Towards transformative social learning on the path to 1.5 degrees

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This paper provides insights into learning orientations and approaches that encourage change and transformation on the path to achieving the 1.5 degree C target. This literature review of the climate change and education/learning interface positions relevant literature in a heuristic tool, and reveals different learning approaches to addressing climate change. We highlight that although traditional lines of departure for achieving climate targets are usually technocratic in nature, especially if a zero emissions pathway is aimed for, there is an increasing realisation that climate issues are complex, deeply intertwined with unsustainable development and cultural change, and require collective engagement. Through considering the 1.5 degree C target as a metaphor for the fundamental changes needed in society, we argue that a wide range of learning orientations, including more inclusive and transformative social learning approaches, are needed to address the colossal challenges facing society.

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Introduction

Education and learning play a leading role in human development and societal transformations [1••], including climate change, with the IPCC [2] highlighting the need for learning-centred transformation in climate change adaption. Yet in an increasingly polarised and value saturated context of climate change disagreement [3] it is unclear what different orientations of learning there are, and how different learning approaches can inform the pathways to 1.5 degree C.

The 1.5 degree C target agreed upon at the Paris climate change summit is often perceived as a technical goal to be achieved through transformations in, for instance, energy production and carbon storage technologies [4]. This is closely connected to a focus on political will in closing the gap between science-based targets and national commitments [5]. Within this socio-technical genre of thinking, education can also be technically 'used' along with communication and social marketing to promote urgent measures to address climate change. Here the focus is usually on behaviour changes related to energy and emissions via transmission of authoritative, scientifically derived information and facts. Such approaches may be useful and necessary as they can induce a change in human behaviour [5,6••], but there is also the increasing recognition that in a 'post-truth' world of 'alternative facts', there is a need to explore new ways of conceiving, framing, producing and communicating science [7]. Van der Linden et al. [8] suggest, for example, 'inoculating' the public against misinformation through pre-emptively warning people about politically motivated attempts to spread misinformation, a process that requires critical engagement if it is to avoid becoming a new form of social engineering. Modes of knowing such as critically reflexive engagement with scientific knowledge, that science may not always easily illuminate, thus also need fair and urgent consideration as we strive to face the challenge of climate change [3,9].

Given the notable climate events of 2017 (e.g. devastating hurricanes, whose attributions coupled to climate change are still being examined) the notion of a 'new normal' for current climate is being debated (for example, recent Water Research Commission in Johannesburg, 2017). Next to seeing the 1.5 degree C target as a technical target [2,5,6••], this ambition can also be perceived as a metaphor to indicate fundamental changes needed in personal belief systems, values, structures, and ways of organising societies and economies. Such an approach can

surface difference in perspectives, and highlight the synergies, contradictions, controversies and conflicts inherent in climate change debates. This calls for social engagement [10], and in some instances, for the exploration of alternative ontologies and lifestyles [11•]. A shift from facilitating changes through optimisation towards reflexively learning to understand differing views, perspectives, cultures and ways of approaching climate change can begin to point to those areas requiring personal and societal transformation [12•,13]. These expanded paradigmatic approaches are gaining much traction (e.g. recent Resilience Conference in Stockholm, September 2017; Transformations Conference in Aberdeen, September 2017). In this paper we note this expanding reflection but focus much of the paper on the role that education and learning can play in building capacities for critical thinking, reflexivity, systems thinking, collaboration, collective agency and transformative practice [12•].

Methodology and framing the review

Engeström et al. [14] argue that most research on learning is conducted in formal educational settings. In the context of 'wicked problems' [15] such as climate change, however, more learning research is needed in real-world situations and informal contexts [11•]. Following this line of thinking, this review covers formal, as well as organisational and informal learning contexts in a multidisciplinary 'melting pot' of research from the learning sciences [1••,11•,12•,13,14,16–19], transition sciences [6••,10,20,21], and environmental and climate sciences [4,5,22,23,24,25••,26,27,28•].

Common keywords were used in the literature search (climate change, education (social) learning, sustainability, transformation, transition) across the search engines of Scopus, Web of Science, and Google Scholar to identify articles that were drawn from the multidisciplinary fields outlined above. We particularly sought to identify those papers focussing on meta-theoretical and large-scale studies, global perspectives, and paradigms of thinking associated with learning and climate change that have been produced in the past seven years (2010-2017). The papers selected address the climate change/education and learning interface directly or have direct relevance to this focus. We then differentiated the selected papers for their different approaches and learning orientations. In the context of this paper we have used 'learning orientations' to indicate the contextual dynamics that shape learning, and also the purposes that drive the orientations. For example, a policy orientation would indicate that the learning is oriented *mainly* towards policy implementation. We also found that the contextual dynamics were shaped by diverse institutional settings, for example organisational learning is shaped by more formal organisational settings, while traditional science-based learning is shaped by the history of science education that emerged in formal education settings. Policy

oriented learning is shaped by policy imperatives, and transformation/transition oriented learning appears to shaped more loosely by a diversity of less structured learning environments and histories, but most often foregrounded the need for multi-sector and multi-actor engagement. Through an iterative process we mapped out the papers in relation to these contextual settings and histories.

We then adapted Jickling and Wals' [29] well-cited heuristic for classifying emancipatory and instrumental forms of learning within the sustainability context, drawing also on Dillon et al.'s [30] interpretation, and through iterative engagement with the selected papers, we identified and mapped out four orientations to climate change learning, namely: science-oriented [5,6••,16,22–24,31], policy-oriented [17,18,20,21], organisational/management-oriented [19,25••,32,33,34••]; and wider social transformation/transition orientations [11•,14,26,27,28•,35–37,38••,39–41]. This allowed us to position the papers (see Figure 1), within a 'force field' heuristic, whereby two dotted lines distinguish the field within which the centre of gravity of each of the four orientations falls. Those lines, however, are not meant to divide the orientations, but rather to provide a way of considering different orientations to learning, as well as how they may relate, and what their particular contributions can be to climate change and learning. As a final step, based on the papers reviewed, we distilled the characteristics and conditions needed for supporting change on the road to 1.5 degrees C associated with each of these orientations.

Analysis of climate change learning as shaped by diverse learning orientations

If considered in more depth, the heuristic mapped out in Figure 1 displays a continuum of learning theory research, ranging from more behaviorally oriented to more inclusive and transformative modes of learning that emphasise reflexivity, capacity-building and competence. The juxtaposition in Figure 1 between predefined/prescribed and open/emergent learning approaches, as well as the division between authoritative learning approaches focusing on matters of fact (where we know what needs to be done and how to act with relative certainty) and participatory learning focusing on matters of concern (where we have a hunch but do not know for sure and need to engage people in a co-creative quest), allows for a more nuanced view of this continuum. It also allows for inclusion of approaches to climate change learning that include debate and deliberation about the kinds of changes required.

Each of the learning orientations tend to show specific motives, approaches and learning-related issues that are helpful to consider on the pathway to 1.5 degrees C. Hulme [3] notes that there are multiple, creative applications of the idea of climate change; applications that do not necessarily require agreement, as they "thrive in