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Abstract

Education for Sustainable Development (ESD) is increasingly embedded in higher education (HE) due to the current emphasis on tackling the environmental crisis. Similarly, Civic Society Organisations are expanding their mobilization and practical action in communities. These approaches can reach almost all people on the planet and open avenues for effective global action around sustainable development. It is important to connect both learners and develop agents of change in society. In this paper, we focus on how digital

resources can support democratization of knowledge production and improve equitable citizen participation in ESD and practical action at the local and global levels.

The paper investigates structures, processes and components that support transnational collaboration in digital spaces, particularly, around the enhancement of sustainable environmental attitudes. We use Collaborative Online International Learning (COIL) as a basis to develop EcoCOIL as a versatile model for expanding coalition building tools and principles, to promote environmental citizenship and develop multi-layered communities of practice. Stakeholders include university students and staff, technical experts, business leaders and entrepreneurs, social innovators, policy makers, Community Social Organisations (CSOs), etc. EcoCOIL focuses on co-created wisdom sharing across intercultural, intergenerational and transdisciplinary actors; it brings an innovative, participatory angle to curriculum development by integration of lifelong learning principles and practical facilitation of sustainable behavior within communities in real time.

Key words: Education for Sustainable Development (ESD), Collaborative Online International Learning (COIL), Communities of Practice, EcoCOIL

Introduction

The effects of climate change are now observable by almost everyone on the planet. Local, regional and global weather patterns have gradually changed long-term patterns as a result of human activity; challenges have been exacerbated by poor adaptation of human behavior across the entire planetary system (UNEP, 2019; JPI, 2019). Climate change is significantly influencing human activities, experiences and wellbeing and natural ecosystems (EC, 2019; UNEP, 2019). Scholars (Werkheiser, 2017; Salīte et al., 2019; Jasanoff, 2010; McMichael, Barnett, & McMichael, 2012) and environmental activists (e.g., Greenpeace, Extinction Rebellion) have been raising considerable alarm about what is termed a catastrophic crisis or 'climate emergency', and this is being seen in Climate Emergency Declaration by organizations and governments (UN, 2012; 2016; EC, 2020), and commitments to net zero greenhouse gas emissions (Dewulf et al., 2020). Yet, beliefs, actions and responses to the climate crisis vary across communities (JPI, 2019; Moser, 2019; Rusch & Heidi, 2015). This variance Stevenson, Nicholls and Whitehouse (2012) suggest is linked to political distrust and economic apprehension. Though there are technological innovations such as carbon capture and renewable energies that could enhance opportunities to transition to sustainable products (Sharp, 2002; Edquist & Leif, 1999), it is essential that communities are mobilized and equipped with the competencies, attitudes and skills to adapt individual and collective behaviors to be part of the 'net zero' transition. In this paper, we propose a mechanism for engaging learners across nation states, generations and disciplines using Collaborative Online International Learning (COIL) tools and principles. Ecologized Community Online Intercultural Learning (EcoCOIL) integrates COIL and ESD, allowing for curriculum transformation as well as intercultural, intergenerational and transdisciplinary engagement. EcoCOIL can be characterized in the dimension of lifelong learning and viewed as a practical facilitator of sustainable behavior change.

The European Commission (2019) has identified that considerable and urgent changes to individual and societal practices are needed to ensure that climate change does not irreversibly destroy the environment and impede human development and growth. For example, food systems and food behavior change has been ignored for a

long time, while it is now upheld that without that substantial changes to food production, we will not be able to cut greenhouse gas emissions (UNESCO, 2018). To support these sustainable transitions, there is a need to provide practical support and capability spaces for individuals, groups, corporations, and communities to feel engaged and empowered to act and to understand the implications of a net zero transition (Ellen Macarthur Foundation, 2015; Clark et al., 2016). It is important to provide Education for Sustainable Development (ESD) that enhances understanding around sustainable behaviors for individuals, groups, communities, and public and private organizations. ESD provides not just information but also appropriate risk communication and solutions, which prevent citizens from feeling overwhelmed by the impending crisis. ESD also offers opportunities for collective action and innovation as more people understand the cross-cutting priorities that require urgent attention (O'Flaherty & Liddy, 2018) and the co-benefits of action.

Prior research linked to climate change communication (Moser, 2014) has demonstrated links between individual awareness and perceptions (Wilson, 2017; McDonald, Chai, & Newell, 2015) showing widespread understanding of the risk associated with climate change (Jones, Hine, & Marks, 2017; Van der Linden et al., 2015); however, knowledge is not leading to positive action or behavioral adaptations. Considerable apathy among significant groups (Antadze, 2018; Ballew et al., 2019) has foregrounded the importance of examining cognitive, affective and axiological dimensions of climate change risk communication, lifelong learning activities for ESD, along with the dominant socialization and educational processes that underpin civic inaction (Jain et al., 2013). On the other hand, prominent groups and activists expressing ecological grief or climate anxiety (Marshall et al., 2019; Reid, 2019; Ashlee & Neville, 2018) have highlighted the need to provide practical support and capability spaces that stop citizens from feeling overwhelmed by the impending crisis or the cross-cutting priorities that require urgent attention. These reactionary behaviors indicate how feelings of powerlessness, lack of trust and transgenerational solidarity impede opportunities to mobilize citizens to act (Spence & Pidgeon, 2010) highlighting the political dimensions of the climate discourse (Ballew et al., 2020), and the requirement for collective action at national and transnational levels. Supported by lifelong learning opportunities, inaction should be tackled by providing the socioeconomic, cultural and political tools to support activism and the cognitive, conative and affective support systems that enable smaller, vulnerable, disadvantaged or marginalized (rural, disconnected, voiceless) to draw upon the resources and confidence of networks and advocates, too.

Education for Sustainable Development is increasingly embedded in higher education (HE) due to the current emphasis on tackling societal challenges like the climate crisis (Dovros & Makrakis, 2012). Formal education is identified as a major tool for tackling climate change apathy and anxiety (Liddy, 2013). It is important to support learning beyond the classroom and play a role in supporting a sense of environmental citizenship and climate justice which can enhance collective and participatory processes that will sustain the changes required. Accordingly, Civic Society Organizations deliver ESD and practical action in communities (Sénit, 2020). It is important to connect learners across all spectrums, from formal to informal, developing agents of change in society.

ESD can be used in different contexts, including supporting inclusion, engagement and mobilization. There is a need to learn and understand new ways of working sustainably across societies, fostering partnership between citizens, communities and government that support the development of new skills, approaches and methodologies for tackling

global challenges (CEDEFOP, 2008). Skills such as Participatory Budgeting have been transformative in major cities, enhancing responsive, inclusive, participatory and representative decision-making (Cabannes, 2019). Their transferability from one culture to the other is vital for the development of the new social norms and changes in practice towards greater consciousness of how to act more sustainably. ESD can be used:

- to understand what we need to do as individuals to lessen individual, our family and community impact on the environment and sustainability;
- to develop new skills to act as communicators (nudging, motivating and mobilizing others) to network with and inspire others for change;
- to share ideas and develop new solutions as entrepreneurs (profit or not for profit etc.) to create more sustainable solutions to everyday issues;
- to become more effective campaigners and lobbyists for change to inform and influence others whether they be political parties or corporations;
- to influence policies and business actions (offering green solutions).

It is important to understand how we create and present innovative ideas through design thinking (Kelley & Kelley, 2013); proposals that capture imagination have been used by celebrities to make sustainable behaviors admirable with a view to making them social norms. The challenge is to understand how we can identify and create new social norms that encourage sustainable behaviors in a holistic way. EcoCOIL allows for co-creation of Norm-Creative Innovation (Nilsson & Jahnke, 2018). A review of using social norms to change behavior (Yamin et al., 2019) involving over 90 reviews illustrates how social norms have proven to be a popular and cost-effective way in which both researchers and practitioners attempt to transform behavior in day-to-day life on an ongoing basis. The advantage of making a change in social norm is that it is inspired and motivated by collective action at the community level as opposed to requiring costly regulation and enforcement (Tankard & Paluck, 2016).

The EcoCOIL approach focuses on collaboration, inclusion, participatory and responsive work around sustainable development. The principles underpinning the design and ethos are elaborated in the next session.

Transnational Model for Delivering ESD

EcoCOIL emphasizes the necessary connection among education, global citizenship and the climate crisis. Framing the transition to sustainable societies is seen as a "wicked problem" (Rittel & Webber, 1973), i.e., a complex set of problems that cannot be tackled sequentially and for which there are no simple, linear resolutions (Morton, 2013; Morin, 2007). Indeed, apparent solutions to specic problems can lead to new challenges. We propose an EcoCOIL framework that is dialogic and proactive; focused on linking 'glocal', i.e., ideas and values that consider the global implications and reach of local behaviors and decisions and at the same time acknowledge how local cultures, ideals, and socioeconomic pressures shape everyday lives (Gupta, van der Leeuw, & de Moel, 2007; Patel, 2017), in conjunction with orienting learners to the systems mind-set (Habron, Goralnik, & Thorp, 2012). EcoCOIL embraces systems thinking, a key sustainability competency (UNESCO, 2017) providing a framework for international, holistic critique of current climate change narratives, including formulating transformative responses that anticipate the consequences of inertia, and envisions new norms and avenues for civic involvement in a climate-aware action through global and democratic citizenship.

Digital resources are a major tool for connecting learners and enhancing lifelong learning mechanisms that are transformative and practical (Lange, 2004); digital spaces have improved educational access and supported democratization of knowledge production and improved citizen equality. The COIL approach has successfully enhanced dialogic learning in HE across international boundaries into community spaces. The online nature of COIL supports wide-ranging collaboration across disciplines, physical and sectoral boundaries and supports socially distanced learning where necessary. COIL also encourages access because it has lower barriers to engagement (no need to travel or incur large costs), it connects local, civic groups with international actors and can tackle ontological and epistemological positions which delegitimize the need for behavioral change and sustainable activities.

Collaborative Online International Learning

COIL, defined as "not a technology, or a technology platform, but a new approach to teaching and learning which provides faculty and students the ability to communicate directly and immediately with peers far away," is increasingly used as an innovative space for collaboration, dialogue, knowledge and cultural exchange (Rubin, 2016, p. 134). Key principles have been identified (ibid.) for COIL activities to include a strong element of international cooperation among students; problem-based/activity led-orientated activities formed by a number of internationalized learning outcomes, and a reflective component that helps learners make explicit learning resulting from engaging in such intercultural encounters (Beelen, Wimpenny, & Rubin, 2020). EcoCOIL can be seen as an important contributor to HE, enhancing the current trends that integrate internationalization and global citizenship education as tools for tackling exclusion and global challenges (Wimpenny & Orsini-Jones, 2019).

COIL principles can be applied anywhere where there is internet connectivity, including in secondary, primary or vocational education. This enhances the potential for transnational interaction in EcoCOIL. Though the adoption of innovative online teaching methods as part of impacting the wider education ecosystem and community learning is not typically reflected in institutional (internationalization) policies and plans (De Wit, 2016), increasing attention is placed on how experiential learning and real-world experience are embedded in formal curriculum (Chen & Adefila, 2020). COIL generally provides a sustainable, ecological approach for mobilization of a collaborative, active, international, transdisciplinary education movement seeking to promote knowledge development on approaches to support moving beyond inertia, particularly because it opens learning environments for developing dialogic skills, communication tools and reflective practice that can be embedded into the curriculum. It offers a fertile space for expanding the education ecosystem and develops awareness of everyone's responsibility towards climate change.

COIL emphasizes 'collaboration' and takes place in virtual environments. Similar forms include Virtual Collaborative Learning (VCL) or Computer-Supported Collaborative Learning (CSCL), though these do not necessarily include an international element. Central to the EcoCOIL model are structures, processes and components that support transnational collaboration in digital spaces. EcoCOIL leverages pathways for raising awareness by using ESD; this provides a rich foundation for learning about climate change. In addition, there is provision to engage in authentic challenges; this supports

transformative learning (Mezirow, 1997; 2000), encouraging participants to develop sustainable environmental attitudes at local level and share practices transnationally.

In practice, EcoCOIL extends to a range of stakeholder and integrates coalition building tools and principles with a view to promoting environmental citizenship and developing multi-layered communities of practice (Moser & Pike, 2015; UNEP, 2019). Potential stakeholders include young people, university students and staff, technical experts, business leaders and entrepreneurs, social innovators, policy makers at local, national and regional levels, community social organizations (CSOs), community associations and interest groups such as farmers, activists, or unions, civic organizations for the elderly and non-governmental organizations (NGOs) amongst others. COIL activities are to be designed to engage cognitive, affective and axiological dimensions of learning (forms of knowledge and types of values) and enhance citizens' capacities to transform their individual and collective behaviors through collaborative inquiry and positive, interdependent coalition building (UNESCO, 2017; 2018; UN, 2016).

The essential principles and tools of COIL that EcoCOIL include (see Figure 1):

- Active peer-to-peer online interaction;
- Co-construction of knowledge;
- Intercultural communication;
- Dialectic questioning;
- Strategically designed learning activities to empower learners to catalyze change.

Figure 1

Essential Tools and Principles for EcoCOIL

Operationalizing EcoCOIL

There are some challenges operationalizing the EcoCOIL model, though the pedagogical approaches used in COIL have been shown to promote transformative learning experiences (Beelen, Wimpenny, & Rubin, 2020; Kapenieks & Kapenieks, 2020). It is important to examine how digital educational spaces can serve as a nexus of collaborative dialogue and action. The use of appropriate tools and facilitators will, in part, determine how successful the alliances are in co-designing and delivering activities that lead to positive learning experiences and social-behavioral change in their local communities and glocally.

In order to enable the success of programs, it is important to make adequate preparations, checking that

- The infrastructure is suitable: appropriate devices and connectivity;
- Resources are aligned to the activities and relevant to the context;
- Communication and interaction channels will be facilitated by experts;
- Activities are meaningful;
- Key stakeholders are engaged;
- The materials promote global and environmental citizenship;
- Practical support for communities to build greater societal resilience is embedded.

These are essential for promoting engagement, encouraging participation and building commitment (Dewulf et al., 2020; Sabatier, 1998).

Other aspects of organizing an effective and engaging COIL session need to be carefully considered as well. For example, who 'runs' an EcoCOIL program – climate specialists or policy makers? The principles of EcoCOIL suggest that management should not be limited to a particular discipline or stakeholder group; however, it is important to acknowledge the benefit of expert input, particularly the usefulness of proficient and knowledgeable oversight. Other bespoke considerations include how EcoCOIL is managed, participant recruitment, on-boarding and support, etc. Practical points for organizers extend to funding, especially given the multistakeholder involvement and the length of a given program.

EcoCOIL is framed around UNESCO's (2017) framework for developing sustainability competencies (see Table 1). The efficacy of the EcoCOIL model is demonstrated by the elements that enhance the sustainable competencies, in particular, collective action by supporting coalitions, strengthening connections, solidarity, developing environmental citizenship/greening campaigns, public activism and enhancing accessible/inclusive communication channels. In essence, EcoCOIL is a multi-layered pedagogical/social approach to connect transdisciplinary and transnational learners through COIL enriched environmental citizenship learning, coalition building activities, citizen science/phenomena-based initiatives/problem-based learning. It aims to deepen partnerships that emphasize positive interdependence and multi-layered networks.

Table 1

Definitions of Key Competences in Sustainability Adapted from Brundiers et al., 2012

Competencies	Definitions	EcoCOIL approach
Systems thinking	Ability to collectively analyze complex systems across different domains (society, environment, economy etc.) and across different scales (local to global), thereby considering cascading effects, inertia, feedback loops and other systemic features related to sustainability issues and sustainability problem-solving frameworks (Wiek, Withycombe, & Redman, 2011, p. 207).	Integrates systems thinking organization and delivery.
Futures thinking	To be able to iterate and continuously refine one's own futures thinking (visions, scenarios, etc.), in productive and explicit tension to the status quo; recognizing the implicitly held (and largely unrecognized) assumptions about how society works and how they influence the status quo and critically reflecting how they might influence futures thinking.	Supports real-world problem solving and reflection.
Values thinking	To be able to differentiate between intrinsic and extrinsic values in the social and natural world; to recognize normalized oppressive structures; to identify and clarify one's own values; to explain how values are contextually, culturally, and historically reinforced; to critically evaluate how particular stated values align with agreed-upon sustainability values; and to differentiate between espoused values and practiced values.	Engages participants in reflexive evaluation of all the sustainability dimensions.
Strategic thinking	To be able to recognize the historical roots and embedded resilience of deliberate and unintended unsustainability and the barriers to change; to creatively plan innovative experiments to test strategies.	Evaluation and testing of tactical ideas + feedback loops.
Interpersonal	To be able to apply the concepts and methods of each competency not merely as "technical skills," but in ways that truly engage and motivate diverse stakeholders to empathically work with collaborators and citizens' ways of knowing and communication.	Focus on multistakeholder engagement.
Integrated problem-solving	To be able to combine and integrate steps of the sustainability problem solving process or competences, while drawing on pertinent disciplinary, interdisciplinary, transdisciplinary, and other ways of knowing.	Engaging with authentic, real world problems and proffering/testing solutions.
Implementation	The collective ability to realize a planned solution toward a sustainability-informed vision, to monitor and evaluate the realization process, and to address emerging challenges (adjustments), recognizing that sustainability problem-solving is a long-term, iterative process of planning, realization, and evaluation.	Provision of a practical element with a glocal dimension.

See next page for continuation of table

Continuation of Table 1

Intra-personal or self-awareness	The ability to be aware of one's own emotions, desires, thoughts, behaviors, and personality, as well as to regulate, motivate, and continually improve oneself drawing on competences related to emotional intelligence and social and emotional learning.	Intercultural, emotional and sociocultural communication tools support self-awareness and intrapersonal reflexivity.

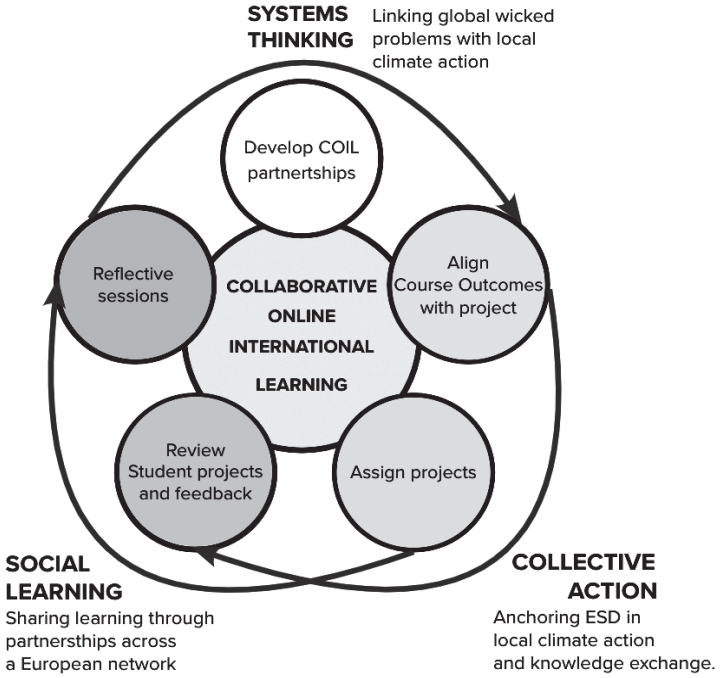
Supporting Lifelong Learning

The rapidly developing response to the climate emergency and net zero challenge requires effective lifelong learning at all layers of our society. EcoCOIL is designed to support ESD in a range of spaces, essentially it involves fusing COIL with ESD, and including stakeholders in the collaboration activities democratizes opportunities to access ESD (see Figure 2). Since EcoCOIL is technology-enabled collaborative learning, it involves groups of online learners who co-construct knowledge and engage in critical problem solving around shared problems, thereby developing a community of practice. COIL activities are used to support intercultural learning, Global Citizenship Education (GCE) and the development of communication and collaborative competencies. According to the UNESCO, GCE empowers learners of all ages to understand that the problems of human rights violations, inequality and poverty still threaten peace and sustainability. These problems are global, not exclusively local issues. GCE enables everyone to become active promoters of more peaceful, tolerant, inclusive, secure and sustainable societies. EcoCOIL tools and techniques can be used to promote knowledge exchange and collective action in youth centers, university classes and civic organizations around ESD and environmental citizenship activities providing solutions on a local scale, branching out to broader scales of activity.

In addition, higher education institutions (HEIs) are increasingly using COIL exchange for virtual mobility as part of internationalization at home, stressing the purposeful international and intercultural dimensions in both the formal and informal curriculum for all students (De Wit, 2016). By making use of digital technologies, EcoCOIL emphasizes an interconnected communicative learning environment as a major vehicle for promoting global citizenship education, involving collaborative learning across two or more institutions. EcoCOIL encounters will help encourage expansive and reflexive learning through new opportunities for participants to share ideas, engage with globally shared problems and question frameworks that form values, behaviors, epistemologies, decisions and climate change practices (Wiek et al., 2016; Armstrong, Krasny, & Schuldt, 2018). Participants explore real-world problems (transdisciplinary, complex and multifaceted global 'wicked' challenges) and draw upon the expertise and experience of their peers from other countries to proffer practical solutions.

Figure 2

Integration of Systems Thinking, Collective Action and Social Learning in EcoCOIL



For example, a good EcoCOIL project will involve University/Youth/Community learners, as well as business partners, local and municipal authorities, technical experts, regulatory bodies, etc. in different countries. Activities will be organized around mini projects such as the construction of a community pavilion, food gardens or mini green parks.

Social Learning

The EcoCOIL approach enhances a community-based action using real-world scenarios as practical case studies and social learning principles (Chen & Adefila, 2020). Social learning principles reinforce transformative behavior through action; it emphasizes learning in social contexts allowing for observation, attention, retention, reproduction and motivation (Glasser, 2007). It introduces the concept of collective action competence as a practical tool. The project analyses how social learning and collective action competence can reinforce voluntary sustainability initiatives and practices.

Incorporating Citizen Science

EcoCOIL can also infuse the Ten Principles of Citizen Science (see ECSA, 2015; Robinson et al., 2018) as a means of engaging a wide range of transgenerational participants and stakeholders. Citizen science activities can promote learning, enhanced collective action and sustainable scientific endeavors and innovation in sustainability. Stakeholder

communities will be engaged in the activities and activism done locally by individuals, organizations and business and governmental partners. This way, EcoCOIL can facilitate coalition building and environmental citizenship among groups supporting the "greening" of their communities and mobilizing sustainable global/local activism (Patel & Lynch, 2013).

An example of a citizen science project, which can be used to support an EcoCOIL delivery, is monitoring of wildlife. Longitudinal monitoring and comparison with older records can help identify responses to climate change. This activity engages citizens in scientific data collection and when delivered via EcoCOIL can enhance transformative learning and rich coalition building. Participants would also be able to share practice in real time using accessible language.

Co-created Wisdom

Collaborating across transnational boundaries supports co-creation in communities at levels that provide opportunities for local nuances to be incorporated into problem solving. The collaboration at this micro scale allows for personal and socially meaningful innovation in at least three distinct ways. First, this includes incorporating community story telling into conversations about environmental justice (Lowery et al., 2020), as individuals are able to offer narratives that demonstrate impact of any decisions on lived experiences. Secondly, community participation supports meaningful collaboration among stakeholders at the policy level as well as a 360-degree ecological view across social, cultural, business dimensions etc. (Laurent et al., 2020). Finally, it ensures that intersectional data and transdisciplinary partnerships are used when considering challenges around sustainability to improve pathways for just transitions, equitable reforms, enhancing resilience in communities and promoting social innovation in development (Kramer & Wagner, 2020). This kind of cooperation between academic experts and public wisdom is critical for tackling wicked problems (Atlee, 2017; Kakoty, 2018).

Conclusion

Adequately addressing global complex problems such as climate change requires new approaches to engagement, education and civic participation are needed. Particularly, we have discussed the importance of mobilizing citizens to co-create solutions alongside other stakeholders and introduced the EcoCOIL as a generic model that could support transnational, collaborative learning and action. The EcoCOIL model provides a holistic approach for empowering and mobilizing stakeholders from different segments of society to learn and act collaboratively with respect to the climate crisis. The importance of collective action has been demonstrated by Verhoef et al. (2020) who have used a similar multistakeholder model where people in the same community can 'buddy' with someone else to support inclusivity around access to online technologies.

EcoCOIL is based on a user-centric design and can be adapted to fit the context of different users, and adopted readily as a means of improving awareness, educating citizens, engaging and enhancing collective action and mobilizing coalitions. It does require digital technologies and virtual learning tools. Participants are engaged in experiential learning and share their practice through the community formed in the digital space. This requires a high level of commitment, motivation and social literacy.

EcoCOIL is a model that can deepen social capital and broaden social networks. These are essential for tackling the climate crisis by facilitating interaction and transformative behavior.

The EcoCOIL model has significant theoretical benefits for ESD and the transformation of behavior; nevertheless, several elements of the fused approach will require testing and evaluation given the complexity of supporting real world learning in a way that facilitates engagement across the life course and constituent communities. It is important to work out how to support intercultural communication as various groups may speak different languages, have a range of sociocultural norms or political approaches. In addition, further investment in technology for deprived communities and wider evaluation about which technologies work best in recognizing differing needs and demands are essential for this approach.

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