Open is not enough: design considerations for a networked data commons

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Abstract

Recently, researchers within the Networked Learning (NL) community have tried to (re)claim NL's roots in critical pedagogy and (re)assert its commitment to social justice (Networked Learning Editorial Collective, 2021; 2021a). However, despite these avowed intentions, NL has also been criticised from within for "fail[ing] to take account of emancipatory struggles and political imperatives in society more broadly" (Networked Learning Editorial Collective, 2021a, p. 328). The suggestion is made to put NL "to work … to allow the concept of NL itself to become 'networked': to make connections, to interrelate, to transform, mutate, and hybridise in response to the pressing issues of our time" (Networked Learning Editorial Collective, 2021a, p. 359). In this paper, we take concepts from NL and put them "to work" in relation to the design of an informal digital learning environment – that is, a digital environment that lies outside of formal education provision, but that is intended to be a place where knowledge can be shared and circulated and where people encounter knowledge in ways that enable them to think, understand or act differently. The work was carried out in the context of a project aiming to develop design principles for an internet-based platform through people would be able to openly access, learn about and share publicly available data, using Scotland's waste and re-use data as a case study. In this context, we plug NL into a theoretical and methodological design assemblage that connects concepts of openness, data literacy, (de)coloniality, and participatory design into new formations that we hope will allow these concepts to mutate and hybridise into something closer to the social justice ideals that NL claims.

Keywords

Open data, commons, network, decoloniality, phenomenography, values, co-design.

Introduction

Recently, researchers within the Networked Learning (NL) community have tried to (re)claim NL's roots in critical pedagogy and (re)assert its commitment to social justice (Networked Learning Editorial Collective, 2021; 2021a). However, despite these avowed intentions, NL has also been criticised from within for "fail[ing] to take account of emancipatory struggles and political imperatives in society more broadly" (Networked Learning Editorial Collective, 2021a, p. 328). A tendency to fixate on collaboration, co-operation and collective inquiry, trusting relationships, shared challenge and so-called "convivial technologies" (Networked Learning Editorial Collective, 2021) risks "a collapse into pure process, a fetishization of interaction for its own sake, even a new version of what Biesta (2012) calls 'learnification' (Networked Learning Editorial Collective, 2021a, p. 328). The suggestion is made to put NL "to work … to allow the concept of NL itself to become 'networked': to make connections, to interrelate, to transform, mutate, and hybridise in response to the pressing issues of our time" (Networked Learning Editorial Collective, 2021a, p. 359).

This paper emerges out of work the authors have engaged in as part of the [Data Commons Scotland](#) project. In it, we take concepts from NL and put them "to work" in relation to the design of an informal digital learning environment – that is, a digital environment that lies outside of formal education provision, but that is intended to be a place where knowledge can be shared and circulated and where people encounter knowledge in ways that enable them to think, understand or act differently. We plug NL into a theoretical and methodological design assemblage that connects concepts of openness, data literacy, (de)coloniality, and participatory design into new formations that we hope will allow these concepts to mutate and hybridise into something closer to the social justice ideals that NL claims.

First, we explore some issues relating to Open Data and the Open Data movement. We then draw on concepts from the recent decolonial turn in critical digital studies and the related field of human-computer interaction (HCI) research and design. We show that aspects of the coloniality that has been identified as underpinning corporate Big Data and technical design practices are also present in and reproduced by Open Data narratives and practices. In order to resolve some of these implicit colonising (and sometimes paternalistic) tendencies, we need to go beyond the simple and singular notion of *open* data to develop more nuanced, context-dependent conceptions of multiple sociotechnical data-human assemblages. We mobilise De Angelis's (2017) description of a commons as an (eco)system comprised of common goods, commoners and social relationships as a way of conceptualising these assemblages, and suggest ways in which core concepts from NL can be adopted and adapted in thinking about their design. We then apply these ideas in relation to the design of a networked data commons intended to serve the particular purpose of increasing the circulation, production and valorisation of data relating to waste management (including recycling and diversion through reuse) within Scotland.

Open data, data (de)colonialism and a networked data commons

While people may be generators of data, the majority are excluded from the production and evolution of both digital technologies and data sets or collections, with control of these processes predominantly lying in the hands of large corporations and governments. For many, relationships with data in particular are characterised by an imbalance of power, and the ubiquitous generation and use of data may seem a threat to agency and empowerment rather than an opportunity. Efforts have been made to counter this through both the Open Data movement (see, e.g., Davies et al., 2019) and participatory and co-design movements (see, e.g., Simonsen and Robertson, 2013); however, more recently, critical digital studies have begun to undergo a "decolonial turn" (Alvarado Garcia et al., 2021; Couldry and Mejias, 2021; Cruz, 2021), which attempts to articulate and resist the re-productive tendencies of existing data and HCI practices.

Open Data and its discontents

The Open Data movement has long sought to make data more accessible in order to foster economic and social well-being (Shirky, 2010), as well as business innovation and productivity (Jenkins et al., 2013). Open Knowledge International links data and knowledge through their definition of Open Data: "Knowledge is open if anyone is free to access, use, modify, and share it – subject, at most, to measures that preserve provenance and openness" (Open Knowledge Foundation, n.d.). Open Data advocates assert that making data openly available will create new opportunities for economic activity, improve transparency and governance, and empower people to live in more creative and sustainable ways through increased knowledge. Within this perspective, data are described as:

> a public good that enables the creation of a wide range of products and services. All sectors of our economies, at the local, national, and global level, rely on it. Roads help us to navigate to a destination; data helps us to navigate to a decision. (Dodds and Wells, 2019, p. 260)

Partly as a result of the efforts of the Open Data movement has been at least partially responsible for local, national and international agreements that commit governments and organisations to publishing data openly, such as the Helsinki Region Infoshare (Helsinki Region Infoshare, 2011), the Scottish Government Open Data Strategy (Scottish Government, 2015) and the G8 Open Data Charter (G8, 2016). As a result, large quantities of data are now being produced by many organisations and published openly online. Yet despite several years of effort, the extent to which these data are genuinely open to critical and creative interaction remains limited. It has been suggested for some years now that it is too simplistic to assume open publication of data will automatically lead to increased and democratised data use (Janssen et al. 2012). Data may be hard to find, use or trust (Meijer et al., 2012), leading to what has been described as the myth of public reuse of government data (Hellberg & Hedström, 2015). Even strong supporters of the Open Data movement recognise that there are problems: "at the moment, too much of our data infrastructure is unreliable, inaccessible, siloed, or can only be

used if you can afford access" (Dodds and Wells, 2019, p. 261). As a result, "[d]ata innovators struggle to get hold of data and to work out how they can best use it, while individuals do not feel that they are in control of how data about them is used or shared" (ibid.).

More fundamental critiques have also been levelled at both the practical enactment of openness and the movement's political and philosophical underpinnings. Kitchin (2013) outlined four critiques of Open Data, including two at the level of practical enactment, in relation to funding and sustainability, utility and usability; and two at the level of politics and philosophy, in relation to "the politics of the benign and empowering the empowered" (n.p.) and an inherent neoliberalisation and marketisation of public services. We can connect these critiques to some of the issues identified above; funding and sustainability may be part of the reason for infrastructure unreliability, utility and usability clearly depend on access, the reference to "data innovators" suggests Kitchin's empowering of the empowered, and the discourse of innovation links strongly to that of neoliberalism and marketisation. Perhaps because the Open Data movement has historically drawn on elements of both technological libertarianism and neo-Marxism, the concept of Open Data has a sometimes tense and ambivalent relationship with notions such as private ownership and the market. As Lund describes, there is:

> a central ideological lacuna in absent discussions of unconditionally opened-up resources that strengthen the accumulation cycle of capital. This logic favours the negative freedom of closed business models in the competition with open ones that could foster more positive notions of freedom, although open business models are generally advocated and commons are mentioned as desirable. In a dominant ideological formation, openness is used to promote its opposite in the economic field. (2017, n.p.)

It is concerns such as these that lead Lockley to ask if "openness tend[s] towards serving a hegemonic public while claiming to work for everyone?" (2018, p. 146) and to suggest that "open" has come to "[function] like 'green', 'fair trade' and 'free range' as both a marketing term and an exclusionary term" (ibid.). While perhaps better than nothing, openness, as it currently stands, seems to be no guarantee of a democratising, let alone emancipatory, capacity.

Digital and data (de)colonialism

Narratives and critiques of openness have circulated within critical digital studies for some years now, but it is only recently that the field has started to take a decolonial turn. This has begun with a recognition that data and digital technologies may enact new forms of coloniality in the form of data practices, and particularly Big Data practices. Critiques of coloniality have largely focused on proprietary data (what might be thought of as *closed* data) and the acquisitive and exploitative actions of corporations. In their recent work, Couldry and Mejias:

> insist on an explanatory model for Big Data practices in which colonial extractivism remains a real, not metaphorical, feature of capitalist accumulation … the extraction of value through data represents a new form of resource appropriation on a par with the landgrab (the seizure of land, resources and labor) that kicked off historical colonialism (Couldry and Mejias, 2021, p. 3)

Thus the trope of data as "the new oil" is instead replaced with data as the new Dark Continent. But digital coloniality does not just reside in data harvesting or extraction practices; it is also potentially present in the ethical-political agency of sociotechnical systems (Introna, 2014; Wilson and De Paoli, 2019; Winner, 1980). In the field of HCI, a recent manifesto aims to help HCI researchers and designers avoid coloniality, and to open up the discipline so that it can operate in a 'world of many worlds'. (Alvarado Garcia et al., 2021, p. 8). Stressing the importance of "land" (understood both literally and metaphorically), the authors of this manifesto recognise the complex ways in which designers of sociotechnical systems embody their own relationship with land and territory, which "shapes our way of making sense of and being in multiple world(s), as we are walking contradictions ... [and which] materializes itself in our everyday life experiences, expressing itself in ever-changing questions of belonging and identity" (p. 4). This leads to a further awareness of the complicity of designers in both extractivism and in the design of systems that perpetuate particular political and power relationships, and (exploitative) forms of work, "unknowingly reproduce[ing] standards and processes that follow a capitalist logic (problem solving, evangelizing UX, designing for universalism, etc)" (p. 5). In a move that essentially asks HCI professionals to reflect on and critique assumptions about the 4W1H/5W1H design processes, the manifesto urges people working in the field to follow five pathways to decoloniality: Understanding The Why, Reconsidering The How, Changing The For Whom, Expanding The What and Reflecting on The What For (p. 4).

Cruz (2021) makes some similar points in relation to the Philosophy of Technology. Asserting that "Western Modernity keeps imposing itself through a triple mutually reinforcing and shaping imprisonment: coloniality of power, coloniality of knowledge, and coloniality of being" (p.1847), Cruz suggests that "technical design has an essential role in either maintaining or overcoming coloniality" (ibid.). He goes on to develop principles for both reflexivity and effective co-production with usually marginalised/subalternate communities. Cruz concludes that "[a]cknowledging and nurturing care (as labor/work, affect/affections, ethics/politics)" (p. 1862) should be sociotechnical design's first and non-negotiable principle.

Open data advocates: decolonisers or missionaries?

The decolonial turn in critical digital studies has, to date, tended to focus on the extraction of value from, and the disempowerment of peoples within, the Global South by companies that are largely based in the Global North (including the USA and China). However, it is not only people in the Global South whose data feed the mills of data-capitalism. Any people or communities who contribute to but are excluded from the control of these processes might thus be considered marginalised or subalternate – inferior in status and power to those who both control and profit from data. Thus this perspective might also be usefully applied to explore and perhaps address some of the problems associated with the openness enacted by the Open Data movement.

As already noted above, positive narratives of Open Data often include "data innovators" and other holders of specialist, expert knowledge who hold the keys to activating that value. As some of the advocates of Open Data suggest, "the success of open data efforts is heavily dependent on the existence of an ecosystem of actors focused on driving the use of data through all aspects of society" (Dodds and Wells, 2019, p282). Implicit in this is a belief that this "ecosystem of actors" knows what is best for society and has the right to "drive" whatever they believe this to be through society. There is no acknowledgement that a lack of enthusiasm for (and even resistance to) increased data uptake and use may be valid, or may be related to the ethical-political values embedded in and enacted by Open Data-based sociotechnical systems. Indeed, as Lockley points out, "in every form of openness we have seen a tendency to an apolitical, almost ignorant nature, and a tendency to production from the global North" (Lockley, 2018, p. 159).

Similarly, solutions to the problem of trust (both in data and in the use of data) that have been proposed from within the Open Data community assume an uncomplicated and uncontested set of ethical-political, as well as use and exchange, values. Although there is a welcome acknowledgement that increasing levels of trust requires that the "the whole data ecosystem … build ethical considerations into how data is collected, managed, and used in order to ensure equity around who can access and use data and how the benefits are distributed" (Dodds and Wells, 2019, p. 267), little attempt has been made to explore (let alone challenge) precisely whose ethical considerations (and therefore judgements about values and valorisations) might come in to play. Indeed, although there is some recognition that there is more than one type of value, this has tended to be limited to the duality of use and exchange values, rather than ethical, political, social, aesthetic or other types of value. There is also little recognition of the cultural, geographical, and contextual contingency of value judgements and valorisations.

Thus, while proponents of Open Data may oppose the hegemony of Big Data corporations and closed government data – in the decolonial perspective, the new colonial powers – they often do so by encouraging more widespread diffusion and uptake of values and practices that characterise these powers. Even those Open Data projects that explicitly seek to decentralise data practices, such as Tim Berners-Lee's Solid project[1] or projects using distributed ledgers to achieve networked consensus have an explicit aim of giving data ownership back to individuals. Such efforts are also often characterised by what Lockley (2017) called Founding Fathers, a tendency that further embeds a somewhat paternalistic benevolence that is not far from the perspective of the well-meaning, *improving* coloniser (we brought them the railways, after all). In either case, people are encouraged to become more data literate.– to be educated into the data practices that allow Big Data corporations etc. to grow in power and profit. They are encouraged to find ways to extract economic and political value out of the data that have (graciously) been made available to them. That is, data literacy is framed within a broader Open Data advocacy discourse that embodies *libre* notions of choice in relation to the use and reuse of data; however, the conditions of that choosing are limiting and circumspect. People are encouraged to take corporations and governments on at their own game, rather than to play a different game altogether. Thus despite good intentions, some Open Data advocates might be compared to the missionaries of the recent Western colonial era, attempting to bring enlightenment to the ignorant and benighted, rather than learning

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[1] https://solidproject.org/about

about and from their perhaps different perspectives on the potential values of and relationships with data – that is, their own data cultures.

It has previously been argued that designs for sociotechnical systems could (and perhaps should) start by recognising a plurality of values (Wilson et al., 2018). A crucial element of *decolonial* sociotechnical design approaches would therefore surely be to recognise not only that the perspectives of the usually marginalised or subalternate matter and can be understood, but also that they are themselves plural. Approaches that avoid (or at least attempt to avoid) slipping into binaries of us-and-them, of majority-and-other, need to be developed.

A data commons as a learnable, networked assemblage

A more productive and less colonial approach to democratising data may thus need to start by recognising that value, of whatever kind, is an emergent property of human-data-practice assemblages held together by social/sociotechnical relationships that depend on a range of different kinds of value. Such assemblages can be compared to contemporary conceptions of *commons,* in which culturally and contextually contingent but critically important social relationships and values are central features.

De Angelis (2017) describes a commons as an assemblage of common goods, people and the relational values that connect them. In his view, the common goods that define and are cultivated within a commons have "a use value for a plurality" but that simultaneously a plurality must "[claim and sustain] the ownership" of those common goods (p. 31). Common ownership is claimed and sustained by

> the creation of relational values, that is, values that select the 'goods and bads' of social action while at the same time sustaining and (re)producing one another, social relations, social practice and the ecology in which social practice is embedded (De Angelis, 2017, p. 31)

A commons as a whole is then a social (or sociotechnical) system of commonly held resources and a community of subjects who "engage in communing" (p. 90), controlling the system so that the resources are sustained and the community is reproduced. Importantly, communing is defined as "doing in commons that has a direct relation to the needs, desires and aspirations of the commoners" (ibid.) and as "a social process embedded in particular values that defines a sharing culture in a given time and context, through which they reproduce resources and the community that comprises them" (p. 104). That is, the relational values that connect up the components of the commons assemblage are related to the different ethical-political values held by the commoners. It is important to note that these are *created* through the interactions between commoners and common goods within the commons, rather than pre-determined or externally imposed. In the context of a data commons, this allows for values and valorisations of data to emerge through interactions with data, rather than inhering in the data themselves.

The concept of commons offers a way of recognising both the critical importance of different values and valorisations of data, and their contingent, emergent nature. However we also wish to avoid the "romanticism of the commons" (Lockley, 2017, p. 155); a commons is not an intrinsically democratising or emancipatory assemblage, as its nature and evolution will be determined by dominant values and valorisations. A commons in which commoners act to sustain their community by excluding anyone with different culture or values will be a racist commons. In the context of a deliberately designed data commons, we (the designers) have the opportunity to design features into the system that encourage, constrain or discourage particular values and valorisations.

Networked learning in a data commons

In the content of a digital (data) commons, there are significant conceptual parallels between these notions of the importance of relational values, commoners and communing and the NL conceptualisations learning through connectedness (Networked Learning Editorial Collective, 2021) and students as producers (Carmichael and Tracy, 2020; Neary and Winn, 2009). In their exploration of the role of open, linked data in NL, Carmichael and Tracy (2020) describe student production as "participation in the co-production with others of new material, digital and knowledge artefacts and networked assemblages" (p. 120). Replacing student with the more general term learner, there is a connection that can be made between the data commoner who produces and sustains a data commons through interactions with data and other commoners, and the learner who co-produces through interactions with resources and other learners.

However, it is important that these NL ideas need to be plugged into (or refracted through) additional conceptions, in order to avoid normalising and totalising conceptualisation of value. For example, within the NL community, it has been suggested that "new forms of production, including the production of knowledge, be reoriented towards the use value, rather than the exchange value, of what is produced, resisting the tendency ... for relationships between suppliers and users of knowledge, particularly in digital environments, to assume the same forms as has existed around other forms of commodities" (Carmichael and Tracy, 2020, pp.118-9). This echoes the limited conception of value and valorisation identified in our discussion of Open Data above, as well as reinforcing categories such as supplier, user and commodity. Indeed, Carmichael and Tracy (2020) themselves note McLaren and Jandrić's (2015) critique suggestion that educators (or in our case, sociotechnical system designers) need to recognise and resist the appropriation of technological developments by capitalism, and to develop alternatives.

Carmichael and Tracy (2020) suggest that where Open Data are used in a networked learning assemblage, there is a need to better understand literacies in the context of both data production and data consumption. This may be an important distinction in considering the design of a data commons, where commoners create and share, as well as make use of, data. Here, we understand digital literacies as situated, nuanced and networked practices (Gourlay and Oliver, 2016), not as a set of technical statistical, numerical and representational skills.

The Data Commons Scotland Project

All this begs the question: how can those with privileged access to funding, data, expertise and time (e.g. academics, data scientists, IT professionals, UI/UX specialists) design a sociotechnical data ecosystem that creates or enacts a networked, decolonial data commons? We believe that this requires the recognition that data commoners are essential to the maintenance and production of the commons, and that potential commoners will need and want to make sense of data on their own terms, in ways consistent with values of all types (political, ethical, aesthetic as well as use and exchange) as they emerge and evolve within the commons.

In the Data Commons Scotland project, we have been exploring the question of how to design such a system in practice. Recognising both the importance of relational values to a commons and the non-value-neutral character of technology, we start with an explicit articulation of the values that we, as designers, bring to the project. We value equity and sustainability above economic productivity; we value knowledge sharing but at the same time value being able to put limits on what is shared; we value a plurality of perspectives as a way of enhancing our own understanding as well as that of others; and we value capacities to exercise judgement, make decisions and take actions that align with our values. As a result, we aim to create a sociotechnical system that not only enables access to, but actively encourages increasingly sophisticated and critical use of, ownership of and production of (open) data.

We also recognise the plurality and contingency of commons and as such, recognise that principles for the design of one data commons will depend (to a greater or lesser extent) on the "topic" or focus of the commons – that is, on an initial category decision that identifies what will count as data-of-interest. For Data Commons Scotland, we have chosen data on Scotland's waste, including diversion of waste through recycling and reuse. We have chosen data from the waste sector for the following reasons: (i) waste data may be produced and published by many actors (e.g. government, companies, public authorities, third sector organisations and individuals); (ii) a focus on sustainability, the reduction of pollution and the circular economy is consistent with our own values; (iii) waste data may have a range of values or be valorised in different ways by different people, including (but not limited to) value as a means of better understanding our environment and society, value in terms of holding waste producers and/or authorities to account and value as a potential expeditor and even creator of circular economic activities. Our challenge is to find ways to connect disparate sources of data together as linked common goods in a networked commons designed to be inclusive to non-experts; and to design a sociotechnical system that not only meets the existing needs of multiple users, but also recognises and builds on their capacity for learning.

Research and design processes

Our research and design processes have themselves been more fluid and emergent than following a fixed protocol or methodology. However, we have drawn on some prior traditions, most notably in the participatory, co- and values-sensitive design movements.

Once we had established both the particular context for our putative data commons and our specific aims, we

started to explore the ecosystem of already-open data on Scotland's waste. This led to a series of observations that need to be considered in our design of a sociotechnical commons system:

- There is a significant body of data on household and commercial waste collected, curated and published by the Scottish Environment Protection Agency (SEPA). However, these data are published in places and in formats that require high levels of pre-existing knowledge: knowledge of what data are collected, knowledge of how they are collected, knowledge of how to navigate the data interface and knowledge of how to interpret the data. These data are open but in many ways, and to many audiences, inaccessible.
- There is little consistency in the nature, format and location of waste data published by local and city authorities. Thus a person who has learned how to extract and understand data published by one authority may have to start their learning afresh when attempting to locate and interact with data published by another authority.
- There is a significant gap in data on the diversion of waste through re-use or repurposing.

At the same time, we began what are ongoing processes of co-research and design with a range of potential contributors to or actors within the putative commons. These include people and organisations that already publish data relating to Scotland's waste stream – at present, predominantly SEPA, the Scottish government statistics unit and local authorities. They also include people and organisations that do or might productively interact with waste data – given our own alignment with learning and action, this includes waste data specialists, local government, recycling companies, environmental consultants, teachers, librarians, third sector organisations, environmental activists and private citizens with no particular prior interest in waste. To ensure ongoing growth of the commons, we also consciously attempted to include people and organisations that might be able to add new data to what is already available – that is, to re-produce and create common data goods.

We began with some fairly standard approaches from the traditions of participatory and co-design (Simonsen and Robertson, 2013), with in-depth, semi-structured interviews and workshops intended to explore what people would want and value, as well as pre-existing capacities, in relation to a digital platform focused on Scotland's waste data. The interviews and workshops also provided opportunities to explore some of the features such a platform needs to have to attract users and thus contributors and thus create the conditions for a commons to emerge. The interviews enrolled a broad range of people into the design process. One workshop enrolled people working within the waste sector (as data processors, waste collectors or waste processors). Another attempted to enrol people with an interest in Open Data. These workshops were designed following initial analysis of the interviews and the exploration of the already-published data described above, and included explorations of both common barriers to opening up waste data, and the desirability of suggested features such as recommender systems, chatbots and tools for assessing data reliability. At the time of writing, we have also conducted follow-up interviews and observations of people's responses to some alternative look-and-feel approaches; as with the initial interviews, these attempted to enrol the perspectives of as wide a range of people as possible.

Spurred by the lack of publicly available data on waste diversion through reuse and repurposing, we have also been working with three non-profit organisations in the reuse sector. As well as dialogues to find out about their values, aspirations and preferences, we have also been helping them to process and re-present the data they generate and encouraging them to make it publicly available.

Emerging design considerations

The "data" generated in the processes described above are inevitably refracted through our own understanding and value-relationships. This process gives rise to two distinct sets of design considerations for a putative waste data commons.

Design consideration arising from interviews and workshops

The initial interview data were analysed using the methods of phenomenography (Åkerlind, 2005), which explicitly embraces variation rather than seeks to define typical or average experiences and understanding. This approach was chosen in an attempt to retain the plurality of experiences of and attitudes to both waste and data that the interview participants expressed. We thus sought to allow what might otherwise be considered the subalternate perspectives of people who are not and, importantly, *do not wish to become* data or waste experts to be active design considerations.

The analysis drew out a range of perceived, anticipated and imagined values or valorisations of waste data and interactions with such data. Interestingly, discourse about the potential economic exchange or use value of waste

data was almost entirely absent. Instead, interviewees described accessible data on Scotland's waste as being of value in order to expand one's own knowledge; acquire knowledge to inform one's own decisions and practices relating to waste and resources; acquire knowledge to persuade others to change their practices; to improve existing waste management processes; to create novel processes and solutions; to hold authorities to account; and to empower others to hold authorities to account. For some, though, the dangers of unintentional misinterpretation and even intentional misuse or misrepresentation outweighed the potential values of data use.

The results were used to create personas and scenarios[2] that reflect the complexities of potential waste data commoners lives and, in particular, their values and interests (Wilson et al., 2018). The scenarios emphasise that engagement with the platform might be driven by more than one interest, and that the platform itself might be designed to encourage increasingly critical and creative engagement with data. They describe how different audiences may hope to interact with a platform supporting a waste data commons, as well as providing examples of encounters they may have that would make this process easier or more of a challenge.

The personas and scenarios, combined with the discussions at the two interactive workshops, allow us to identify some key features that a waste data commons needs to include in order to stand any chance of enrolling a range of our interviewees as waste data commoners. As well as the ability to access data in simple formats, view graphical representations of data sets, and select data sets to compare, these key features include:

- metadata including information about data provenance and history
- metrics or other indicators of data reliability and confidence, plus mechanisms to enable non-experts to engage with data uncertainties
- a recommender system or other means of becoming aware of different data sets
- mechanisms for people to contribute and publish their own content, whether in the form of data sets or stories
- mechanisms for people to communicate with each other.

It is in response to some of these design considerations that NL concepts may be brought into play. If the various data sets that we can make available are conceived of as a network of knowledge and learning resources, then the "value" of the network lies in the value-relationships that connect people to resources (and resources to resources). That is, the assemblage of the networked data and people can become a data commons if people (waste data commoners) are able to connect with data in ways that add to their knowledge, their capacity for decision-making, their sense of agency and their capacity for persuasion – i.e., in ways that align with the values expressed to us in our design research. It is thus up to us, as designers, to find ways of using the relationships between data sets and different uses of data sets to suggest pathways between and within them. It is also up to us find ways of allowing our potential data commoners to explore provenance and history in ways that allow them to develop their own judgements in relation to reliability and trust.

Design considerations arising from work with third sector organisations

One of the most important outcomes of our work with non-profit organisations working in the reuse sector is our own far deeper appreciation of their relationships with and valorisations of data. In all three cases, the people in coordination or management roles identify significant ways in which the collection and presentation of data about their own organisation's activities is important to them. The biggest driver here is funding (in a somewhat ironic echo of academic life). Two of the three organisations have no core funding and one has only limited ongoing funding; all must therefore continually engage in funding-seeking activities. In the contemporary era of accountability and transparency, engaging in something that is in some ways self-evidently worthwhile as a social and community good, such as reducing food waste and providing a community food service, or reducing the disposal of furniture and white goods in landfill and simultaneously making such goods available cheaply within the community, is no longer enough. Instead, organisations such as these must *account* for the economic and social good they create, and increasingly also the $CO_2(e)$ emissions they avoid. Thus there is an imperative to count and weigh, to apply carbon-equivalent formulae, and to serve up numerical data to potential and existing funders. Our third sector partner organisations thus have ambivalent and sometimes tense value-relationships with their own data, as unfavourable power dynamics force them into particular behaviours.

Despite this, all three organisations display a genuine desire to collect and curate their data "well", so that the data they acquire and re-present communicates the various goods they believe they are achieving, as well as in

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[2] The personas and scenarios can be accessed on the project's website at
https://campuspress.stir.ac.uk/datacommonsscotland/resources/

order to demonstrate carbon-reduction commitments that are conditions of their funding. It is here that parallels can be drawn with the NL concepts of students as collators, assessors and producers of knowledge resources. Staff and volunteers with varying degrees of confidence and interest in data and digital systems are already enrolled in "hybrid set[s] of reconfigurative practices … the creation and coordination of socio-material assemblages, involving acquisition, curation, destruction and creation" (Carmichael and Tracy, 2020, p. 128) of texts in the form of paper-based records, spreadsheets, and digital documentary reports. The implications for our putative data commons design include:

- A need for spaces in which potential commoners need to be able to make sense of and identify value in their own data in their own ways, for their own purposes, before making it publicly available to others.
- A need for mechanisms to assist in the collection and curation of data that they themselves identify as useful.
- Guidance on the standards and metadata needed if data are to be made publicly available.
- Any manipulations, conversions and re-presentations (for example as carbon-equivalent data, or other equivalence-assertions) need to be both explained and justified

As above, it is now our responsibility as technical and pedagogical designers to accommodate such considerations while bearing in mind both the values and valorisations of waste and re-use data expressed to us in our earlier participatory design activities and in our ongoing work with third sector organisations. Here, we face the challenge of designing in the face tensions imposed by the knowledge and agency-seeking valorisations expressed by all our participants, and the competitive and new managerialist context the organisations find themselves in with respect to funding.

Discussion and conclusions

In conclusion, in this paper we have described a project that responds to the call made by Gourlay in her contribution to the Networked Learning Editorial Collective's (2021a) recent work, by exploring a potential learning setting "in terms of the actual, situated, more-than-human 'mess' of specific contexts, disciplinary content and cultures, and also the wide diversity of ways of engaging" (p. 328), including the possibility of reluctance and avoidance.

The design considerations we have outlined cover a broad range of features and functions. However there are some reoccurring themes that emphasise the importance of designing with and for a plurality of contingent perspectives and experiences. Echoing Carmichael and Tracy's (2020) findings in relation to students, we see that the "digital literacies" needed by our participants are not only situated social practices, but are also practices "shaped by their own concerns, intentions and existing network relations" (p.130). We also see that there are very real tensions that we need to face up to, for example relating to encouraging particular pathways through the data sets, which could easily lead to a "people who bought this also bought" normalising tendency; making pre-determined value judgements about the reliability of data, which might unintentionally privilege one form of value over another; and encouraging more data use by third sector organisations for whom data have become a critical financial concern, displacing human judgements about the ethical, political and cultural values of their projects.

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