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Research article

Climate change and sustainability education in India and the place for arts-based practice: reflections from East Kolkata Wetlands

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Abstract

In 2019 India was ranked seventh most affected nation by climate change, yet 65 per cent of the Indian population had not heard of climate change. India's revised National Education Policy mentions climate change and environmental issues as part of its work towards reaching the United Nation's Sustainable Development Goals. However, to date, climate education in India has tended to remain the responsibility of the secondary science teacher in many schools where resources are limited. Following calls for a more holistic and multidisciplinary approach – where students can link environmental issues with their lives – we reflect on three arts-based climate education exemplars with students

from the East Kolkata Wetlands (EKW) (n = 150, 10–17-year-olds). We consider how these frame climate change and sustainable education as a collective learning experience, rather than as scientific concepts alone. We respond to Szczepankiewicz et al.'s model for climate education and propose that teacher training in the EKW context can be conceptualised through a three-stage, interconnected approach to pedagogy: building concepts, learning through hands-on activities and building communities is central. We suggest that these three generalisable tenets of student teacher practice should be explored in other areas of ecological fragility, as well as in spaces of economic insecurity.

Keywords climate education; sustainability; India; arts-based practice; eco-citizenship; community; hands on; East Kolkata Wetlands; teacher training

Introduction

In 2019 India was ranked seventh most affected nation by the impacts of climate change (Eckstein et al., 2021) and yet 65 per cent of the general Indian population had not heard of climate change (Leiserowitz, 2018). Such dissonance has not emerged intentionally. A focus on environmental education has its genesis in the National Policy on Education, 1986, updated in 1992 (Government of India, 1998). It has been mandated by the Supreme Court of India and overseen by the National Council of Education Research. Environmental education, which includes climate change and sustainable education (CCSE), is part of teachers' professional development offered through a distance education programme developed through the Centre for Environmental Education. The National Council for Teacher Education also developed a manual on environmental education for student teachers. Through all this, the protection of the environment is a common feature around which the National Curriculum Framework is developed. More recently, India's revised National Education Policy (MHRD, 2020) mentions climate change and environmental issues as part of its work towards reaching the Sustainable Development Goals (SDGs). These 17 goals, agreed by the United Nations (UN) in 2015, have 169 targets to be realised by 2030. The goals of specific interest to this article include issues relating to: promoting decent and sustained work for all; making settlements sustainable with appropriate production and consumption patterns; and conserving and sustainably using marine and land resources. Education in India has been framed as a way of raising awareness of climate change and its impacts in line with the SDGs (Government of India, 2020), thus developing educated and engaged eco-citizens. Such citizens are situated within the context of sustainable development, wherein social equity, improved quality of life, aspirations for a better life, opportunity, democracy, participation, inclusion, health and positive social change are embedded (Agyeman and Evans, 2004). In this sense, sustainability, environmental justice and social good are entwined (Mor Barak, 2008). More widely, there is growing concern about the role of the eco-citizen in sustainability and climate change education due to the challenges of personal reflection on self, relationship with others and environment, and care of place (McEwen et al., 2020).

In this context, a series of activities was devised that linked knowledge, locality and the development of the eco-citizen using a cross-curricular arts-based pedagogy with minimal resources. While the broader objective of the project was to compare pedagogies for CCSE in the UK and India, this article focuses on the series of activities developed and reflected on by practitioners in India to inform teacher education. The specific questions this article explores are:

1. How can pedagogies that support learners' local knowledge enhance engagement with issues surrounding CCSE in India and the development of eco-citizens?
2. How can student teachers in India be better prepared for the challenges of teaching CCSE?

Central to our engagement with children from the East Kolkata Wetlands (EKW), India, we aimed to:

1. raise awareness of issues of CCSE practices through an immersive arts-based pedagogy embedded in the EKW and its socio-spatial landscape
2. address issues of identity and aspirations of children from the EKW and build notions of eco-citizenship through dialogic practice

3. build exemplar workshops to showcase how arts-based climate education can be enabled by teachers and student teachers in response to Szczepankiewicz et al.'s (2021) model for climate education.

This article presents the context of the EKW, before considering the place of arts-based practices and CCSE. We then consider practitioner observations of CCSE on activities with students in the EKW. Data are taken from a literature review of the Indian teacher training curriculum, interviews with nine practising teachers, reflective diaries, and photographs taken by the two India-based authors of this paper, along with examples of student work (10–17 years old) from two high schools in EKW (n = *c.* 150). Data from these different sources were analysed by the team during and after the engagement activities. Following Altrichter et al. (2008), analysis of data was read and reflected on to inform ongoing sessions and distil insights.

We argue that linking human agency with life experience and resources is imperative at a time of climate crisis. We further argue that trainee teachers need guidance in appropriate pedagogies to support young people in their development as eco-citizens and learning for socio-ecological resilience (Adger, 2000).

Climate change and sustainable education

During the 1990s, educators around the world became increasingly aware and concerned about the impact of economic development on the environment (Jickling and Wals, 2012). As this work developed and became known more widely as 'education for sustainable development', education began to be integrated into global policy initiatives (UNESCO, 2005; Aikens et al., 2016). In 2004, the UN launched their Decade for Education for Sustainable Development (UNESCO, 2005), which highlighted the belief that education for sustainable development should be integrated into both formal and informal education in order to develop the knowledge and attitudes required for a sustainable global society (Aikens et al., 2016; Salas-Zapata et al., 2018). In 2015, the UN, now at the end of their decade of education for sustainable development, adopted 17 SDGs. These not only reflected broad social and economic issues, but also demonstrated – through SDG 4 – the need for quality education. Hallinger and Chatpinyakoop (2019) consider education for sustainable development to be the most fundamental element of the 17 SDGs, as it looks to harness sustainable behaviours, attitudes and values among global citizens and at all levels of education. However, the implementation of CCSE has been, and continues to be, variable. For the purpose of this article, the focus will be on how CCSE has been implemented.

Climate change education and sustainability in India

Traditionally, CCSE in India has been the responsibility of the science teacher, with only student teachers of biology having subject knowledge relating to CCSE as part of their curriculum. In the 1990s, India's education system was reviewed in the *Learning Without Burden* report (Yashpal Committee, 1993). Science curriculum load, as with other subjects, was taught through authorised textbooks, with the view that the curriculum was a 'bag of facts' to deliver. Such pedagogy robbed learners of agency, and expert knowledge was celebrated over local (Takker and Ramchand, 2022). In 2009, major education reforms were witnessed across the country with the introduction of the National Curriculum Framework for Teacher Education (NCTE, 2009). Within this, teacher education was recommended to build student teachers' ability to construct knowledge, using pedagogic expertise to meet the needs of children in diverse contexts. By 2014, the two-year Bachelor of Education (BEd) programme integrated 'knowledge about the learner, the subject and the societal context' (NCTE, 2014: 15). The Government of India (2020: 37) suggested that this shift in policy was the key 'to empower learners to become aware of and understand global issues and to become active promoters of more peaceful, tolerant, inclusive, secure, and sustainable societies'.

India's revised curriculum begins to make links between disciplines, and highlights the complexity of overlapping issues and processes. However, implementing these curriculum reforms has challenges. While subjects are reconceived around environmental issues, they do not engage with immediate issues of climate change and sustainability (Sarang, 2021). Instead, Indian curricula, and its teacher training, continue to centre on the transfer of information about environmental law, wildlife protection and Supreme Court decisions relating to issues such as the species of grasses grown in India.

Those areas of India that follow systems implemented by the Central Board of Secondary Education (CBSE, 2019: 9) are expected to:

> strive to promote conservation of environment on their campus through rain water harvesting, segregation of waste at source, recycling of organic waste, proper disposal of waste including electronic waste, use of energy saving and energy efficient electrical equipment, greening of campus, use of solar energy, education and awareness amongst children on environmental conservation and cleanliness, etc.

However, Ramchand (2022) identifies that inadequate resources and state investment is a critical obstacle for successful CCSE. Teachers and student teachers have little access to quality resources while training and when qualified. In addition, the Affiliation Bye-Laws (CBSE, 2019) state that it is mandatory for schools to set up Eco-clubs and ensure participation of learners across all school ages. While such policies provide curriculum and extra-curricular opportunities to engage with CCSE, this is not consistent across India. This article relates to schools in West Bengal who follow the West Bengal Board of Education (WBBE). Teachers in our study spoke of how the implementation of CCSE is context dependent. While there are Eco-clubs in many settings, teachers spoke of 'high tier' schools (with plenty of resources) more easily managing to source and deploy dedicated resources for CCSE. In middle and lower tier schools, CCSE was reported to still be the responsibility of geography or science teachers. Further challenges include teacher education programmes entrenched in ritual-like practices (Government of India, 2012, 2020) and student teachers tending not to view activities and resources as teaching tools to enable co-constructed, dialogic learning (Ramchand, 2016).

The need for alternative approaches to CCSE

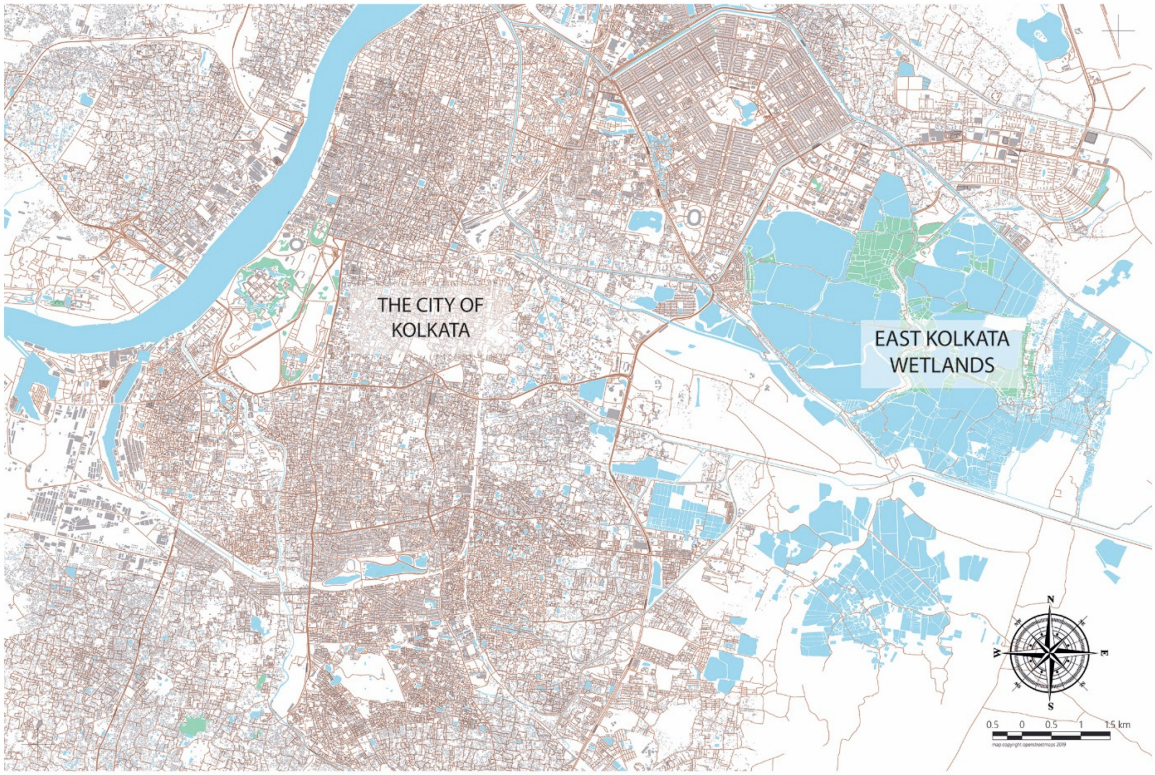
In this context of multiple challenges, Sarang (2021) calls for practical knowledge about CCSE to be shared with and among children, enabling them to co-create their understanding and link environmental issues with their lives and futures, thus motivating young eco-citizens to conceive of solutions. The need for such holistic pedagogy (which for the purpose of this article relates to the activities teachers use) is not limited to India alone.

Szczepankiewicz et al. (2021) present a conceptual model for a systematic approach to CCSE that has three elements: *cognitive*, *socio-emotional* and *behavioural learning*. This model recognises the need for a holistic approach to CCSE, noting that teacher education is essential and requires exploration. However, as with pockets within the Indian context (such as schools in the EKW area), this model provides no detail as to what this teacher education and associated pedagogies might look like, or how this might be achieved in different contexts. Szczepankiewicz et al. (2021) call for work to develop these insights. While the content of CCSE is recognised as science based, the format by which this is communicated through effective pedagogy has been left to be explored. We will consider this in the context of student teacher needs, appropriate pedagogies in EKW and the transferability of such a framework to other areas of ecological fragility and in spaces of financial insecurity.

East Kolkata Wetlands, India

The world's waterways have 80 per cent of all human-produced untreated wastewater discharged into them. This creates health, environmental and climate-related hazards – significantly contributing to greenhouse gas emissions (IWA, 2018). The EKW is spread over 12,500 hectares and lies on the eastern fringes of Kolkata, India (see Figure 1). It is the largest stretch of sewage-fed wetlands in the world, and an internationally renowned Ramsar site. Ramsar sites are wetlands designated to be of international importance under the Convention on Wetlands (Matthews, 1993) – an intergovernmental environmental treaty. This is a peri-urban landscape, inhabited by about 150,000 people.

Figure 1. The East Kolkata Wetlands in relation to Kolkata, India (Source: Disappearing Dialogues Collective)



This community views wastewater as a nutrient to be preserved, using it to facilitate their livelihoods, treating the sewage from the city through paddy cultivation, vegetable farming, animal husbandry and fish farming. These practices produce 15,000 tonnes of fish per year (Dey, 2015), 10.5 million tonnes of rice per year (Dey and Banerjee, 2016) and 150 tonnes of vegetables per day (Prusty, 2017). They treat sewage and help with drainage. The EKW is thus critical to Kolkata's sustainability. The rich biodiversity of the area further adds to this, and helps to maintain the city's ecological balance.

While of major benefit to the area the EKW is under severe threat. The growing urban centre, far from acknowledging the EKW's role in maintaining ecological balance, views the area as *real estate in waiting* (Bunting et al., 2010). As such, the area is highly susceptible to illegal filling, encroachment and environmentally unsustainable development schemes (Bhattacharya, 2017). Local waste is often dumped into the water bodies of the region, and the cascading effects of climate change are disrupting the acidification of freshwater systems and threatening the biodiversity (Roy-Basu et al., 2020).

All these factors make EKW extremely important as a context for CCSE – in terms of both needs and assets. The rich ecology, unique landscape and biodiversity must be preserved as much as the embedded traditional knowledge and contextual wisdom of the area. For local students, the EKW could be used as a fertile learning ground in their overall development to become responsible eco-citizens and stewards of sustainability for their local context. However, such a task brings with it challenges for the student teacher to negotiate.

Climate change and sustainable education through arts-based practice

The teachers we spoke to (see Table 1) about how they were prepared to teach CCSE in the EKW were in consensus: training for the teaching of CCSE had been predominantly restricted to the teachers and student teachers of science (in particular, biology). Pedagogies learnt in training for the purpose of

communicating CCSE were knowledge transfer based. In schools that had equipment, this could be supported through the use of interactive whiteboards where videos could be shown. However, many schools, especially in the EKW, are without such resources. This calls for an exploration of more holistic approaches to CCSE alternative pedagogies, through and with different subjects that student teachers can explore.

Table 1. Summary of teachers/principals interviewed (Source: Authors, 2022)

Teacher/principal	Subject	Board of education	Level taught
T01	Art	CBSE	Middle and high school
T02	Drama	CBSE	NA
T03	Language	WBBE	Junior school
T04	Teacher training	Modern Academy of Continuing Education, Kolkata	Student teachers
T05	Geography	WBBE	Middle and high school
T06	Science	ICSE	Middle and high school
T07	English	ICSE	Middle and high school
P01	-	WBBE	Whole school
P02	-	WBBE	Whole school

It has been argued that art has a critical role to play in CCSE, as it can create hope at a time of crisis, and encourage responsibility and care for the local and global (Ryan, 2016). Bentz (2020) notes that combining arts-based methods and climate education can serve to expand young people's imagination, and so empower them to co-create new futures through transformative change. Such a pedagogy sits in contrast to the traditional pedagogies with which student teachers are familiar in WBBE, and it forms the basis of activities presented in this article.

Some arts-based practices in schools in Kolkata and the EKW are being developed. The Arts Integration Programme is followed by the CBSE, but not by the WBBE. Under this programme, the CBSE link all curriculum areas with arts. This requires two subject specialists and the support of the art teacher. As one teacher (T02) commented, 'the value of this initiative is high, as art definitely helps address the gap between subject and context'. However, due to the different education boards of India, the manner in which arts-based practice and the potential CCSE engagement are implemented is patchy.

Arts-based CCSE can be delivered in three ways: in, with and through art (Bentz, 2020). To use art *in* or *with* CCSE reduces art to creating more aesthetic ways of communicating complex issues, and thus relinquishes its potential to contribute to seeing climate change and sustainability in new ways. CCSE *through* art invites a more embodied experience, one where the senses are connected with new perspectives to stimulate social reflection. It is this latter delivery path around which activities in this study were planned.

The process of engagement foremost encouraged *situated learning* from the students' lived experience through three main avenues:

- *learning from the context*: an immersion in a locale
- *learning by doing*: an assimilation of knowledge through activities, individual or collective
- *learning to observe, innovate and disseminate*: a process that does not create distinctions between knowing and sharing, between learning and teaching, between assimilation and dissemination.

Being by nature holistic and interdisciplinary, the pedagogies of arts-based practices enable discussions on intangible issues (for example, identity, security and confidence) essential to understanding and making sense of CCSE. Activities situated in the young people's lived experience were developed, which focused on three concepts: developing community understandings of the locality (relating to SDG 11: Sustainable cities and communities, and bringing context to Szczepankiewicz et al.'s [2021] conceptual model), understanding biodiversity (SDG 14 and 15: Life below water, and Life on land) and the use of finite resources (SDG 12, Responsible production and consumption).

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The context of learning reported here is one where classrooms do not usually follow an integrated arts approach, and are without resources such as interactive whiteboards and access to the internet. This can be a challenge for student teachers. Pedagogies cannot rely on showing films, or using computer-based quizzes or internet research; in the EKW, alternative pedagogies needed to be explored that were innovative in their use of resources, relying on dialogue and group work for critical thinking to engage and enable CCSE that works towards eco-citizenship.

Method

This study is situated in the qualitative, participatory paradigm, and it comes in response to calls for more participatory approaches to research for marginalised groups – including those from rural areas, young people and the Global South (Alminde and Warming, 2020). In attempting to identify how pedagogies can support learners' local knowledge and enhance engagement with issues surrounding CCSE, and how student teachers in India can be better prepared for the challenges of teaching CCSE, we developed three workshops and delivered these to two schools located in the EKW (see Table 2 for information regarding participation).

Table 2. Workshop and school information (Source: Authors, 2022)

Workshop theme	Target SDG	School	Age group	Number of students
Building Community Understanding	11	Bamanghata High School	14–17	30
Understanding Biodiversity	14, 15	Kheadaha High School	13–15	30
Understanding Finite Resources	12	Bamanghata High School and Kheadaha High School	13–17	60 (30 from each school)

Participation and inclusivity were at the root of our approach. This enabled discussions and concerns regarding the environment and sustainability to be heard. Students were seen as active agents at the centre of their own learning and cultural formation (Hedegaard, 2020). This approach relinquished the control of the teacher/researcher and provided opportunity for unpredictability and the space for new ideas to emerge (Walters, 2020). Three workshops were designed, which are outlined below.

Workshop 1: Building community understanding (SDG 11: Sustainable cities and communities)

This first workshop was based around three activities (each taking about thirty minutes) that reflect on *building community understanding*. Traditional forms of CCSE in the EKW present decontextualised, textbook-based learning. Focusing on the local disturbs this tradition and realigns the learning to the familiar. Students' surroundings, lifestyles, practices and people all become part of learning through lived experience. The classroom-based sessions required minimal movement of furniture and low-cost resources of paper and colouring pens.

Activity 1: role play

The first task involved groups of about ten students in role play. Role play was used to develop communication skills, creating a new atmosphere in the classroom and developing knowledge of local context (Wulandari et al., 2019). As a first activity, it allowed students to dramatise both hypothetical and known situations in a safe environment through active learning. Each group enacted a short scene which they felt represented their environments. Role play offered space for reflective, embodied, fun learning – in contrast to the traditional knowledge transfer of teacher to student.

Activity 2: collaborative visual representation

Each group made a collaborative, visual representation of their neighbourhoods and the components of the EKW that were enacted in Activity 1. Changing medium concretises earlier learning into referable forms and provides opportunity for students to consider their own position, as stewards for the environment and developing eco-citizens, through communicating by non-verbal means (Barnes, 2022).

Activity 3: freeze frame

The final activity returned to role play, where each group of students was asked to create a freeze frame: a 'family portrait' in which students dressed in favourite items of clothing, and items of clothing belonging to a family member (of an earlier generation) which they had brought into class. Dressing up and wearing costumes tends to be enjoyed by younger children (Coyne et al., 2021). However, in this activity, the costumes did not relate to imagined heroes or characters from epic stories, but people they knew and could relate to. Groups were asked to dress up as a family who live and work in the EKW. Each family was to be comprised of people from the students' generation, their parents' and their grandparents' generation. This activity required students to empathise with their family and people who lived within their local community. Again, this activity required no use of costly resources, but did rely on students critically reflecting on family and community cohesion in their locality.

Workshop 2: Understanding biodiversity (SDG 14 and 15: Life below water, and Life on land)

Taking students out of the classroom can be nerve-racking for the student teacher (Quarmby et al., 2019); however, the wealth of experience that such pedagogies present can bring new meaning to CCSE which traditional pedagogies in this locale offer. Students walked around the wetlands and along the wastewater canals – collecting flora samples, recording data and observations through drawings and writings. This personal study allowed students to see how elements within the wetland's biodiversity exist and benefit everyday life.

This workshop destabilised the usual science and geography lessons in which CCSE is usually experienced. Students were taken outdoors for research-based learning. Some countries embed outdoor learning in their expectations. Scandinavian schools have outdoor learning every day, while in China, where there are high levels of pollution, outdoor learning is not encouraged (Sandseter and Kennair, 2011; Birkeland and Sørensen, 2021). Workshop 2 recognised that outdoor learning is embedded in the local culture of which students are part (Grindheim et al., 2021), and so helps to form rooted cultural understanding.

Workshop 3: Understanding finite resources (SDG 12: Responsible consumption and production)

Two making activities were developed in response to the illegal waste dumping in the area. Students created herb gardens and costume design from domestic waste. Learning through making has a long history rooted in the work of Piaget, Dewey and Montessori, with their emphasis on active learning (Martinez and Stager, 2013). Martin (2015) notes that making activities help students take on different roles (for example, mathematician, scientist, designer) to enable knowledge, skills and practice to come together to solve problems, while Brown (2015) and Kostakis et al. (2015) comment that sophisticated tools such as 3D printing or virtual reality software are often used in making to engage students in practical, hands-on learning. Due to the limitations of the context, our activities did not rely on expensive equipment or resources.

Activity 1: herb gardens in disused plastic waste

Plastic waste is a major form of inorganic pollutant in the EKW. Children are familiar with seeing this waste, and providing space to repurpose plastic bottles as planters for a variety of local flora opens up conversations about individual and collective practice that could potentially solve local problems that

may be similar elsewhere – thus linking the local to the global. Students were asked to choose a piece of clean plastic waste and visualise how it could be transformed into a herb garden. Students then made the gardens – involving cutting and decorating the plastic vessels, before filling them with compost and seeds.

Activity 2: costume designing with local inorganic domestic waste

Students were asked to reuse and make costumes using material from classroom displays that would have been thrown away. This activity created objects that foreground the abundance of waste in the EKW and its problems for the larger local ecosystem.

Ethics

Ethical consent was gained from the university's ethics committee following British Educational Research Association (BERA, 2018) guidelines. Consent was then gained from head teachers, parents, teachers and students. At the start of each workshop, the research was re-explained to participants, and verbal consent was confirmed.

Data collection and analysis

All participants and schools were coded to support anonymity (school, participant). Interviews were recorded, transcribed and then coded using content analysis, as defined by Patton (2002: 43). During the workshops, photographs were taken, both of activities and creative products. Photographs were taken for a variety of purposes, including to showcase work in later exhibition spaces, and as a representation of the experiences and issues relating to the particular activities and where they took place. Pink (2021) notes that this walking through and photographing a place can invite the viewer to follow a narrative of the journey (or, in this case, activity) and explore the visual text as an empathetic and experiential one. Due to limitations of space, and our ethical responsibility not to include identifiable individuals within this publication, we have included only a limited number of images in this article. We hope this provides a taste of experiences, and we will explore this visual narrative making for CCSE elsewhere.

We adapted Clark and Moss's (2011) method of learning walks with students. While learners were drawing at their desks or along riverbanks, and while they created their herb gardens or costumes from waste, we walked round them, asking questions and discussing activities in order to clarify meaning. Using student-centred techniques of data collection allowed non-threatening insight into thinking and learning about the issues they were exploring. These activities and insights were later written up in our research diaries, and they helped us in making sense of the photographs when further analysis was undertaken after the session.

We followed Braun and Clarke's (2006) five-step system as a thematic approach to qualitative data analysis. This involved: (re)reading and becoming familiar with the data; generating initial codes; searching for themes; reviewing the themes; refining the themes; and looking for commonalities and complexities. Overarching themes identified were: use of space, resources, and links to locality (social and environmental). We triangulated themes between the data sets, and these were reviewed by a second member of the research team in order to verify the domains.

Findings

Workshop 1: Building community understanding (SDG 11: Sustainable cities and communities)

Activity 1: role play

Students co-constructed their understandings of the local geography, as recorded in research diary entries:

> A group enacted fishing and the relationship to water. The girls at the front mimicked swans which are very commonly seen here. Other girls in the back mimicked different fishes in the water. Within this landscape, a boat with fishermen (depicted by boys) is out to catch the fish. Interesting to note how all of the boys act as the fishermen, even though no such gender roles were assigned.
>
> Another group enacted the scene of a busy haat in the East Kolkata Wetlands. [The *haat* is a market that gets set up periodically in a pre-decided place.] Haats in the EKW are usually agglomerations of various kinds of local produce, traditional craft-based objects and commonly consumed items. These usually cater to the immediate communities, and items are available at very affordable prices.
>
> In the students' enactment various stalls were set up. On the left was the puchka [a very common, cheap and famous street food of Kolkata] seller serving her various customers. In the middle, a girl was trying to depict a vegetable/small goods seller. On the right a fish shop was depicted. There was a general chatter accompanied by sounds of haggling and bargaining by the participants, which mirrored the real haat.

Role play provided a space for students to reflect on what their locale was like, and through their depictions they began to critically question who had what role, why they had those roles and what the consequences of those roles were for the community and ecosystem. Students were constructing their knowledge from each other with support from the teacher.

Activity 2: collaborative visual representation

Through both our diaries and image analysis, gender was a consistent theme through Activity 1 and Activity 2's role play and drawing (for example, female market sellers and male fishermen), while environmental protest was considered an action of both males and females. A deeper understanding of the wetlands became visible through these outputs:

> Students represented the links between human life and the life of things around, specifically flora [see Figure 2]. It showed both the activities of nurturing as well as harming of the existing flora. In the background children's placards say – ' bachao, praan bachao' [save plants, save lives] and 'jalabhumi bachiye rakhar sochetonota chai' [we need increased awareness to protect the wetlands].
>
> Interesting to note that the river in all depictions is blue and looks clean – this does not reflect the reality, but perhaps the idealised version of the locale. In this image, children are in some sort of a school uniform, holding up the placards of protest. When questioned, the makers said that they wanted to highlight the role of students and education in being the ambassadors of awareness and positive transformation. (Research diary entries)

Figure 3 is a powerful representation of the haat ambience with a special emphasis on the puchka seller. Elements of the EKW landscape are indicatively present. The standalone sketch showed a chicken seller with his wares. A poem accompanies the image, roughly translated as:

> In the distance, is a haat – a place where many streets lead,
> A place where people meander to, a place where they meet,
> This one day, people all come together in laughter, joy and celebration
> So many things are found – it defies comparison!
>
> Different people sit, shoulders together, sharing space –
> The tea stall sees a gathered crowd.
>
> Someone shouts – 'Be careful, there's a baby –
> He might get hurt amidst the crowd!'
> And there's people, novel food –
> Amongst other things, the puchkas are good. (Research diary entry)

The open-ended nature of this activity allowed students to respond to the task in whatever creative form they chose, allowing for both drawing and poetry to emerge. Not restricted by a model of teacher delivering knowledge and student receiving it, students were able to co-create complex understandings of systems through their talk and interaction with the teacher and their creative pieces. The reliance of local people on the ecosystem could be explored through both image and metaphor: the lone fisherman of increasingly polluted waters; the desire for students to care for the environment and a young baby (in the poem) getting 'hurt amidst the crowd'. This intergenerational representation allowed for discussion of who and what is in danger and from whom.

Figure 2. Student collaborative artwork (Source: Disappearing Dialogues Collective)

Activity 3: freeze frame

Students dressed up and then built a backstory for each of their family characters. This illustrated generational transformation in gender roles, economic activity, connection to the locality and future hopes for greater environmental stewardship through eco-citizenship:

> The children started by introducing the grandparents of the family – seen in a saree, and wearing a lungi, with a gamcha wrapped around his torso. This was followed by the father of the family wearing a shirt and his wife in a kurti. Finally, the two daughters of the household wore a dress and a t-shirt respectively.
>
> When asked if the dressing of this family has been appropriate, the students replied yes it was of a 'typical style'.
>
> The student dressed as the grandfather in the second group introduced himself as a labourer working in the building industry. He wore a lungi, with a gamcha wrapped around his torso. The grandmother, wearing a saree, identified her work being primarily within the house, taking care of the household and family members. The father, in a shirt with trousers and with an identity card hanging round his neck, said he was a security guard. His wife, with a dupatta thrown over her torso, took care of the household. The younger generation of the family were college students and all wore dresses.

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> There was a gender divide in where people worked. There was also a shifting of the professions through the generations. While the grandfather worked in and around the community, the son works as a security guard in the city. The daughters were studying in college so they would most probably have a future that takes them out of the EKW. (Research diary entries)

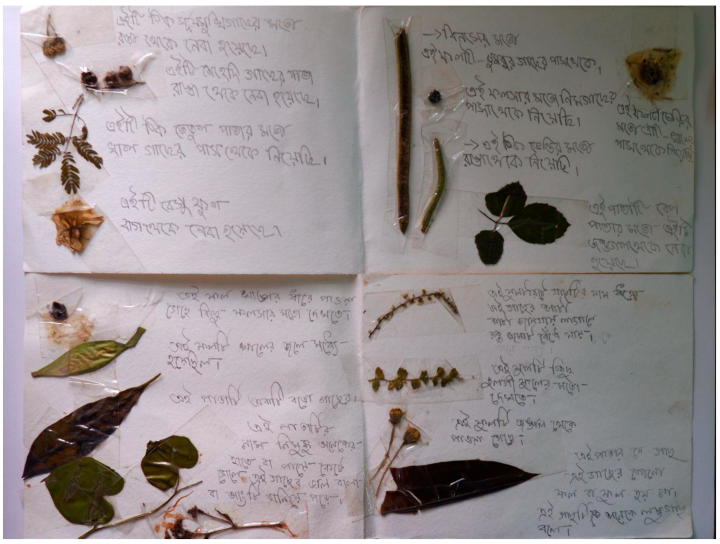
Figure 3. Student collaborative artwork and poetry (Source: Disappearing Dialogues Collective)

Workshop 2: Understanding biodiversity (SDG 14 and 15: Life below water, and Life on land)

Students were encouraged to identify the value of the ecological wealth of the EKW as they walked along the water. For many, this gave a sense of pride and new respect for their environment as growing eco-citizens. The children helped each other identify the species they had collected. Students took the time to explain how certain leaves and fruits are used at home to treat common ailments:

> There were numerous discussions whilst making the Wetland Nature Journal [see Figure 4], sharing key information and facts about species. These sheets of information were further worked on by the students at home where family added recipes that involved the use of specimens. Samples were also collected for the Wetland Nature Archive. The archive is not only useful as a documentation of local knowledge, but is also critical in the process of dissemination to a wider audience through its exhibition and giving real purpose to CCSE that the children experienced. (Research diary entry)

Figure 4. Nature journal (Source: Disappearing Dialogues Collective)



Workshop 3: Understanding finite resources (SDG 12: Responsible consumption and production)

Activity 1: herbal gardens in discarded plastic bottles

The workshop saw children coming up with bright and colourful transformations of bottles (see Figure 5).

> We asked each of the participants to take home the planters and take care of them and help the plants thrive. What was most heartening to us was seeing the children add to these planters by making their own. Even today, as we roam in the surroundings around the children's homes one can find recycled bottle planters and small kitchen gardens many months since the workshop. Thus, this workshop demonstrates how the arts and community can come together to transform an object seen as waste to something of value. (Research diary entry)

This simple activity had little cost, yet it inspired children and families to develop ideas and actions that sustain a growth in eco-citizenship.

Figure 5. Herb gardens (Source: Disappearing Dialogues Collective)

Activity 2: costume designing with local inorganic domestic waste

> Throughout this activity, discussion of why waste is created and how it might be reduced were critically considered and guided by the children. Reflection on what would usually happen to the waste and original sources were discussed. The use of waste chart paper from the classroom and newspaper (donated from home) provided interesting forms as children experimented with joining and structure [see Figure 6]. The activity culminated in a display of work to share ideas and disseminate knowledge with others – this display proved to be a great motivation and gave the children purpose. (Research diary entry)

This activity built on the work the children had been doing on reusing domestic waste, and it helped further unlock the creativity of the group to imagine waste in different forms. The culmination of these waste minimisation activities, along with other activities (including making musical instruments from domestic waste with the help of invited expert musicians, and making paper from banana plant waste), provided a central element of the children's performance at the Kolkata Centre for Creativity in a performance, titled *'We can save our wetlands together!'*

Figure 6. Costume design (Source: Disappearing Dialogues Collective)

Discussion

In the CCSE activities presented in this article, the process of interaction, discussion and presentation all play an equally important role that a student teacher needs to explore both in training and practice. All activities triggered a discussion of various aspects of CCSE based on particular SDGs. Livelihoods, customs and practices of the EKW were explored through drama, allowing for the exploration of SDG 11, and for community understanding to develop. Starting from the children's lived experiences, discussions developed about the unique natural features of the landscape, the community's relationship to water, and various species of plants and flowers that grow there. Fishing as an important profession, its various structures and linkages to the EKW community were discussed. Children discussed the importance of the local *haat* (weekly market), with the various sellers and their wares. Finally, the larger issues of waste and the encroachment of the EKW by the growing city were considered.

Using outdoor learning opportunities to look at the biodiversity of the EKW played a critical role in familiarising the students with their own context, and could offer the student teacher an opportunity to explore these contexts, positioning their students as experts. Although children live and grow up in the EKW landscape, that knowledge is often ignored within the classroom in favour of the

predominantly didactic strategies of traditional CCSE. Once outside, personal knowledge can resurface. This community knowledge was further developed when students took their journals home. Providing opportunity to talk with parents and grandparents extended and gave authority to other voices than the teacher in their development as eco-citizens through CCSE. Students were able to compile knowledge of biodiversity in the community about the local context for CCSE. Having an exhibition as a final lesson outcome gave real purpose and focus to the children's work, which was mirrored in the waste minimisation sessions.

The *waste minimisation sessions* not only worked towards a final performance that contributed to public dissemination of learning, but, as with other activities presented here, built on community knowledge, CCSE subject knowledge and transformative action on a low budget – all essential for the student teacher to consider in this context. Using creative activities could allow the student teacher to frame concepts such as cycles of production and consumption, and linear and circular economies, while also exploring new alternatives of utilising waste in the locale.

The activities discussed all have a common approach: they focus on using children's lived experiences as the grounding for learning through dialogic exploration, reliant on minimal resources. We argue that this focus should be included in student teacher training within the EKW.

Szczepankiewicz et al. (2021) present a conceptual model for a systematic approach to CCSE that has three elements: cognitive, socio-emotional and behavioural learning. In this article, we have presented a deeper layer of understanding of what this could look like in practice, in the EKW, and, we argue, in other areas that support learners in ecologically fragile, low resourced locations. We have shown how such an approach has enabled a more embodied learning experience: senses connect with new perspectives to stimulate social reflection and develop eco-citizenship through dialogic teaching. These experiences are not restricted to inside the classroom. We have seen how drama, journal making and craft provided space for children to talk and learn together, share learning with families and the local community, and deepen situated knowledge of their position in an ecosystem under threat by local and global forces. Such pedagogy needs to be explored and developed in student teacher training in the area. Student teachers need opportunities to think of activities as processes, and learners as co-creators of understanding (Rosaen and Florio-Ruane, 2008) in context, with resources as a scaffold (Ball and Cohen, 1996), rather than presenting themselves as the purveyor of knowledge, reliant on textbooks. These pedagogical approaches do not necessarily incur financial costs with extra resources, but they do demand planning and delivering activities in ways which support critical thinking and dialogue.

In order for student teachers to feel confident and be better prepared for the challenge of delivering climate change education in fragile ecosystems such as the EKW, we argue that current training needs:

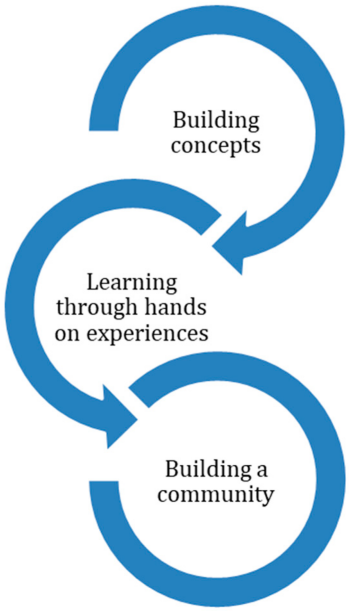
- specific support for subject knowledge development across the curriculum, so that CCSE does not rely on science teachers alone
- specific support in CCSE pedagogy, with a focus on arts-based practices to develop learning that supports eco-citizenship through a value-based, inclusive, dialogic approach
- exploration of ways in which the local environment can be used as a teaching tool in order to engage and enable holistic experiences and link the familiar with complex issues and processes at the global scale.

In response to Szczepankiewicz et al.'s (2021) model, we propose that teacher training can be conceptualised through a three-stage, interconnected approach to pedagogy where *building concepts*, *learning through hands-on experiences* and *building communities* is central (see Figure 7). Szczepankiewicz et al.'s (2021) model is purposefully contextless. Our model is purposefully contextualised in the EKW. We suggest that the three generalisable tenets required in student teacher practice should be explored in other areas of ecological fragility, and in spaces of financial insecurity, to consider its transferability in the future, and with larger groups and wider age ranges than those afforded here.

In this model of teacher training, we move away from the textbook and knowledgeable teacher as main modes of CCSE knowledge transfer. We conceive of CCSE concepts as critical to holistic development of the child, but not as the responsibility of a single discipline or teacher. Concepts are building blocks with which to make connections – between subjects, between the taught and the seen, between what is learnt and what is known. These concepts help children navigate and understand the complex interrelationships of their locale. Hands-on activities, individually or in groups, are a central component of arts-based pedagogy. Such pedagogies help the student teacher blur boundaries between different bodies of knowledge, pulling from multiple sources of information and skills to create

sets of tangible outcomes. Hands-on activities also provide opportunity to take learning outside the classroom, into the context and into everyday life; none of these are necessarily reliant on expensive equipment and resources. We recognise that confidence and competence in appropriate outdoor pedagogies will need to be developed, as well as concerns regarding preparation time, resources and wider school culture that are reinforcing a didactic approach (for a discussion of this, see Quarmby et al., 2019). Building a strong community of eco-citizens, crafting sustainable futures and mitigating climate change form the basis of transformative change; it cannot be done alone. Building communities happens slowly, but planning (for example, for exhibitions and performances where children are the main authors, and the reality of the locale is the key theme) can promote wider engagement. Taken together, this model creates trajectories through which CCSE can pave the way to building up a community of eco-citizens – learning from, and working with, their own local contexts to create change.

Figure 7. An integrated approach to CCSE in East Kolkata Wetlands (Source: Authors, 2022)



Declarations and conflicts of interest

Research ethics statement

The authors declare that research ethics approval for this article was provided by the University of the West of England, Bristol, ACE ethics board.

Consent for publication statement

The authors declare that research participants' informed consent to publication of findings – including photos, videos and any personal or identifiable information – was secured prior to publication.

Conflicts of interest statement

The authors declare no conflicts of interest with this work. All efforts to sufficiently anonymise the authors during peer review of this article have been made. The authors declare no further conflicts with this article.

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