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Conflicted epistemologies in secondary school environmental education: implications for sustainable climate action in Uganda

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ABSTRACT

Transformative secondary school environmental education is likely to impact climate action by producing environmentally responsive citizens. We present a case study of environmental education in northern Uganda, and how learners' intended actions are moderated by their exposure to both formal and non-formal indigenous environmental knowledges. Guided by the Critical Place Inquiry theory, we undertook a pragmatism paradigm where a mixed methods approach was used to collect quantitative and qualitative data from 1,282 secondary school learners and 12 teachers in 30 rural and urban schools. Individual interviews, focus group discussions, document reviews, questionnaires, and arts-based scenarios were used to collect data. Findings revealed that learners' school-acquired environmental knowledge is not transforming them into environmentally responsive citizens because formal and non-formal knowledges are conflicted across pedagogy, curricular, and textbooks. We propose a harmonisation of the two epistemologies so that learners can relate school knowledge with their every-day environmental realities for climate-smart citizenry.

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Conflicted epistemologies; environmental education; secondary school learners; transformative education

SUSTAINABLE DEVELOPMENT GOALS
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Introduction

Education has been situated by the UN as one of the conduits through which sustainable environmental actions should be delivered with Sustainable Development Goal 4.7 targeting that *all learners acquire the knowledge and skills needed to promote sustainable development by 2030*. As early as 1970s, environmental education had gained global attention where the 1972 Stockholm Human Environment Declaration under Principle 19 emphasised that need for education for the younger as well as adult generations and underprivileged communities in environmental matters. This set the stage for the 1977 UNESCO and UNEP Tbilisi Intergovernmental Conference on Environmental Education where the parties agreed to institute environmental education on their national educational agendas. At the Rio Environment and Development Summit in 1992, Agenda 21 in Chapter 36 directly emphasised the role of both formal and non-

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formal environmental education in changing people's attitudes so that they have the capacity to assess and address their sustainable development concern (UNCED 1992).

Education is hinged on various epistemologies; majorly formal and informal in character. While harmonious co-existence of these epistemologies has been found to be beneficial for transformative learning (Seehawer and Breidlid 2021), by contrast, formal education systems in sub-Saharan Africa have tended to sideline indigenous epistemologies, thereby uprooting the beneficiaries of formal education from the realities of everyday life (Kezabu 2022). Environmental education is a clear site of this process of sidelining, yet it is arguably an area where epistemological pluralism (Beaumont and de Coning 2022; Keet 2014) may be particularly beneficial in the context of intensifying environmental crises. In this paper, we demonstrate how the secondary education system in Uganda has conflicted indigenous knowledges with formal school knowledge, and we suggest that the consequence of this is non-transformative environmental education among secondary school learners. The objectives were to establish aspects of indigenous environmental knowledge that are embedded in the formal school curriculum documents, how secondary school learners' formal school knowledge moderates their intended environmental actions, and how teaching practices conflict (or not) indigenous and formal environmental knowledges in secondary schools.

Gruenewald (2003) emphasises that alienation of people from their cultures and places is one of the leading causes of the profound lack of care for the environment. The systematic ways in which indigenous knowledge is alienated by the formal education system in Uganda have been documented by Mulumba and Muwagga (2013) in higher education and teacher education, where teacher curriculum mortifies indigenous knowledge, values and skills, because it is built on foreign pedagogical paradigms. Similar observations have been made (Adyanga 2014; Kagoda 2009; Tabuti and Damme 2012; Thomas 2023) that the knowledge passed on in western types of education was, and still is, at odds with that of informal education, yet it is invaluable in solving community problems (Monk et al. 2023). Young people are taught to disregard almost all aspects of their heritage including their traditional language(s). For instance, many Ugandan schools discourage pupils from talking in the vernacular on school premises, and reprimand those who do (Milligan et al. 2024).

Relatedly, Kezabu (2022) indicates that Uganda's formal education contributes to the people's disconnection from their communities and from their cultures. It is argued that this is primarily due to the examination-driven curriculum; the foreign orientation of the formal education system and the subjugation of indigenous knowledges from the curriculum. However, Kezabu (2022) does not elaborate how the knowledge systems are conflicted at the level of teaching practices. This paper elaborates how the two knowledge systems are conflicted both at the structural as well as the operational and tactical levels in Uganda's secondary school education, and how the inter-epistemological conflict may impact the potential for transformative environmental education in the country. The data is drawn from the Ugandan case study of an international comparative education study called *Education as and for environmental, epistemic, and transitional justice* (JustEd), implemented in Uganda, Nepal, and Peru.

The theoretical framework we use is the critical place inquiry theory proposed by Tuck and McKenzie in 2015. It examines the uniqueness of place-based attributes across the social, economic, political, and environmental spheres amidst the forces of globalisation

and neoliberalism. With a focus on global education agendas that specifically promote formal education based on western epistemologies, we seek to analyse the uniqueness of local place-based epistemologies and how they can be of relevance in influencing environmental education outcomes in the midst of a formal education system in Uganda. The theory embeds the transformative paradigm that seeks to expose, oppose, and redress forms of oppression, inequality, and injustice. The thesis of the article builds on the theory to critically examine the teaching practices undertaken in formal school environmental education, and the ones undertaken in informal environmental educational settings with the view of identifying contradictions that set the two knowledge systems on a collision path.

According to Moore, Gelfand, and Whitsett (2015), epistemologies form the basis for frames of interpreting reality. Common frames of interpretation occur in specific contexts, and these frames help individuals not only to make sense of what is going on around them but also to guide their actions. With increasing school enrolment, particularly in secondary schooling in recent years (Deininger 2003; Kan and Klasen 2021), and the thriving indigenous knowledge systems across the Global South (Ankrah, Kwapong, and Boateng 2022), we argue that schools are potential sites of conflicted knowledges due to othering of indigenous knowledges by the formal school environmental knowledge. Conflict in epistemologies may lead to perceptual inconsistencies, which may partially explain the failure to relate with environmental realities like climate change and natural resource degradation. In our discussion, we consider the consequence of producing school graduates whose intended environmental actions may be conflicted too.

Literature review

We understand indigenous environmental knowledge within the wider context of the broader field of 'indigenous knowledge': a multifaceted body of knowledge, practices, and representations that are maintained and developed by peoples with long histories of close interaction with the local natural environment (Owuor 2007). The term indigenous, therefore, denotes that the knowledge is typical and belongs to peoples from specific places with common cultural and social ties. A number of authors have argued that indigenous knowledges are one of the greatest assets for sustenance of communities in the Global South as it encompasses environmental management practices that are locally adaptable. Mbah, Ajaps, and Molthan-Hill (2021) point out that indigenous knowledges are integral to a cultural complex that also encompasses language, systems of classification, resource use practices, social interactions, ritual and spirituality. Indigenous knowledges have been used for climate change adaptation (Hosen, Nakamura, and Hamzah 2020; Siggia, Battista, and Tinervia 2016), soil improvement practices (Akhter et al. 2013; Hosen, Nakamura, and Hamzah 2020; Nzeadibe et al. 2012; Rahman and Alam 2016), water conservation (Opare 2016; Oviedo et al. 2016; Tlhompho 2014) and sustainable agriculture (Jiri, Mafongoya, and Chivenge 2015; Nelson et al. 2019).

Recent authors have argued that indigenous knowledge is important within environmental education because it can enhance learners' ability to connect with their local realities (Ajaps and Mbah 2022; Mbah, Ajaps, and Molthan-Hill 2021) and support reflection on human–nonhuman relationships (Kopnina 2020). Incorporating place-based pedagogies and indigenous knowledges in the curriculum can help to counter

what Fogarty (2010) refers to as educational approaches that solely privilege a cultural relativist approach [in reference to Western education], which Fogarty goes on to argue just provide generic education. Since our cultural experiences are placed in the geography of our everyday lives, and in the ecology of the diverse relationships that take place within and between places (Gruenewald 2008), epistemic placelessness may result in an irrelevant education to the recipient community. Therefore, indigenous knowledges, place-based and localised as they are in character, help to anchor educational practices that communities can benefit from, particularly in the field of environmental education. Embracing indigeneity in environmental education (Johnson 2012) could be one way to arouse what Freire (2000) terms 'critical consciousness' through using pedagogies that are indigenous to the place and familiar to the learners which may ensure transformative educational engagements.

The challenges of incorporating indigenous knowledges into environmental education can be understood through a reading of the broader literature on inclusion of African indigenous knowledges in formal education settings (Hoppers 2001, 2017; Masaka 2019; Mawere 2015; Silva, Pereira, and Amorim 2023). These authors show that there is significant evidence of their absence and marginalisation in formal education systems across sub-Saharan Africa. Ezeanya-Esiobu (2019) further argues that, despite the diversity and complexity of indigenous knowledges, they are often neglected in knowledge production environments, being generally described with words such as 'primitive,' 'backward,' 'savage,' 'rural,' and 'unscientific'. Because of this, the unique knowledge and interpretations of reality produced by indigenous communities through a complex process of cultural construction end up being made invisible, marginalised, and regarded as an inferior social experience, against a hegemonic and colonial epistemological oppression (Ndlovu-Gatsheni 2018). Within formal education systems, we repeatedly therefore see a refusal to 'recognize and build on the knowledge that the children from non-western systems of thought have' (Hoppers and Richards, 2012, 45). These absences could also be understood as a form of epistemic violence whereby postcolonial education systems continue the disempowering of indigenous knowledges, exercising violence in the production, circulation and recognition of knowledges (Pérez 2019; Spivak, Colpani, and Mascat 2022).

While tensions have been highlighted in the literature when indigenous knowledges are incorporated into a predominantly formal knowledge-based education system (e.g. Pesambili 2022), much less has been written about the ways that teachers deal with these tensions; nor how they impact outcomes, or in the case of environmental education, environmental actions. Masaka (2019, 299) writes that genuine acceptance of indigenous knowledges as part of epistemological pluralism (Keet 2014) in sub-Saharan African school curricula has the potential for learners to 'awaken their own agency, such that they might contribute meaningfully to the determination of their own destiny in life'. Genuine inclusion of indigenous knowledges, thus, necessitates moving beyond nominal acknowledgement to providing space for understanding differences and potential conflicts. This requires dialogue whereby teachers and learners self-consciously recognise the limits of different epistemologies and engage with other approaches without attempting to usurp them. It also, arguably, needs recognition of the 'epistemic value of diversity' (Balarin and Milligan 2024; Robertson 2013) and a deliberate attempt to synchronise different knowledge systems (Seehawer and Breidlid 2021). It is these moments of conflict and potential

for greater dialogue which could in turn lead to more sustained and positive environmental outcomes that we focus on in this paper.

Education system and environmental education in Uganda

The initial stage of organised instruction in Uganda is pre-primary or nursery education – ages 2–5 years (WB 2012). The primary school system lasts 7 years – ages 6–12 years, during which children sit for the Primary Leaving Examinations (PLE), after which learners (ages 13–17 years) enter secondary school education, which is divided into lower secondary education (Ordinary level), where learners (17–20 years) sit a national examination to obtain the Uganda Certificate of Education (UCE), and upper secondary education (Advanced level). Learners who pass the UCE go on to 2 years of advanced level secondary education and take a national exam, which results in the award of the Uganda Advanced Certificate of Education (UACE). Learners who pass the advanced-level exams go on to university or other institutions of higher learning (GoU 1992).

Uganda has rolled out a new curriculum for lower secondary which started in 2020 and schools teach 13 subjects at senior 1 and 2, out of which seven are compulsory. The pedagogical approaches advanced in the new curriculum aim at empowering learners with a broad range of competencies, skills and creativity. It is designed to focus on relating learning to real-life situations and ultimately problem-solving skills in a given situation. Environmental awareness is one of the cross-cutting issues in all the subjects (NCDC 2020).

Before the concept of environmental education in Uganda, issues concerning environment were taught as nature studies. Increasing environmental problems such as soil erosion and land degradation, pollution, drainage of wetlands and loss of biodiversity among others drew the attention of the government of Uganda to plan for ways of addressing environmental problems (MoE&S 2013). In the formal education sector, the publication of the Government White paper on Education in 1992 facilitated the formulation of policy to guide environmental education plans.

To facilitate formulation of policies, the National Environment Statute was formulated and subsequently the National Environment Management Authority (NEMA). The National Environment Statute provides that NEMA coordinates, monitors and supervises all matters related to environment and environmental education (The National Environmental Act 1995, 2019). In 1996, NEMA together with the Ministry of Education and Sports (MoES) developed a national education strategy for environmental education in formal education sector. In this strategy, environmental education rests with schools, colleges, universities and other tertiary institutions of learning in the country. At the school level, environmental education is not considered a separate curriculum but rather is incorporated as a cross-curricular subject (NCDC 2020).

Methodology

The study employs a pragmatism research paradigm because the data sought to answer the research questions is a blend of both qualitative and quantitative types which are hinged on the constructivism and positivism paradigms, respectively (Kaushik and Walsh 2019). At the same time, both data sets reinforce each other to infer the

Table 1. Phase two school details.

School (pseudonym)	District	Urban/Rural	Public/Private	Population	Boarding/Day
Kalam	Amuru	Rural	Public	Mixed	Day
Buk	Amuru	Urban	Private	Mixed	Boarding
Karatac	Kitgum	Rural	Private	Mixed	Day
Kicar	Kitgum	Urban	Public	Girls only	Boarding

environmental actions resulting from exposure to knowledge. The research design was cross-sectional, where data were collected from a representative sample at one point in time, inferring the findings to the entire population (Bhattacharjee 2012). Sampling was purposive and random. Purposively, only subjects and teachers of environmental-education related subjects were involved in the study. However, students were purposively randomly selected.

Accordingly, the findings in this paper are drawn from a sequential mixed methods case study (Cresswell and Plano Clark, 2011). The first phase of the study involved documentary analysis of the new and old secondary education curricula. The second (qualitative) and third (quantitative) phases of the study were conducted in Gulu, Amuru and Kitgum districts in Northern Uganda. Data generation focused on the lower secondary education section, including teachers and learners aged between 13 and 17 years (in lower secondary section).

Gulu, Amuru and Kitgum districts were selected in line with the broader project's aims to explore the intersection of environmental, epistemic and transitional (in)justice in secondary schooling in Uganda. The districts were purposefully selected because they are sites of historical and contemporary injustices. For example, many households in the district are economically marginalised and rely on burning trees for charcoal despite the widespread recognition of the negative impact of this on the natural environment. There is also wetland degradation as households expand their subsistence agricultural acreage to undertake dry season cultivation occasioned by longer-than-usual dry spells due to climate change. The districts also implement both the Universal Primary and Secondary education systems where selected government-owned secondary schools run a zero-tuition fee policy and teach compulsory environmental education subjects like geography and biology. The communities are largely rural, and still practice traditional ways of life around the social, political, environmental, and cultural spheres. The *Ker Kwaro Acholi* cultural institution is a strong cultural institution headed by the paramount chief with administrative structures cascading up to village level, where the *Rwot Kwedi* presides over natural resource management and enforcement of indigenous environmental best practices.

Within these districts, four schools were selected for the qualitative part of the study (see Table 1) and thirty for the quantitative part. The schools were stratified in urban/rural, public/private and then randomly selected.

3.1. Curriculum review

The curriculum analysis was undertaken through a content-based documentary review (Hsieh and Shannon 2005). The sample included textbooks and syllabus documents for the subjects of geography, biology and agriculture, since these are the subjects where issues related to environmental education can be found. The syllabi included the 2008 (old) and the

2019 (new) versions, while the text books covered Year Books 1 to 3 for the respective subjects. Note that the sample represented both new and old curriculum for the lower secondary (ordinary level), since both curricular were still being implemented in the process of phasing out the old curriculum.

We undertook an initial content analysis of the examples and case studies used in the syllabus, coding them based on whether they represented indigenous or place-based knowledges, as compared with formal knowledge. We also undertook content analysis of the prescribed learning activities (although noting that this is only what is within the textbooks and so not indicative or what activities teachers may choose to complete with learners). One of the codes for these activities was the use of local and/or place-based learning activities such as experience-based learning and field trips.

Interviews with learners and teachers

In phase 2 of the study, we conducted semi-structured interviews and focus group interview discussions with learners and interviews with teachers. A total of 12 teachers, each for the subjects of geography, biology, and agriculture from four secondary schools, were interviewed about the pedagogy they undertake during teaching and learning of the three subjects which contain environmental education content. Sixteen learners (female and male) ranging between 13 and 17 years, in senior one to three classes were selected from four schools using snowball sampling (64 learners total). All the selected learners participated in individual semi-structured interviews. Some of the learners were selected to participate in at least one focus group discussion. Ethical considerations were followed, including attaining ethical clearance, consent forms signed by the school and later individual parents (through appending their signatures or fingerprints), assent forms signed by learners, and providing participants information sheets and debriefs. Learners were provided refreshments in the course of the interviews, and time compensation in terms of school materials (books, pens, mathematical sets, and rulers). During individual interviews and focus groups, learners were asked about several environmental justice-related subjects. One of the aspects was related to how topics related to environmental management are taught in their schools. The questions also sought to investigate learners' attitudes about the environment, if the environment had rights to exist and their future aspirations as regards environmental protection.

All data was transcribed, and where necessary translated into English. Using NVivo software, the data was first analysed using thematic analysis where each theme was colour coded. Themes evolved when patterns became apparent and to see the intersections between different themes. The themes generated from the data included indigenous environmental knowledge, school environmental knowledge, violence against the environment, teaching methods. Thematic data were transferred into Excel spreadsheets by the school to show participants and theme for organisational purposes.

Questionnaire

In phase three, a questionnaire was designed and uploaded onto computer tablets with questions and case scenarios testing learners across their environmental knowledge, behaviour and attitudes, alongside questions related to epistemic and transitional justice knowledge which are not the focus of this paper. The scenarios had

slider responses. A total of 1,282 learners from 30 selected secondary schools participated in the survey. In each school, learners were selected using cluster and convenience sampling techniques (Golzar, Noor, and Tajik 2022). Each school with lower secondary level was treated as a cluster, and, any class of learners in senior 1, 2, and 3 classes formed a sub-cluster. Depending on the availability of any of the classes in a given school, the school administration would choose which one to participate in the survey, thus the convenience. When a class was selected, all the learners in that class would participate in the survey. The survey items were designed in English and Acholi languages, and a learner would choose which of the two languages to use. Data was analysed by first of all downloading it from computer tablets into a central server and sorted according to categories of items. The R statistical computer software was used to generate descriptive statistics and regression analysis (Bevans 2020) mainly to find out the relationship between learners' school knowledge/behaviour/attitude and their intended environmental actions.

Findings

One of the major findings of the study was the absence of indigenous environmental knowledge in curriculum and learning materials. In the new competence-based curriculum for lower secondary school, only 4% of the prescribed-learning activities in the geography syllabus relate directly or indirectly to locally relevant activities that may bring in learners' indigenous or local knowledges. The rest of the learning activities is in conventional teaching and learning activities typical of formal educational practices. Moreover, most of the case studies that are prescribed for teachers to use are not indigenous knowledge-based, or even locally Uganda-based. Whereas there are no European and American case studies, the African case studies are drawn from countries like Zambia, Congo, South Africa, Gabon, Egypt, Nigeria, Ethiopia, and Ghana. These countries may have peculiar differences with the local Ugandan settings, and hence not blending formal school knowledge with local relevant realities. Our analysis further indicates that textbooks neglect relevant indigenous knowledges in their content, advantaging formal western science. We found out that environmental topics in geography learners' books 1, 2, and 3 depict an orientation towards Western scientific knowledge (learners' book 4 is not yet published by the Government). Only 3% of the examples and case studies depict indigenous knowledges.

Similarly, we observed that the syllabus is not emphatic on using fieldwork as a teaching strategy. In prescribing field-based learning activities, the syllabus elaborates: 'If possible, learners visit an area where fishing takes place … ' (43), meaning that fieldwork is not mandatory; teachers are at liberty to adopt it in their lessons or not. Most of the teachers of geography, a subject where environmental content accounts for 25% of the syllabus, revealed that learners are taken for fieldwork studies only once during their four-year cycle of the Ordinary level (lower secondary school). This activity only takes place purposely to prepare the learners for the national examinations (where tasks on fieldwork are compulsory). This has promoted relaxation in enforcing field-based learning, already coupled with other challenges that disfavour it, such as those mentioned in interviews with subject teachers and learners from schools. For instance, in Kalam, one of the teachers said:

> Of course, we have challenges of finance. I have struggled for many years that I have been here [in the school]. At least I have managed to take them [learners] three times for field work in Kampala . . . Learners would be asked to pay separate charges for fieldwork but it's very hard to raise . . . I gave the suggestion that as a child joins senior one, they should begin to contribute so that by the time they reach senior four they have enough money, but the school said that this would increase the cost of school fees . . .

If the school system cannot support experimental teaching methods, it means that learners cannot apply the content they learn to environmental contexts. This also contributes to a classroom-based pedagogy, neglecting field-based exploratory methods that are at the centre of indigenous environmental education, and consequently conflicting western environmental knowledges with indigenous environmental knowledges. This may explain why learners' environmental behaviour does not change even when they are taught about environmental awareness and conservation.

Besides the theoretical nature of environmental education, teacher centeredness was identified as a dominant teaching approach in formal pedagogy. This is observed in the following statements from learners at Kalam and Kicar schools, respectively:

> He [the teacher] wrote a heading about soil and tried explaining . . . (but) I cannot remember [what he taught] so well.

> Some teachers just come in even without greeting they teach for the one hour and twenty minutes and when they are done, they just move out without asking whether you have understood or if you need more explanation.

Since learners do not get in-depth engagement during teacher-centred learning, we suggest that they do not relate the concepts easily and this means that environmental management is in jeopardy because learners do not comprehend what is taught. During interviews, learners mentioned that they are taught environmental conservation in the classroom; however, many responses from learners and teachers confirm that these lessons do not have a transformative effect on learners regarding environmental protection in their communities:

> People dump waste in swamps, yet schools taught them about recycling.
> (Learner from Buk)

> . . .people urinate and even bath there [in the water source] yet some drink it, and dump rubbish [in the water source] . . . people around Lakwat[1] who don't have toilets use polythene bags then just throw it, so when it rains, that flows into the water. . . (Learner from Karatac)

> These learners actually take it as subjects for exams. . . they throw litter anywhere [even after being taught] . . . It [schooling] does not have real impact in these children. . . (Teacher at Kalam)

On the other hand, it was observed from the data that learners relate more to, and their environmental actions are moderated by the knowledge they acquire from the community outside the school. They recognise rituals carried out through indigenous environmental knowledges in ensuring environmental management. In Kalam, learners recognise that:

> When people are in need of rain, they pick a goat and millet flour. . . go to the hills or rock. . . kill a goat as a sacrifice to the gods and the ancestors. They cook the goat, eat and dance. Upon return, . . . then it rains.

Although the ritual is intended for human subsistence, it shows that actions towards the environment are practiced in indigenous environmental knowledges. However, at school where the Western environmental content dwells, learners are evaluated based on what they know about the environment (not what they do to/in it). Therefore, learning about the environment is geared towards passing the assessment, as one of the teachers retorts, people come in class, get the knowledge mostly to pass exams and go (Teacher at Karatac). This misdirects environmental knowledge from creating environmentally responsible citizens, to producing intellectual learners who are in position to retain memory for examination purposes.

Our findings further show that the language used to deliver school environmental knowledges also conflicts with Western and indigenous environmental knowledges. Whereas the indigenous environmental knowledge is rooted and often expressed in the learners' first language – Luo, all the environmental teaching resources in secondary schools are written in English, and most learners express difficulties in understanding the content. This statement was made by a learner from Karatac, and it was re-echoed in all the four schools: English is used for teaching, not all learners understand so Luo is sometimes used for translation. Many learners, however, testify that sometimes teachers do not translate concepts into Luo at all and this leaves them speculating about the meaning or sometimes giving up. The strict enforcement of English as a medium of instruction side-steps the local language, essentially divorcing indigenous knowledges from the school system.

Trying to implant a knowledge system in an environment where it has not been developed also enlists a conflict between the locally developed (indigenous), and the newly introduced (Formal Western) knowledges. Any knowledge is developed and thrives in an ecosystem. When a knowledge system is introduced into an ecosystem in which it was not developed, then a collision path with the locally generated one is set. Learners are exposed to school knowledge that does not relate to their everyday life challenges of poverty, resource use, and related social-economic realities. Some learners, for example, have to cut down trees to produce charcoal for sale in order to raise money for school requirements, including tuition fees, yet the formal school curriculum teaches them about tree planting and the negative consequences of deforestation. In interviews with teachers and learners, it was clear that the contradictions that young people encounter between being taught to plant trees and the need to burn trees for their families' economic survival were left unexplained. This leaves young people unsupported to make sense of the complexities of enacting positive climate action in the context of environmental and financial precarity.

Crucially, results from the survey confirmed our observations in the analysis of curricula and interviews. The findings reveal that school environmental knowledge in the curriculum does not moderate learners' intended actions in respect to SDG 13 (Environmental Action). The regression analysis results produced an R value of −0.106 at a P-value of 0.028 when intended actions of the learners were analysed against their school environmental knowledge at shown in Table 2.

Table 2. Regression results showing learners' school knowledge and their intended environmental actions.

	Dependent variable:
	EnvJ Intended Actions Uganda
Constant	0.007
	(0.076)
attitude	0.027***
	(0.002)
experience	−0.007*
	(0.003)
Knowledge	−0.106***
	(0.028)
Groups	28
SD.RE	0.097
Observations	1,281

***$p < 0.005$; *$p < 0.05$.

This finding is reinforced by learners' responses when a scenario of a choice between protecting land with a thriving ecosystem and clearing it for construction of an industrial compound which would create jobs was presented to them. About 76% of the learners selected a slider response below.

> I would support the project; I believe this sort of business and construction would bring development and prosperity to my community.

In another related scenario involving a choice between a polluting factory and protecting a polluted river, the majority of the learners (61%) observed that:

The local population should not lose jobs just because of air/river pollution.

It was expected that the learners would bring on their school acquired knowledge in the scenarios above, since learners spend most of their time in school learning environmental management. However, this was not the case, since the two scenarios demonstrate how learners' formal school knowledge has not transformed their intended actions towards the environment.

Besides, the study findings revealed that the knowledge acquired in the community outside the school was the major influence of learners' intended actions towards the environment. The reason for the strong influence of community knowledge is that indigenous knowledges which are highly prevalent have a set of strict enforcement built in the everyday lives of the members of the community. The *Ker Kwaro Acoli* – Acholi cultural institution headed by a paramount chief, is a custodian of traditional indigenous knowledge rules around the use of environmental resources. The institution has, for instance, banned the cutting of certain tree species in the area, for example, the shear nut tree and the *Borassus* palm. There are sanctions any offender faces in the form of fines payable in kind if they cut such trees. The respect the paramount chief commands in the community makes his declarations law unlike central government laws which lack enforcement. In one of the interviews, a learner from Karatac confirms this:

> We have some trees, shea trees at our home which if you cut one there must be a clan meeting to reprimand you. That tree is not supposed to be cut. If you do not follow the rules you are fined.

The fact that learners could not apply this knowledge in the scenarios above means that formal school knowledges and indigenous environmental knowledges do not reinforce each other to have a combined positive effect on learners. This is because knowledge systems are conflicted along syllabus, pedagogy, and teaching and learning resources associated with formal Western environmental knowledges that hinge the formal education in the country.

Discussion

The findings have shown that indigenous and formal school knowledges come into conflict within the education system, mainly through subjugation of the indigenous environmental knowledge. This means that learners have been separated from the realities of the present environment (Kezabu 2022), yet Seehawer and Breidlid (2021) contend that a collaborative co-existence would lead to transformative education. If the school environmental knowledges were embracing aspects of the community knowledges (which is predominantly indigenous knowledge), the findings suggest that this could enhance learner's overall environmental behaviour. This supports previous research in Uganda that has shown that place-based epistemologies are crucial for developing learners' potential to connect to and interpret their local realities (Kezabu 2022). The subordination of indigenous knowledges by the formal school knowledges, however, does not promote knowledge cross-fertilisation; and consequently, the combined cognitive economies of scale learners would otherwise benefit from for enhanced positive environmental action.

Since findings indicate that community knowledges are the major influencer of learners' intended actions towards the environment, it is important that the formal school embraces the environmental knowledge practices and pedagogies of the place where it is situated. Studies by various scholars like Barrio (2013); Hoppers (2017); Kezabu (2022); Koehler (2017) have advocated for inclusion of indigenous knowledges in the formal school curriculum. Paradoxically, the lower secondary curriculum, and in particular the geography syllabus as prescribed by NCDC (2019), recognises that one of the aims of secondary education is to promote an appreciation and understanding of the cultural heritage of Uganda. Our findings have clearly shown that the curriculum itself does not reflect this with indigenous knowledge-related content and practices largely absent from syllabi and teaching and learning resources.

Our findings have also pointed out the significant role of pedagogies that connect learners to the place where they live and the indigenous knowledges that reside there and also suggest the need for pedagogical transformation whereby teachers can support learners to understand the contradictions between the different knowledges they encounter. Pedagogy is the art of teaching and constructive pedagogies that embrace unique features across different epistemologies are possible. Here, there are clear resonances with pedagogies that are used within peace and history education, in particular, that of reparative pedagogies. Paulson (2023) explains that reparation generally, and in its application to education specifically, is often described as encompassing material, symbolic, epistemic, and affective measures to right wrongs of the past. The current wave of competence-based curricular in secondary education across countries may be a step in the right direction.

Critics of competence-based curricula like Hirtt (2010) have decried the displacement of humanistic learning with a set of skills to be produced in a professional setting, and if education were reduced to the provision of 'skills', it would be no different from the training of an irrational animal. This is to emphasise that the seemingly epistemologically all-embracing curriculum revolution leaves out some aspects of local epistemologies that need to be identified and brought on board in educational settings. In most cases, what has emerged from competence-based curricula is the inclusion of place-based knowledges but being taught using western approaches. Pedagogies and curricula that support epistemological pluralism (Keet 2014) and the epistemic value of diversity (Robertson 2013) are one way that this could be achieved.

We argue that for indigenous knowledges to become meaningfully included in environmental education, considerations need to be made to broader issues within the education system. One clear example here is the use of English as the medium of education which we have argued is a form of epistemic violence, both in its association with Western formal knowledges and the ways that a strict enforcement of an English-only school policy leads to learners' shame and embarrassment to speak in the classroom (Milligan et al. 2024). There is a need for education systems to embrace learners' first languages to enable them express themselves during the teaching-learning process so that academic concepts get connected with everyday mundane experiences embedded in the areas where they live.

Finally, another consideration to make is the context in which the education system operates. In Uganda, wide-spread poverty in rural areas (World Bank 2023) is an issue to consider. For example, in the study area, learners and their families have to engage in charcoal production (deforestation) in order to fund their education (school fees and other scholastic requirements) yet the same education system teaches about the harmful environmental effects of deforestation. Also, poor government funding for the education sector occasioned by inadequate budgetary allocations (Juzon and Liberman 2021) may not support the ideal pedagogical and curriculum reforms that are envisaged.

Conclusions and recommendations

In conclusion, a pedagogy that recognises and embraces different environmental knowledge systems may be mounted in everyday teaching practices of schoolteachers. A hybrid pedagogy with both formal and informal school characteristics is possible and can situate learners in their community experiences. This pedagogy can be entrenched in curriculum documents in the form of a framework that any teacher in any environment can implement based on the special characteristics of the place.

Education systems can go beyond inclusion of different knowledges within the curriculum to genuine acknowledgement of how these knowledges can be evaluated, critiqued and developed to bring about meaningful change in the way environmental education is structured at curriculum level to how it is taught at classroom level.

Finally, there is a need for more research to understand the ways that multilingual and epistemologically diverse curricula and place-based pedagogies can support transformative environmental education for positive action. This paper has argued that the genuine

inclusion of indigenous knowledges, and supporting learners to understand how they conflict with and can enhance formal school knowledges, is one place to start.

Note

1. This is a pseudonym.

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