and the core task of dialogue between epistemologies to accommodate such underlying epistemic differences and challenges. How these differences and possible resulting tensions can be addressed in the classroom or educational setting is another subject that requires further exploration.

It is not the authors' intention to jump to simplified conclusions. Most of the few existing studies on practical attempts to integrate IKS into African education report on positive reactions from the students (e. g. Cocks, Alexander, & Dold, 2012; Dharampal, 2006; Nkopodi & Mosimege, 2009; Schabort, 2011). However, more research and long-term experience is needed to be able to tell the effects of such knowledge integration. The integration of culturally and contextually relevant IKS alone will not solve a complex global education crisis. In the introduction, we mention Alexander's (2015) and Schweisfurth's (2015) call for the international debates on quality education to include questions on *how* something is taught, that is, pedagogy. The question *what* is taught, that is, which and whose knowledges students learn in school, is an equally important – and equally neglected – aspect. Ideally, research on dialogue between epistemologies would take into account the combination of knowledge and pedagogy, that is, inquiries into which pedagogies are suitable for which knowledges. Moreover, the issue of assessment needs careful reconsideration, which, as alluded to above, touches upon the question of the purpose of education as such. Currently, sub-Saharan testing regimes centre on the individual and are exclusive and extractive (Hapanyengwi-Chemhuru & Makuvaza, 2017). What kind of learning and competencies should students acquire through the education system? In this article, we have suggested that the ability to make sense of, and apply, knowledges according to what makes sense in a given context provides students with a larger repository of strategies for sustainable livelihoods than drawing on one knowledge system only. Hence, assessment would not only test specific Western knowledge content, but also contain elements that cater to the holistic, communal nature of IKS as well as allowing for possible interactions between knowledges. Hereby, formative assessment practices, group assignments or practical tasks might be more appropriate than purely theoretical and summative assessment. Scholarly accounts on African indigenous education conceptualise it as encompassing informal situated learning as well as formal elements such as initiation ceremonies and rites. Often, riddles, proverbs and storytelling served as teaching methods (Avoseh, 2013; Hapanyengwi-Chemhuru & Makuvaza, 2017; Ocitti, 1994; Seroto, 2011). Such accounts may serve as a basis for developing both epistemically appropriate and locally grounded teaching and assessment strategies, which then need to be adapted to contemporary learning situations. In South Africa, the context of the presented case study, the previous science curriculum (DBE, 2002) was conducive to such exploration and potential educational transformation. Stating that "curriculum development which takes account of world-views and indigenous knowledge systems is in its early stages", the curriculum presented itself as an "invitation for such research and development" and "an enabling document rather than a prescriptive one" (DBE, 2002, p. 12). The most recent science curriculum (DBE, 2011a; DBE, 2011b), on the other side, marginalises IKS as an issue of the past rather than being of relevance today. This is a serious setback for the idea of integrating knowledge systems in the South African classroom and for the students who struggle to make sense of the Western epistemic hegemony at school. A new revision of the South African curriculum which takes into account the different knowledge systems among students is therefore urgently needed.

What we emphasize with this article and the discussed case is that disregarding local or indigenous knowledges in education as it is presently done, means discarding a huge potential in education both to de-alienate children from the taught content, as well as promoting sustainable development – the latter being more urgently needed than ever to enable the survival of our shared planet. If SDG4 aims to be more successful than the MDGS in terms of learning efficiency and if the "S" within the SDGs is to be taken seriously, IKS need to be embraced and explored in a respectful, decolonial manner not only in some academic niches, but by mainstream discourses and development practices.

CRediT authorship contribution statement

Maren Seehawer: Conceptualization, Methodology, Data curation, Writing – original draft, Writing – review & editing. **Anders Breidlid:** Writing – original draft, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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[6] See Seehawer (2018a) for an account of practical challenges such as lack of IKS that prevent South African science teachers from integrating IKS into their regular lessons and how these challenges were addressed in the present study.

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