

Fostering Natural World Engagements: Design Lessons & Issues From, The My Naturewatch Training Programme

Nature's welfare is inter-twinned with humankind's', requiring mass citizen-led action. Wildlife advocate Attenborough says, '*we share responsibility for the future of life on earth, [we all have] the power to change*'. The My Naturewatch project (NW) follows research through design approaches: deploying DIY devices, supporting new engagement methods between nature, technology and humans. The NW cameras assist participants in capturing images of 'back garden' wildlife. Authors position NW cameras as agent(s), enabling 'designed engagement(s)' establishing; agency, serendipity and impact.

The article recounts a '*Training Scheme*', providing nature organisation(s) methods to foster public engagement through DIY, accessible digital technologies. The scheme encouraged appropriation; suiting contextual, environmental and organisational requirements. Authors unpick experiences and issues, realised (through practice) by fourteen nationally acclaimed wildlife and conservation organisations, independently running workshops with NW tools. Findings report on issues and opportunities of; designed community engagement(s) for practitioners engaged with *defining more sustainable practices*.

Keywords

Open Design, Engagement, Design for Active Engagement, Nature, Civic Empowerment, Sustainability

Research Objective

The training programme's purpose(s); to foster a relationship with back-door wildlife, through 'design for active engagement' and open design. Through a design led approach, findings report on opportunities and issues of '*designing active engagement*' with community organisations, for practitioners concerned with defining sustainable working methods.

Introduction

Contextual Overview

Environmental sustainability is the key challenge of the present century. *The State of Nature Report* combines expertise from 50+ organisations. Between "2002 and 2013, 53% of species [have] declined, with 7% of urban species threatened with extinction from Great Britain", suggesting wildlife now faces its biggest challenge ¹. This presents a design space to engage audiences unaware of their impacts on

surrounding wildlife, or ecological systems. Over the last 20 years, environmental issues have had more media coverage alongside “enhanced environmental legislation”². National parks encourage public engagement, but “protected areas are not playgrounds”: wildlife “parks are assets for tourism, but they are not tourist assets”³. Human interactions and experiences within nature, are shrinking. Cox *et al* state, over “recent decades daily contact of people with nature has declined, prevalent in children, with stark differences between nature experiences (e.g. climbing trees) compared with parents”⁴. Resource “provisioning can avert the extinction of experience, benefiting people and wildlife”⁵. We must “re-connect youth [with] natural environment(s), transitioning to ecologically responsible citizens”, as interactions yield impacts⁶. *Connected to Nature*, highlights:

Children's nature connections: 83 per cent infrequently / never smelled wild flowers, 77% infrequently / never listened to birdsong. Adults' nature connections: 79% infrequently / never smelled wild flowers, 62% either infrequently / never listened to birdsong⁷.

Authors believe ‘nature connectedness’ should become embedded within our lives. Engagement in nature “inspire[s] enthusiasm for learning, [as] there is no substitute for hands-on, child-initiated inquiry about the natural world”⁸. Entertainment has a role within climate change, as “edutainment for communicating science to the public is exceptionally powerful”⁹. Nature's value is exponential, complex and intertwined. Natural system degradation occurs “because ecosystem services have no ‘immediate’ market value; hence wider societal value(s) is frequently under-estimated in decision-making”¹⁰.

The Woodland Trust comment “nature, encourage[s] physical activity, enhance[s] social interactions, helping us connect to green spaces, improving health and well-being. For children specifically, outdoor play is important for emotional, physical and social development”¹¹. Nature engagements include; nature’s health service¹², community benefits¹³, wellbeing¹⁴, connectedness¹⁵, economics¹⁶, play¹⁷ and emotion¹⁸. The (non-human) rights of nature “provide an efficient way to protect the environment benefiting all”, seeing this value in isolation or solely for human benefit¹⁹. Society needs to “act quickly redirecting effort[s] being devoted to the commodification of nature, back towards instilling a love for nature in people”. Our “withdrawal from natural environments, sourcing food and other goods has allowed people to forget the realities of ecosystem change”²⁰. Our ‘natural relationship’ needs balance, “even human noise pollution impacts bird behaviours”²¹. Complex combination(s) of dis-engagement

from nature, holds an unknown cost. We “find it hard to love what we cannot give a name to, and what we do not love we will not save”²². The “western world need[s] to change behaviour and consumption patterns to create an environmentally sustainable society”²³.

Contextual Culmination

BBC SpringWatch advocates “saving wildlife starts in your back garden”²⁴. 2019 united ‘The Extinction Rebellion’, culminating generations as “Life on Earth is in crisis: scientists agree we have entered a period of abrupt climate breakdown”²⁵. Biologists “call [current times] the sixth great biological extinction”²⁶, due to “the increase in human population and the consequent increasing demand for food, natural resources and industrial expansion”²⁷. Reports highlight a reduction in teenage nature connectedness, requiring lifelong relationship engagements²⁸. At the *Connecting Teenagers with Nature* Conference, Green MP Lucas stated, “naturalist skills are being lost when we need them most”²⁹. Compounding issues led to “biodiversity loss in our gardens”, engagement(s) must start at home³⁰. *Climate Action to Protect Human Health*, raises “nature’s interdependencies with human health”³¹.

Open Design (OD) enables the re-appropriation of design content, distributed manufacture and opens opportunities to schools, NGO’s and financially restricted organisations. OD evolves design and manufacture values, “rather than one ‘producer’ being responsible for object[s]’ fabrication, it is decentralized to the end user[s]’ control”³². Design decentralization means users (not just professionals) can actively engage in design stages. OD “turns user[s] into designer[s] and provides the control of the [metaphorical] pen”³³, giving users “ability[ies] to fabricate concepts for personal use, distribute globally, or manufacture locally”³⁴. Makerspaces and OD globally proliferates, especially via social media, as “prior to entering the physical door of a makerspace, social media presence serve[s] as the ‘front door’ for Open Design activities”³⁵. OD outputs exceed ‘designs’ original use, e.g. Public laboratory balloon mapping (*publiclab.org*), originated to map the BP Event Horizon oil slick, now internationally catalogues deforestation and other concerns. This articles territory unites; nature engagement, Open Design, social broadcasts and community production... defining the My Naturewatch project (NW).

My Naturewatch Project

The NW project is a collaboration between Interaction Research Studio, Goldsmiths and The Royal College of Art (RCA), Design Products programme. Goldsmiths, led engaging the BBC, designed the

cameras and instructional materials. The RCA team used camera designs in a series of public engagement workshops, engaging: wildlife charities, schools and cultural institutions, including training agents to teach their peers and communities. The My Naturewatch (NW) camera is an;

“inexpensive wildlife camera designed for people to make themselves, as a way of promoting engagement with nature and digital making. We aligned its development to the interests of the BBC's Natural History Unit as part of an orchestrated engagement strategy, featuring the camera on a SpringWatch broadcast, also involving our project website and outreach to social media. Over 3,500 [at time of writing] NW Cameras have been constructed using instructions and software from a website and commercially available components”³⁶.

SpringWatch featured NW with an audience of 1 million and presenter Chris Packham commenting “it's fantastic” and “we can all be involved with this, [it] is brilliant”³⁷.

Design for Active Engagement

Authors present ‘Design for Active Engagement’ (DAE), an emerging discipline, beyond products and services, fostering impactful positive audience engagement. Our perspective integrates “co-constructive processes of trial and action”³⁸. *Politics of the Everyday*, states, designers should provide “infrastructure[s] for project centred democracy”³⁹. Authors see “design experts building a collective design intelligence” producing “design capability of participants”, providing agency⁴⁰. Creating tools and processes to enable others is foundational to the training scheme. Design for inclusion and access removes barriers of; finance, age or gender and encompasses design adaptation. Authors project beyond ‘product’, focusing on “changing / evolving behaviour” through design interventions⁴¹. This article is framed around, *Design for Active Engagement* (DAE) within natural world interaction(s). We see ‘engagement’ shifting beyond consequence mitigation and designing for action. For example, engaging “in forest school(s) contributes to learning skills, encouraging children to work on outdoor activities”, these are designed engagements⁴². Researchers often misclassify engagement as ‘research in the wild’, as it “evaluates prototypes as they are really used within people's lives”⁴³. Authors acknowledge “sustainable development goes beyond individuals”, targeting engagements with communities is more successful⁴⁴.

Access to Nature, stresses nature engagements “increase communities’ ownership of natural places, establishing strong partnerships between communities, voluntary organisations, local authorities and others”⁴⁵. *Citizen Designer* advocates Human Centred Design, “developing solutions based on interaction with actual individuals, [as] user-centred design relates to consumers”⁴⁶.

To achieve DAE, we must design for humans, animals and communities, outside traditional means. Progressing ‘nature’ should “appeal to people’s hearts rather than their wallets”⁴⁷. We propose; designing for and with ‘things’ proactively engages communities, informing behaviour(s). Social sciences argue researchers should work directly with “people they study”, so DAE works directly with audiences⁴⁸. The scheme included diverse groups in “environmental stewardship [to] achieve social–ecological relationships yielding outputs for future generations”⁴⁹.

Method

The ‘My Naturewatch Training Scheme’s’ objective was to foster relationships (external to researchers), encouraging wider participation, removing participation barriers, and build expertise. An open call recruited organisations, borrowing from ‘multi-modal recruitment strategy’ using social media and internet-mediated methods⁵⁰. The call removed biases, included wide demographics and used ‘non-design’ terminology. The call defined; organisational size, scope, intentions, capacity and geographic location. Responses included; local wildlife organisations, school teachers, rewilding projects, wildlife photographers and more. Participants were selected through perceived; impact, involvement with underprivileged / minority groups, potential to scale and areas beyond researcher’s comprehension. Participating organisations included: Durrell Wildlife Trust (Knepp Estate), The Countryside Education Trust, The Wildlife Trusts and more. The work culminated “blended learning”, uniting wildlife / technology for cross-curricular activities⁵¹. Lessons from: curriculum design⁵², public engagement⁵³, previous NW workshops⁵⁴, Fixperts Fixcamp, Design facilitation⁵⁵, Lifelong Learning⁵⁶ and Sustainable Education⁵⁷ informed the curriculum. Authors created ‘project advocates’ as spokespeople (within organisations), sharing material within subsequent networks⁵⁸. Project advocates enable serendipity “conceived as an emerging design process”, encouraging inquiry beyond researcher’s comprehension⁵⁹. The training gave permission to explore *Lifelong Kindergarden’s*; “not focus[ing] on delivering instruction [but] supporting a creative learning process”⁶⁰.

Participants learnt and questioned all processes, gaining confidence. On arrival participants were benchmarked, sharing their technology use and nature engagement through questionnaires, gauging retrospective impact. The training encouraged experimentation, and was inclusive, operating to the slowest participants. Previous work demonstrates “groups building together empower each other” ⁶¹, as “group making” re-enforces social sustainability and exploration provided by others ⁶². Authors gave permission to experiment, as resources were perceived as valuable and participants were fearful to break them. As Clary describes the “protection of one’s self-interest is key to motivation” ⁶³ and remains a challenge, however, communities’ ‘self-interest’ can be designed in.



Fig.1. Build session with participants: Image Credit, James McCauley



Fig. 2. Build session with participants: Image Credit, James McCauley

Participants all had 'NW resource packs' containing; five unassembled cameras, leaflets and instructions. Online resources included; teaching materials, images, films and design files. Each camera component was explained before step-by-step group assembly. The workshop followed methodologies akin to "experience prototyping"⁶⁴, as every participant constructed and experienced the cameras. Authors added 'casing camouflaging', helping participants include public audiences, providing "permission for ownership" and creativity⁶⁵ (Figure 1 & 2).



Fig. 3. Camouflage created by participants: Image Credit, James McCauley



Fig. 4. Immediate 'in workshop' deployment and test on RCA campus: Image Credit, James McCauley

After construction, participants placed cameras (in ethically approved locations) around The Royal College of Art (Fig 3 & 4). Talks from the NW team and Fixcamp shared 'design curriculums' including approaches, prior workshops, films and grass roots initiatives. Groups were then guided (by staff) through

task sheets developing NW deployment and debugging challenges. The task sheets covered; recruitment, press, health and safety, ethics, objectives, self-defined success and NW support; enabling participants to strategize activities, leaving the session with a clear attainable plan.

Transferable Reflections >

The following are authors operational reflections (post activity), for parties to transfer to future activities;

- *Instructional Design*; that can be transformed for different audiences, needs and requirements.
- *Off-the-shelf hardware feedback*; ensuring 'positive assembly' feedback as participants would comment 'is it working' at interim assembly stages.
- *Routine*; aligning technologies in existing routine(s); e.g., exercise, commute or daily activity.
- *Explore Motivations*; different audiences have distinctive means and motivations to actively engage.
- *Technological Troubleshooting*; problem diagnosis enabling technical and non-technical individuals to communicate appropriately aligning terminologies at a distance, without frustration.
- *Redistributing Finances*; for community-led schemes whilst still maintaining project oversight.
- *Avoiding Exclusion*; new means of informing audiences outside digital communities, being mindful of financial and time commitments.
- *Organisations*; giving agency to volunteers whilst maintaining oversight.

Results

Advocates ran fifteen sessions, referred to as Organiser Workshops (OW) including: old aged pensioners, teenagers, schools, museums, technology novices / experts, families, cinemas, conservation projects, MP's, animal hospitals, cultural institutions, broadcasters, NGO's and more. Exemplars include:

- 1) *Adur River Trust* > independent charity creating a new waterway. Used NW toolkits creating a family lending scheme with families and schools, increasing participation establishing a 'camera library'.
- 2) *Suffolk Wildlife Trust* > NW toolkits led to the Trust gaining new volunteers, engaging new families collaborating with a local Wildlife hospital and being presented in parliament by local MP.
- 3) *The Durrell Trust* > part of the Knepp rewilding Estate re-introducing Storks to the UK. The project used the NW toolkit to log and tag flighted birds, gaining wildlife traffic insights. The toolkit cost, enabled the Trust to give volunteers (feeding the storks) NW kits, increasing cataloguing.

Authors invited organisations to a 'celebration' event, hosted at the London Design Museum, six months after the training. Attendees included: Wildlife Trusts, Durrell Wildlife Conservation Trust, Ouse and Adur Rivers Trust, The Conservation Volunteers, Spitalfields City Farm, Westmeads Community Infant School, Heathlands Reunited, Urban Growth Learning Gardens, Wildlife Wonder, The Countryside Education Trust and Froglife. Authors acknowledge a six-month timeline is concentrated. Organisations presented their NW experiences, methodologies and results. The event included a focus group and participants were interviewed individually "avoiding the Hawthorn effect" of negatively influencing peers ⁶⁶. Design Museum senior staff stated NW transformed their sustainable vision:

"It opened-up new thinking in the Learning Department on how the museum can collaborate with HEI's on practice-led design research, demonstrating the crucial role for museums to play, in introducing contemporary design issues and technologies to audiences" (*Design Museum Learning Producer*).

The celebration event gave a space for participants to share experiences. The Training scheme's success impacted organisations'; digital presence, enhanced community connections, and created new charity audiences. The scheme aligned volunteer motivations, helped organisations foster communities and impacted future engagement strategies.

Thematic review was used to analyse interview data, highlighting issues and repeatable elements.

Themes include; connected community, fostering project freedom, engagement, mutual concordance and building ecological citizenship.

Connected Community >

Voluntary motivation is based on "altruism and selflessness" ⁶⁷. Engaging with (natural world) citizen-led activities include various motivations: personal interest(s), "desire to learn, spend time in nature, meeting like-minded people and volunteer for causes" ⁶⁸. These aspects are indicative to NW fostering complimentary motivations. Advocate participants talked extensively about NW 'audience motivation' helped by; skills learning, trial and error, agency over usage and the value in 'social connectedness'. An exemplar, uniting participants who rarely collaborate:

"Oh Dad, give it to me. He'd been trying, and she [his daughter] got it working, then he absolutely ran with it. Putting it out every day, when interviewed, he said, 'Do you know what? I've been looking forward every single day to coming home and seeing what's on the camera'" (OW participant).

Connections were fostered with immediate audiences and external parties. The social connection was highlighted in previous work ⁶⁹ and imperative to the NW project.

“Going to see my grandma and seeing the excitement on her face when she sees a photo of a robin, brought us together. It’s amazing a camera can do that. It’s like these cameras are connecting people through the medium of nature as well as connecting people to nature. People do feel more connected to nature and this had an impact that we could see” (OW participant).

The definition of community brings ambiguity, “communities are simply groups of people who keep coming together over what they care about, building collaborative acts” ⁷⁰. Researcher led workshops focused on collaboration, via delivery with a flattened hierarchy, growing people’s confidence and autonomy. This ultimately fostered communal shared experiences and successes that prevailed beyond the structured workshops. OW stated; “I [conducted the workshop] as a peer-learning sort of activity... I was like, I’m going to need your help to figure this out again” (OW participant). The OW developed tone, delivery and content to ensure everyone felt included and heard. OW commented participants “felt so excited, because you’d made it together, you spoke to other people and you’d got those ideas. You’d made connections” (OW participant). i.e. the work leveraged relationships to help people build confidence and grow from peer’s experience. Outputs also included ‘inter-generational making’ between volunteers with participants stating “I wanted to explore with my grandchildren. They got so much out of it... it’s something all grandparents should do” (OW participant).

Fostering Project Freedom >

The NW project provided participants agency leading with a serendipitous agenda set by organisations. In *Serendipity as an emerging design principle*, the act of serendipity and encouraging it is “a process that can proliferate media by users” ⁷¹. Hollbrook believes “researchers love serendipity; they do not, understand it. Serendipity is not blind luck. Serendipity is sagacity regarding opportunity” ⁷². Project freedom to design interactions can be cultivated through engaging diverse audiences and creating open-ended interactions.

Whether “it’s a family course with [Wildlife Trust] or a charity, each year, we’re now scheduling a My Naturewatch get-together. So, everybody who comes to anything will be invited” (OW participant). OW’s designed and cultivated: loan schemes, synchronised garden watches, technology build workshops,

team building activities, and monitoring for specific species. The NW cameras helped people share what they had seen whilst remaining accessible to all; “these cameras and the images are fantastic for social media, a great avenue to spread your message. It's made us realise how important a social-media strategy is” (OW participant). The common objectives tied participants together to achieve a comfort in the unknown “yes, you know you've got a common goal. You're, trying to see what's around, and collect stuff for afterwards” (OW participant). Enabling people to “break free from dominant behaviours, moving outside the rules of the game” ⁷³.

Neither “humans nor artefacts possess agency prior to their interaction, agency comes into being when the two are combined” ⁷⁴. This combination of; open technology, people, context and shared content foster ‘DIY Citizenship’. A DIY citizen “creates individuality through a process of choosing a higher purpose or makes to encourage others” and subsequently provides agency ⁷⁵. OW shared participants “hadn't actually known that there was a fox coming in his garden, and suddenly he's got these images of a beautiful young fox in the garden” (OW participant). Seeing this intervention as a process that empowered them, through making; “these cameras are connecting people to other people through the medium of nature as well as connecting people to nature” (OW participant). Finally, there was a great bond between technology, communities and nature creating shared experiences, “bring[ing] them all together, connect[ing] nature lovers within the local community” (OW participant).

Engagement >

The participating organisations hosted making workshops and cultivated site visits to participants involved in their community. Organisations fed back, an important opportunity was establishing relationships with participants, something they were unable to do before, creating new volunteers. “We had a look in the garden and I was like, “Well, there's a reason we're not getting anything. It's because you've got a piece of grass and a big fence. Actually, that led to more conversations then about how they could make their garden more wildlife friendly and things” (OW participant). OW sessions were run with larger groups, supporting collaborative learning. Many trained their (inhouse) teams and included people within a social activity that transformed the barrier to entry. OW commented that “We did it together, it was a really fun, a good bonding experience, we all sat down with some tea and cake. By the end, we had all of the lights coming on correctly and people were like, "Oh!..." (OW participant). The Wildlife Trusts commented;

“We’re building up a good picture of hedgehog [locations], allow[ing] us to devote time and energy to areas, it’s a really valuable tool to gather data on where hedgehogs are” (OW participant).

Mutual Concordance >

Authors view ‘mutual concordance’ as an agreement of comprehension participants sign-up to, with ethics and an open agenda, as participating organisations were already highly motivated. In *Unpacking ‘Participation’* Cornwall, states “self-mobilisation’ describes people taking ‘the initiative’ independently of external organizations, retaining resource control”⁷⁶. Participant motivation is always discussed, authors observed the ‘persistence’ and ‘reward’ of getting images as an important aspect; “most of the time, you like people to figure it out because then they feel like they’ve accomplished something” (OW participant). Both the research team and OW continually managed expectations. Participants believed technologies would deliver ‘perfection’ “you won’t necessarily get brilliant photos every time, it’s about sticking with it and building up a picture” (OW participant). These interactions, required people to complete them, giving participants editorial agency. OW stated “get[ting] people to start self-recording and start figuring out what they got from the experience” was the ideal (OW participant). NW’s closest analogy is Citizen Science leveraging social license, trust and engagement. Obtaining “social license for conservation requires engagement with communities promoting dialogue and cooperation”⁷⁷. The challenge is building inclusive systems addressing the needs of; organisations, individuals and volunteers. Mutual benefits exemplar is “the French post office [strategy] joining challenges; the growing number of elderly people living alone; and dwindling letter-writing in the digital era”⁷⁸. Detroit SOUP (exemplar) a micro-granting feast supporting Detroit based projects;

“\$5 donation attendees receive soup, a vote and hear presentations from; art, urban agriculture, technology etc, presenters share ideas. During activities, attendees eat, talk and vote on projects that benefit the city. Winners go home with the raised finances to execute their project”⁷⁹.

The mutual benefit of NW is embedded as participants and organisations prosper, providing a lasting legacy. NW transformed participants approach after NW engagement.

“we’ve always been looking at, how we incorporate technology with nature? To engage certain audiences, especially teenagers, to get them is using what they know best. Witnessing, ‘Oh, I’ve got a fox,’ engages them making them feel part of something” (OW participant).

Thinking about how and why they come to the NGO's events as it is not just about nature, it's about the community, the common goal and meeting other likeminded people. The activities uncovered hidden volunteer needs, "It's really important to remember benefits with volunteers, we know a huge subsection of them are just engaging because, they like nature, but they really need social interactions" (OW participant). Outputs built the importance of mutual benefit to all parties within this construct, "[participants] could see all the data of their surrounding area. Going, I'm inputting and I'm doing science, and they were getting a bit of a pat on the back from themselves" (OW participant).

Wider Issues > Strategic Opportunities >

Design Strategy is a plan/series of manoeuvres for obtaining specific result(s). Strategic design for sustainability is "the development of an integrated system of products, services and communication coherent with the medium-long term perspective of sustainability [whilst] being economically feasible"⁸⁰.

1) *Technology that evolves*. The DIY nature of the project enabled the design team and participants to develop together. For example, "so if a newer version comes out, I could technically have that? was a real, good point" (OW participant). 2) *Beyond volunteering*. The work documented a model, beyond conventional volunteering economies, our parties called themselves custodians not volunteers. With OW organisers stating "It's working. We've tested it. [colleagues] even talked to visitors, which they rarely do" (OW participant). As the project opened new means for communication between OW staff and their site visitors. 3) *Alternate dissemination*. The project yielded large volumes of social media activity, by all and encouraged live conversations at a distance. We fostered new approaches as "If we want to engage certain audiences, especially teenagers, the way to get them is using what they know best, technology is a massive part of that" (OW participant). Authors re-visited insights, for wider opportunities, defining issues and challenges surrounding encouraging public 'nature engagements'.

Wider Issues > Ecological Citizenship

Overarching projects reliant on volunteer workforce(s) often fail over time as they require combinations of curation, communication and integral resources. The work highlighted the importance of establishing co-operatives of skills and mechanisms that do not rely on people's kindness. OW Participants wanted to contribute to bigger causes; "I think if you couple the idea of these workshops or bringing people in to build a camera with a cause, like, "Help us track the hedgehogs in Trumpington" (OW participant). With

comments like; "Oh, I've got a fox," or, "I've got this," but it just engages them, and it just makes them feel part of something" (OW participant). This ownership needs to become embedded as researchers should design for exit from the first day, slowly stepping back mutually handing over projects over time.

Authors reframe 'Nature Citizenship', to be designed in nurturing our planet, i.e., Earth Guardians. For example, Ecological Citizenship could represent 'donations' for nature based volunteering activities, contributing to the 'commons'. i.e., promoting activism through collective designed perspectives. Sites of Special Scientific Interest (SSSi) are at risk due to fly tipping, pollution, invasive species, and impacts of climate change. Of the "4,126 sites of special scientific interest (SSSIs) currently in existence, 47% have not been examined in the last six years, according to environment department data"⁸¹. 'Ecological Citizenship', advocates for;

"transcending consumerism, undertaking challenges: intervening in cultural habits, enacting sustainable change and empowering resilience. We define 'Ecological Citizenship' as; proposals deployed within public communities, positively informing our actions toward sustainable ambitions, beyond our individual personal needs"⁸².

An 'Ecological Citizenship' exemplar is "Mounted City of London police ordered: to help trample in wildflower seeds at the Barbican", as grazing animals play an essential role in maintaining traditional wildflower meadows, because their hooves create dips and furrows that help push seeds into the soil and create microhabitats", i.e., actions benefiting wider parties⁸³. Authors define 'Ecological Citizenship' as proposals, embedded in communities, informing our actions toward sustainable goals. Deploying camera traps are "an attractive tool because [they] provide a low cost, non-invasive survey method which (due to the physical absence of an observer) reduces disturbance and does not require the capture and handling of studied animals"⁸⁴. The bigger challenge is motivation over time, e.g., a negative factor was participants not capturing images, not because of NW camera technical issues, but lacked visiting wildlife. Initially, NW citizens were motivated by their own intrinsic interests, in community studies. However, "for continuing contributions, other factors are necessary to motivate them: feedback about their contribution, acknowledgement by scientists and peers, a sense of belonging to a community, and more"⁸⁵.

Co-ordinated mass Interaction(s), present common issues in the design and execution of Citizen Science projects, that are site specific or include sample collection. When scaled, small interactions (i.e., dropping litter) can have exponential impacts. Mount Everest requires rubbish removal from climbers, since “2015, Tibet officials require climbers to retrieve 8kg of rubbish, fining climbers \$100 for every kilogram” below 8kg ⁸⁶. Everest is specific, however intensity of interactions, is transferable. A regional issue, ‘bird watching apps’ replicating bird calls for photography. Whitehead, RSPB states “repeatedly playing birdsong recordings to encourage a bird to see it/photograph it, can divert territorial birds from important duties, i.e., feeding its young. People should never use playback to attract a species during its breeding season” ⁸⁷. These actions if scaled can have dramatic impact. The training programme was successful working with leading experts and organisations whom independently advised participants. One issue is ‘baiting’, the practice of priming spaces with food, encouraging animal interactions as it; encourages vermin, changes ecological species balance, causes unclean environments ⁸⁸, financial cost ⁸⁹, differential behavioural responses ⁹⁰, bias population parameters ⁹¹, creation of false environments ⁹² and poisons feed ⁹³. Participants shared an “aware[ness] that people overfeed those animals, get[ting] dependent on one or two gardens” (OW participant).

Wider Issues > Amateurs

Amateurs discovering new species, is prevalent throughout history. Publications identifying “new species come out today three times more frequently than earlier decades. Internationally, many efforts are driven by amateurs” ⁹⁴. Instances are fuelled by resources like iNaturalist, a social network for wildlife. Amateurs uploaded photos of “moths or birds to the app, posts your location then, amateurs and expert naturalists help identify the species” ⁹⁵. Amateur access can be polarised as opening engagement has challenges. There are many perspectives on; nature conservation, invasive species ⁹⁶, human interaction(s), native species and control measures. The NW project used the term ‘content creation’ as the project-built opportunity, instead of data and scientific database(s). The wider issue is *how to design user-led rigour to an amateur process, whilst maintaining participants agency?*

Society Centred Design (*societycentered.design*), advocates for new values placing society as a central focus. One of its values ‘Redistribute the Power of Technology’ says ‘Design must seek to redistribute that power for citizen empowerment and equity’. The bigger issue... we still need to design processes to

validate and or support complete lay user/technology 'citizen empowerment'. An overarching theme is that fostering 'engagement with the natural world' is not replacing nature with a screen and or 'sanitising it' beyond recognition. OW participants stated, "My fear is I'm going to end up with a picture of something I really don't want to see... you don't want to see any horrible images" (OW participant). These 'engaged' projects must ethically prepare for how they can be used and what people might see without sanitising or downplaying occurrences.

Conclusion

The successes and failures of designing for 'Active Engagement' were reliant on participants; network, time resources and their passion for charitable cause(s) in communicating and designing objective(s). Authors perceive 'mutual benefits' require further exploration for 'Active Engagement', outside of charitable causes. The design team encouraged serendipitous occurrences as people re-appropriate. One success of the project was agents could dictate how the NW kits were used/deployed. This gave a balance of giving enough and providing permission for people to adapt its use. Repeatable elements include: open designs, off-the-shelf components, adaptable objectives, mutually motivating (user and organisation), mutually benefiting, economic and social media content.

Future work

Design engagements operating across countries without relying on the physical nature of building face-to-face communication, tested in fields, external to NGO and charitable organisations.

Acknowledgements

Attending organisations: (Wildlife Trusts, Durrell Wildlife Conservation Trust, Ouse and Adur Rivers Trust, The Conservation Volunteers, Spitalfields City Farm, Westmeads Community Infant School, Heathlands Reunited, Urban Growth Learning Gardens, Wildlife Wonder, The Countryside Education Trust and Frog life). Facilitators; Hannah Stewart, Beki Gowing and Gareth Lloyd Owen. Photographer James McCauley. Interaction Research Studio, Goldsmiths for collaborating and the Royal College of Art, Design Products + Futures Programme. The project was funded by EPSRC Grant EP/P006353/1.

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