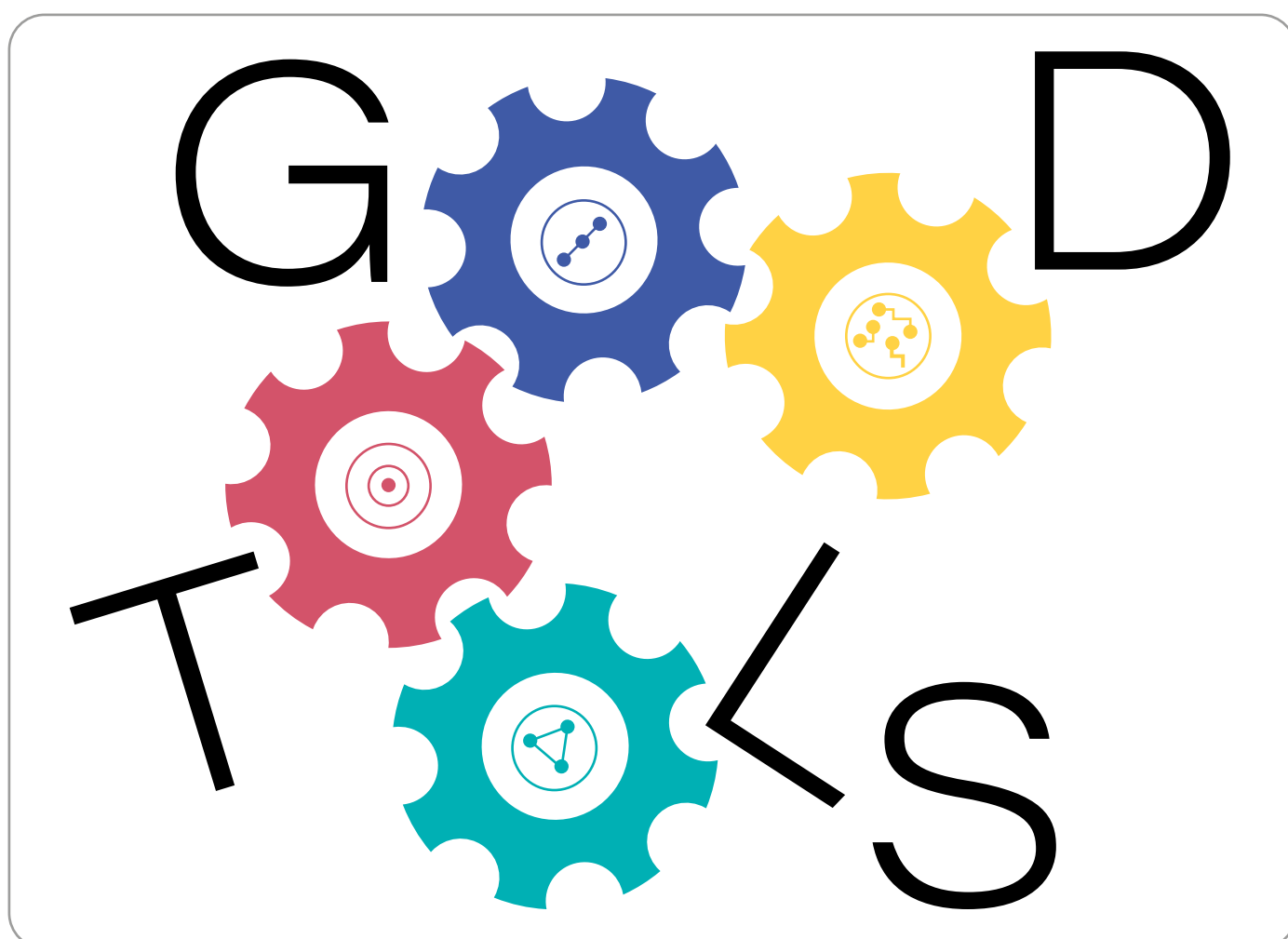# Good Practice Guidelines

DIGITAL TOOLS FOR TRANSDISCIPLINARY AND TRANSFORMATIVE RESEARCH
AND LEARNING

Karrer, Laurenzia; Zabel, Astrid; Hammer, Thomas; Herweg, Karl; Hirschbuehl, Tina; Illien, Patrick; Lemann, Tatenda; Lewis, Anna; Lundsgaard-Hansen, Lara; Mathez-Stiefel, Sarah-Lan; Ming, Eva; Moser, Stephanie; Providoli, Isabelle; Rueff, Henri; Solar Alvarez, Jimena; Trechsel, Lilian; Zeleke, Gete; Zimmermann, Anne

2022

Good Practice Guidelines

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Imprint

We were used to organizing co-creation and learning processes for inter- and transdisciplinary research in face-to-face settings. Then came the Covid-19 pandemic and changed the way we did things – from social distancing and quarantining to working from home. But this disruption has also offered a unique opportunity to explore new options by challenging stable structures and shifting education and research into a liminal state, where innovations are possible. The present guidelines aim to help you make the most of these new opportunities for co-creation in digital settings.

Authors
Karrer, Laurenzia; Zabel, Astrid; Hammer, Thomas; Herweg, Karl; Hirschbuehl, Tina; Illien, Patrick; Lemann, Tatenda; Lewis, Anna; Lundsgaard-Hansen, Lara; Mathez-Stiefel, Sarah-Lan; Ming, Eva; Moser, Stephanie; Providoli, Isabelle; Rueff, Henri; Solar Alvarez, Jimena; Trechsel, Lilian; Zeleke, Gete; Zimmermann, Anne

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SUMMARY OF THE GUIDELINES

These guidelines are comprised of six chapters, each of which is summarized below.

1   Introduction

We were used to organizing co-creation and learning processes for inter- and transdisciplinary research in face-to-face settings. Then came the Covid-19 pandemic and changed the way we did things – from social distancing and quarantining to working from home. But this disruption has also offered a unique opportunity to explore new options by challenging stable structures and shifting education and research into a liminal state, where innovations are possible. The present guidelines aim to help you make the most of these new opportunities for co-creation in digital settings.

2   Transformative science in the digital space

As we began during the pandemic to design new ways of co-creating in an online environment, transformative learning moments emerged. These moments led to new forms of organizing research and education. To ensure that the opportunities arising from the pandemic are fully embraced, these guidelines focus on the knowledge, attitudes, and skills related to co-creation for sustainable development and needed for four types of competence – digital, professional, social, and personal.

3   From face-to-face to digital in different phases of co-creation

The digital tools and methods best suited to your project will depend on the phase of co-creation you are in. In these guidelines we distinguish between three project phases: finishers, bridgers, and explorers. Our world of intertwined digital and physical realities generates a matrix of physical settings, online settings, and a combination of the two – knowing which to choose when is important.

4   Knowledge

In addition to factual knowledge, co-creation requires knowledge about the importance of emotions, reflexive awareness, and other non-verbal, communicative elements. Online settings require greater awareness of these value-driven aspects, as non-verbal communication is more difficult to establish in digital than in physical settings.

5   Attitudes

Addressing inequalities and power asymmetries is an important aspect of transdisciplinary co-production of knowledge for sustainable development. Attitudes are shaped by values and govern modes of communication. Deliberately reflecting on attitudes can help translate these values into actual behaviour in discussions that take place online.

In the context of transdisciplinary research for sustainable development, four attitudes and related values are key:

5.1   *Participation and inclusion* refers to the ability of people to take part, to contribute (orally), and to create connectivity between the different individuals. Online settings can enable a more diverse group of people to participate. To tackle inequalities arising from the digital divide, it is highly recommended to address digital resource-related issues and be aware of digital barriers for different social groups.

5.2   *Contributive fairness* is measured by the relative share of different participants in a discussion. The digital space can provide more equality because social aspects are less visible. Equipping moderators with methods for fair discussion is thus a great opportunity to overcome power structures and hierarchies.

5.3 *Trust* is crucial for collaborative work and is often built on impressions formed in face-to-face settings. In online settings, it is harder to assess ability, benevolence, and integrity – and thus to build trust. To facilitate trust in online settings, it is therefore important to have clear structures, transparency, and bonds between people.

5.4 *Willingness to engage in continuous learning* and self-reflection is essential for transformation: on the one hand, the will to learn is an important adaptation strategy in the face of complex and uncertain sustainability issues. On the other, self-reflection and deep listening open us to other perspectives and to sharing, which are essential in co-creation processes in a "VUCA"[1] world.

6 Skills

Transformative skills for the digital space cannot just be transposed from the physical space but must take into account specificities of the digital space: how does the online environment influence communication? We provide an overview of the skills needed in four spheres: digital, professional, social, and personal. Importantly, these skills are interdependent.

6.1 Digital skills
Develop digital literacy and ensure the participants are comfortable with the technology they need to take part in the digital space.

6.2 Professional skills
Understand the online setting as a field with new advantages and limits; be able to choose suitable online methods and settings.

6.3 Social skills
Enable participation, inclusion, trust creation, and contributive fairness.

6.4 Personal skills
Strengthen emotions, reflexive consciousness, and critical awareness.

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[1] "VUCA" stands for volatility, uncertainty, complexity, and ambiguity

SHORTCUTS

Need to get straight to the point? The shortcuts below lead directly to each chapter.

1 — How Covid-19 created new opportunities within the digital space

2 — Promoting transformative science online

3 — What phase is your project in? Choosing the right digital tools and methods

4 — Understanding the importance of emotions and non-verbal communication elements in the digital space

5 — Understanding the values and attitudes underlying co-creation

5.1 — Ensuring participation and inclusion

5.2 — Fostering contributive fairness

5.3 — Creating trust

5.4 — Fostering a willingness to learn

6 — Adapting appropriate skills and methods

1   Introduction

In its 2021–2024 strategy, the Centre for Development and Environment (CDE) at the University of Bern defines four pathways to impact, one of which is to "co-create sustainability solutions" (CDE 2021). As the name implies, co-creation involves working closely with others. Up until the start of the Covid-19 pandemic, this usually meant co-creating – and learning – with partners from research and practice in face-to-face settings, either abroad or in Switzerland. The abrupt suspension of travel – international as well as between home and office – put a sudden end to in-person meetings in the spring of 2020. This posed major challenges for transformative and transdisciplinary activities in research and learning.

The world quickly embraced Zoom – or Google Meets, or Microsoft Teams – but then another challenge reared its head. As people stayed at home, they were constantly available – and it became possible to hold meetings at any time. Meetings, meetings, and more meetings. And as the quantity of online meetings increased, the quality often decreased, as people became less engaged, or overloaded with information and with work – and they began to suffer from "Zoom fatigue" or complained of being "all Zoomed out". The risk of creating a "new normal" of endless Zoom meetings thus merits critical reflection and discussion in our institutions.

> **"***Transdisciplinary co-production of knowledge is at the heart of what we do***"**
> (CDE 2021)

However, the disruption in in-person meetings caused by the Covid-19 pandemic has also offered a unique opportunity to foster the sustainability competences needed for co-creation, by challenging stable structures and relations, and shifting education and research into a liminal state[2] (Förster et al. 2019). The literature on transformative learning teaches us that learning processes experienced in online formats can help shape a new stable way of using remote tools for research and education. Indeed, manifold digital tools are available that allow for distance communication and can be an opportunity to innovate in our ways of engaging with partners and reaching out to new actors (Altbach and de Wit 2020).

Most of CDE's staff members and international partners have now had ample opportunity to experiment with online learning and co-creation tools. The present guidelines tap into this wealth of experience and seek to help foster sustainability competences and promote transformative literacy. The aim of these guidelines is to support co-creation of sustainability solutions, particularly in remote settings – by exploring social and technological innovations together with research partners in CDE's study regions.

The guidelines were compiled as part of a CDE-funded "Transformation Stream" project. For one year we reviewed literature, collected individual experiences, and organized two interdisciplinary workshops. Around 20 CDE staff and partners around the world were involved. During the process, we shared transformative potentials as well as difficulties of transdisciplinary and transformative co-creation in the digital space. The project itself was thus a co-creative learning process that fed into the guidelines. As you will have noticed, the concept of "transformation" is key – which is why we devote the next chapter to defining it.

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[2] "Most authors agree that TL [transformative learning] is sparked inside or outside a person by an irritation, a 'disorientation dilemma' (i.e. an experience that challenges one's meaning making and being, such as working in a foreign culture), or even a crisis (e.g. a natural disaster or loss of a job)" (Förster et al. 2019).

2 Transformative science in the digital space

To be actively involved as a change agent requires a specific mixture of knowledge, attitude, and skills (Scholz 2011). Such competences may be acquired through "transformative literacy" – the "ability to read and utilize information about societal transformation processes, to accordingly interpret and get actively involved in these processes" (ibid).

There are numerous concepts related to transformation. To help avoid confusion, the German Advisory Council on Global Change WBGU (2012) suggests dividing transformation processes in research and education into four categories. We relate the competences outlined above – knowledge, attitudes, and skills – to these categories.

The first two focus mainly on *knowledge*, with transformation as a subject:

> *Transformation research* "focuses specifically on our understanding of transformation processes in a historical and present-day context (…) and e.g. relates them to the future transformations towards a low-carbon society." (WBGU 2012)

> *Transformation education* "makes the findings of transformation research available to society and critically reflects on the basic requirements for transformative action." (WBGU 2012)

The following two categories also include the levels of *attitudes* and *skills* and can be understood as "transformative science":

> *Transformative research* supports transformation to advance development and innovation in relevant sectors and society, and is in a constant transformation process itself (Schneidewind and Singer-Brodowski 2014).

> *Transformative education* generates an "understanding of action paths and possible solutions. Related educational content focuses, for example, on innovations that are likely to have, or have already had, transformative impact." (WGBU 2012)

Transdisciplinary research[3] and transformative learning[4] are guiding processes needed to shift research and education towards a transformative science, not only, but especially, at an institutional level. Transformative science, as argued by Schneidewind and Singer-Brodowski (2014), is a form of science that is continuously developing in awareness of its social role with regard to its research content and methods, its educational and mediating function, and its institutional constitution.
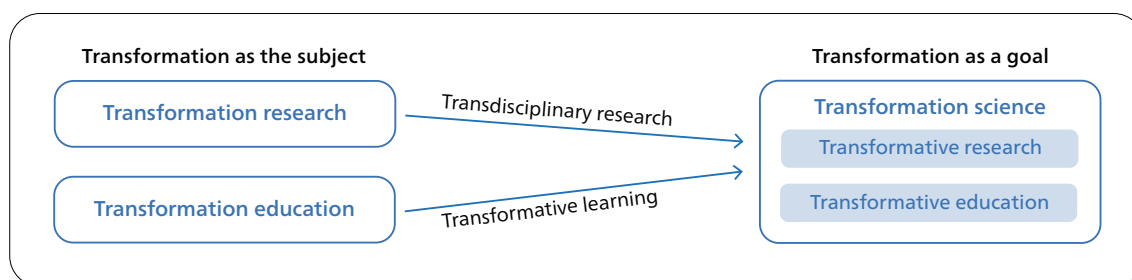
Figure 1: From transformation as content to transformation as a goal. Source: Own illustration

These guidelines reflect that transformative learning and transdisciplinary research are key for achieving transformative science.

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[3] Transdisciplinary research is necessarily interdisciplinary and links different scientific disciplines. In addition, non-scientific actors (e.g. politics, business, etc.) in the problem area are involved in order to arrive at feasible recommendations for action (Bergmann et al. 2012).

[4] "(…) involves a deep structural shift in the basic premises of thought, feelings and actions. It is a shift of consciousness that dramatically and permanently alters our way of being in the world. Such a shift involves our understanding of ourselves and our self-location: our relationships with other humans and with the natural world. It also involves our understanding of power relations in interlocking structures of class, race and gender, our body awareness, our visions of alternative approaches to living, and our sense of possibilities for social justice, peace and personal joy" (O'Sullivan et al. 2002).

2.1   A short embedding in the history of CDE

The institutional history of CDE shows a development from transformation research and education (as defined above) towards transformative science. Instrumental in this development was a 12-year research programme (2001–2013) that was led by CDE: the National Centre of Competence in Research (NCCR) North-South. Based on research partnerships between and among researchers and institutions from the global North and South, the NCCR North-South aimed to: "investigate pathways for sustainable development in the context of syndromes of global change, using disciplinary, interdisciplinary, and transdisciplinary research" (Wiesmann and Hurni 2011). In hindsight, the learning processes experienced during the NCCR North-South – within the interactions between international students and local people and environments, and in the importance of inter- and transdisciplinarity – could "be described as the discovery of ESD[5] competences" (Wilhelm et al. 2019). The learning of skills and attitudes was intended to "promote dialogue, cooperation, self-reflection, and correction of preconceptions after exposure to completely different cultures and visions of the future in the field" (ibid).

Inter- and transdisciplinary skills in face-to-face settings have a long standing at CDE and lay the groundwork for transformative science (Herweg et al. 2012; Herweg et al. 2021). These valuable skills should now be transferred to the digital space.

For these guidelines we have adapted the "Action Competence Model" developed by Herweg et al. (2021: 47). The Action Competence Model is a matrix containing three types of competences: professional, social, and personal. Our adaptation adds a fourth competence: that needed to function in the digital space. Chapters 4-6 of these guidelines focus on the knowledge, attitudes, and skills needed to acquire these competences.

Table 1:   "Action competence model" based on (Herweg et al. 2021) and extended and adapted based on insights gained during CDE's Transformation Stream workshops (2021).

Action Competence Model	Academic Knowledge *knowing about …*	Critical Awareness *attitude/values; willingness to consider …*	Professional Skills *ability to …*
Digital Competence (handling the online world)	• online collaborative tools • the different preparation and follow-up needs of digital exchanges	• openness to innovative IT tools or platforms • willingness to experiment	• handle digital tools competently • harmonize and integrate different IT tools or platforms
Professional Competence (handling the subject)	• causes and consequences of unsustainable development from global to local scales • different visions of SD • concepts and digital tools of project/programme management	• environmental and societal perspectives (interdisciplinary) • sustainable solutions and action • ethical reflection on research and education in digital space	• manage incomplete knowledge and uncertainties • strive for sustainable solutions and action • use an adequate method for the project
Social Competence (handling others)	• basic concepts of social psychology and cultural anthropology	• empathy • international, intercultural and interdisciplinary cooperation	• initiate constructive interactions • describe complex subjects to a specific target group • willingness to compromise
Personal Competence (handling oneself)	• research techniques and methodologies to participate in the research process and academic discourse	• critical self-reflection personal flexibility	• manage time

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[5]   Education for Sustainable Development

3 Moving online in different phases of co-creation

Murphy (2004) presents a model that describes stages of interaction in projects. Murphy's model refers to online settings, but can also be applied to offline settings. Reaching each of the stages requires having accomplished the previous stage, but accomplishing one stage does not necessarily mean reaching the next (Murphy 2004). The stages of the model cover:

- the initial establishment of social presence, i.e. getting to know each other
- articulating individual perspectives
- accommodating or reflecting on the perspectives of others
- co-constructing shared perspectives and meanings
- building shared goals and purposes
- producing shared artefacts

Building on these stages, we can group projects according to the stage they achieved offline before moving online due to the pandemic. We call projects that were in their final two stages when shifting online "finishers". We call projects that shifted online during an earlier phase "bridgers", and those that start online "explorers" (see Table 2).

Table 2: Three stylized project phases. Source: Own illustration

Finishers	Bridgers	Explorers
The project was nearing its completion when the pandemic hit. Team members had been used to meeting face to face.	The project was only just beginning when Covid-19 restrictions forced all communications online. Collaborators with no or only a partial history of face-to-face meetings were challenged to find bridging solutions for the period of online communication.	The project was designed during the pandemic, once Zoom (and other) meetings had become the norm. The project design thus becomes an opportunity to test new ways of conducting transdisciplinary learning and research in an online setting.

Finishers

Transdisciplinary learning and research projects within the "finishers" category were moving towards the project's end at the onset of the pandemic. Decisions on transdisciplinary methods were taken under pre-pandemic conditions and were difficult to change towards the end of the project. These projects were able to benefit from their history of face-to-face meetings and, due to a certain path dependency, may have simply needed to find a communication tool suited to their defined transdisciplinary methods to conduct the work necessary to conclude the project.

Bridgers

Projects in the bridgers category reached one of the first stages in face-to-face meetings prior to the Covid-19 pandemic. To move to the next stages in the online setting, it may help to develop a strong facilitation strategy for communication in the online space. This is important to ensure that the learning and/or research work continues (rather than going into hibernation) until the pandemic eases off and the project can revert to face-to-face communication.

Explorers

Projects in this category seek to explore and build on the forced shift to the digital space, by understanding the pandemic as a crisis that can provoke individual transformative learning processes.[6] Moving from crisis mode to learning can be achieved by reflecting on individual experiences that were displaced, and extending them with new meaning perspectives[7] (Mezirow and Arnold 1997). It should be noted, though, that overwhelming emotions (that can lead to e.g. stress or stagnation) can hinder transformation.

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[6] The "explorers" project phase is a specific learning situation, as the team members had no face-to-face meetings and may never have met in person before. However, transformative learning processes can take place in any of the three categories.

[7] "A frame of reference is a meaning perspective, the structure of assumptions and expectations through which we filter sense impressions. It involves cognitive, affective, and conative dimensions. It selectively shapes and delimits perception, cognition, feelings, and disposition by predisposing our intentions, expectations, and purposes. It provides the context for making meaning within which we choose what and how a sensory experience is to be construed and/or appropriated" (Mezirow 2000: 16).

Through this lens, the Covid-19 crisis and the inconvenience or even emotional discomfort caused by the shift to the digital space, can be seen as a lever for transformation. Understanding the crisis as an opportunity to transform and redesign communication in transdisciplinary projects opens avenues to test and explore new forms of transmitting information on factors known to be relevant for transformational learning such as emotions and sensory perceptions (Förster et al. 2019), but also a reflexive consciousness of power structures and mindsets (Schneidewind 2013). For example, the digital space is becoming more relevant to data collection and field research due to the increasing intertwinement of the digital, the social, and the material (Faxon 2021). On the one hand, this is due to the increasing use of technical innovations such as computer-assisted personal interviewing (CAPI) and different modes of reaching respondents, such as online surveys. On the other, the Covid-19 pandemic has largely restricted in-person fieldwork and forced researchers to find other ways of gathering data and engaging with their research participants. This means that even more reflection is needed as to which method is the most appropriate from the researcher's standpoint. Further, new debates on ethical problems of representation need to be tackled and addressed, e.g. Is the digital research field safe for participants e.g. in terms of data security? Am I, as a researcher, visible in the research field, or am I "lurking"[8]? This requires professional competence to select the method depending on the question and the research field. Faxon (2021) offers a "ground-to-cloud" model, through which one can reflect on the model of inquiry and object of analysis within one's own research (see Figure 2).
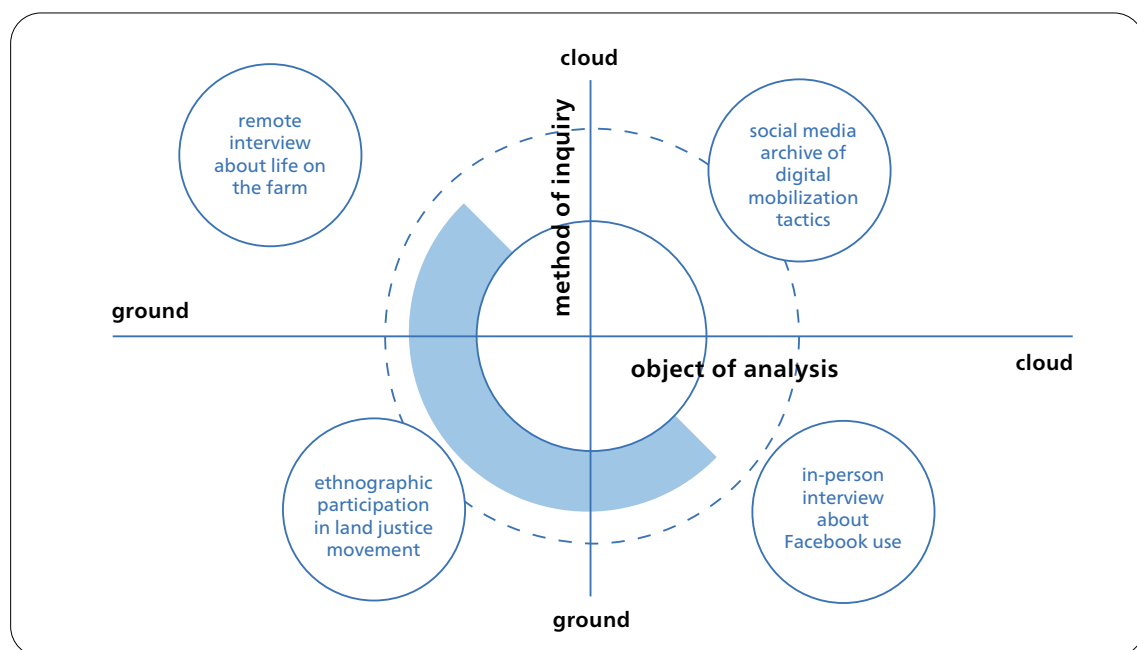

Figure 2: From ground to cloud. Source: Faxon 2021

> Find Skills
> 6.1 Digital skills (6.1.1)
> 6.2 Professional skills

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[8] i.e. invisible observation

4   Knowledge

Transdisciplinary approaches[9] have evolved to address complex problems that are relevant at the wider societal level. Although there is no common definition or coherent practice that guides transdisciplinary projects, there appears to be some consensus that transdisciplinarity involves people with different backgrounds, values, and world views (Thompson et al. 2017).

Many different methods have been used in transdisciplinary research and transformative learning but there is still much room to draw on and synthesize lessons learnt across individual projects (Wuelser et al. 2021). While there is a great diversity of methods available for transdisciplinary research and transformative learning, they share the common trait that they all build on communication (Hämäläinen and Vähäsantanen 2011; O'Rourke 2017). Up to now, much of the literature has assumed that communication takes place in face-to-face settings. Even in research and learning settings where the majority of the communication takes place in the digital space, face-to-face meetings in initial phases are considered key (Gallagher 2013; Berente and Howison 2019).

Within online spaces we communicate not from sender to receiver but from sender via technology to receiver. What we perceive is a screen (mediated) world, which is shaped by its architecture (Rosa 2016). Nevertheless, the starting point of the communication is our position and corporality, which is still in a physical space and influences the way we position ourselves in the online space. Therefore, we need to establish a relation to technology without neglecting our social and corporeal situatedness in physical space, becoming aware of its importance within communication. This is because – apart from transmitting factual information between sender and receiver – communication also conveys emotions and is essential for creating reflective consciousness (social and personal components). These communicative aspects require value-based collaboration, which should be explicitly articulated and reflexively critiqued. According to the cognitive hierarchy model, values are stable moral guidelines that interact with other forms of cognition (Homer and Kahle 1988). Since co-creation processes are to be understood as learning processes, emotions and values are essential for a holistic transformation process and must also be considered as part of the cognitive learning process (Sipos et al. 2008).

It was already noted before the pandemic that consideration of the above aspects applies all the more to online collaboration, where non-verbal communication is difficult to establish naturally (Hammond 2017). Online communication challenges experienced during the pandemic highlighted that two particular aspects of transdisciplinary and transformative approaches deserve special attention in digital settings: emotions and reflexive awareness. (Karrer et al. 2020). We explore these in more depth below:

Emotions. As transformative learning affects the whole person, *feelings* and *emotions* are crucial. Emotions play a fundamental role in the motivation of participants – students and transdisciplinary collaborators alike – and are interconnected with cognition. Therefore, in addition to rational knowledge, emotional, value-based, interpersonal, and relational knowledge is required for an effective transformation (Schneidewind and Singer-Brodowski 2014). However, people who spend substantial amounts of time online have been observed to be less emotional or even indifferent (Kulshreshtha and Sharma 2021). This is clearly a challenge for transdisciplinary research and learning projects that are moved to the digital space.

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[9]   In their description of transdisciplinary research (TR), Pohl and Hirsch Hadorn (2007) stress that "There is a need for TR when knowledge about a societally relevant problem field is uncertain, when the concrete nature of problems is disputed, and when there is a great deal at stake for those concerned by problems and involved in dealing with them. TR deals with problem fields in such a way that it can:

a) grasp the complexity of problems,

b) take into account the diversity of life-world and scientific perceptions of problems,

c) link abstract and case-specific knowledge, and

d) develop knowledge and practices that promote what is perceived to be the common good."

Reflexive consciousness. In transdisciplinary approaches, debating about meanings and establishing certain attitudes towards different forms of knowledge production is key (Schneidewind 2013). Co-production can be achieved through co-learning and a conscious handling of power structures and mindsets. Moreover, reflective and social dialogues can support the learning process not only on a pragmatic and rational level: they can also give impulses to learners to strive for a holistic transformation. In combination, these two elements can be termed a reflexive consciousness, which involves a self-location as well as an institutional location of our basic premises of "thought, feeling, and action" (O'Sullivan et al. 2002). This can shape our thinking towards "seeing our worldview rather than seeing with our worldview" (Sterling 2011).

Find Skills

6.4 Personal skills

5 Attitudes

Addressing inequalities and power asymmetries are important values underlying the transdisciplinary co-production of knowledge (CDE 2021). Establishing attitudes can help translate these values into actual behaviour in (online) discussions. Importantly, specific values influence attitudes, which in turn influence behavioural intentions, and finally, context-specific behaviour (Jones et al. 2016).

Building on this understanding, we argue that attitudes govern modes of organizing communication in both offline and online interactions. We have chosen to focus on four particular elements, selected for their relevance in the literature and for CDE: participation and inclusion (who has the opportunity to talk), trust (what participants dare to say), contributive fairness (who says how much), and willingness to learn.
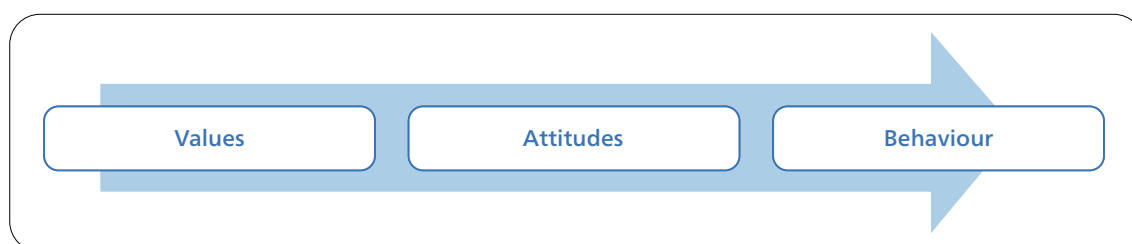
Figure 3: From values to behaviour. Source: Own illustration

5.1 Participation and inclusion

We understand participation and inclusion as two related but distinct dimensions. Participation refers to peoples' attendance in discussions and their ability to provide input, while inclusion refers to "connections among people, across issues, and over time" with a view to achieving co-production (Quick and Feldman 2011). Participation can thus be seen in quantitative (numbers of people attending) as well as qualitative (whether all people affected by the issues at stake are integrated into the discussion process) terms (Thompson et al. 2017). Inclusion, then, can be understood as connectivity between the participants and the iterations of their interactions over time, as the issues at stake evolve. It also refers to a group's capacity to implement decisions and achieve the desired transformations. Inclusion thus not only requires participation of the people affected, but also of agents of change, i.e. people who are in a position to implement decisions (Quick and Feldman 2011).

A review of the literature on participation in online settings revealed mixed experiences. In the field of education, the pandemic-induced shift to the digital space was in many cases a hindrance to participation. Academic conferences, by contrast, saw an increase in participation, as will be further discussed below. Generally, during times of face-to-face communication, the ability to be in a certain geographical location at a certain time is decisive for participation. In the digital space, participation tends instead to be defined by whether the participants have access to the necessary technical infrastructure, such as access to electricity or the actual devices themselves and a mobile data or Internet plan (see Figure 4). At this point, government restrictions on Internet access must also be considered. Such restrictions, which hamper access to information, have spread in the global South since the disruption of the pandemic, for example in Myanmar and Kenya (Jigsaw 2021).

Moreover, deficient access to technical devices, licenses, and a space to work can be a constraint both at a structural and an individual level. The pandemic highlighted and accentuated the digital divide, and access to online education and participation became an issue of inequality. Thus, access to infrastructure and to the Internet can be understood as a measure of equity and is key to democratic access to education and overall participation (Braun et al. 2020; Marinoni et al. 2020). By pointing up socio-economic inequalities, the digital divide is forcing us to understand the position, resources, and opportunities of those involved (Czerniewicz et al. 2020). As public access to places like universities or libraries was restricted, people without their own devices or with only limited access to electricity in their home environment were automatically excluded from participation in online events.
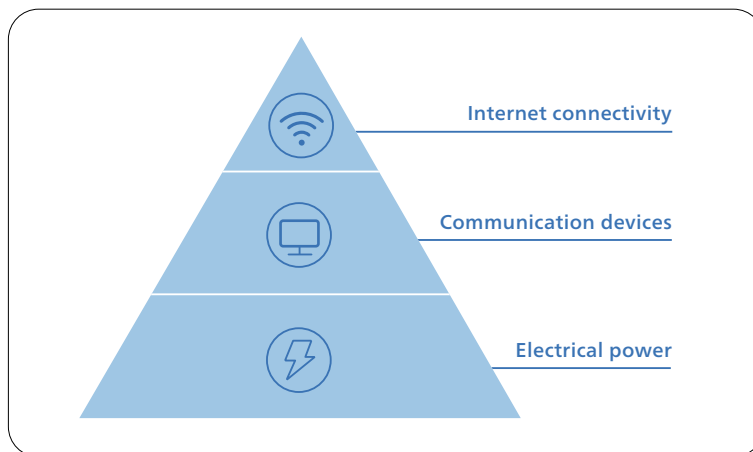
Figure 4: Preconditions for participation in the digital space. Source: Own illustration based on Czerniewicz et al. (2020: 955)

As mentioned above, participation in online scientific conferences increased substantially during the pandemic. The move online allowed more people to participate – especially people who would previously have been unable to travel, e.g. due to vulnerabilities or disabilities, caring responsibilities, or a lack of funds for conference fees and accommodation costs (Sarabipour 2020; Achakulvisut et al. 2021). Viglione (2020) argues that this makes online conferences more inclusive than their physical counterparts. More inclusivity and diversity of researchers (e.g. in terms of geographical background, seniority in research, gender, ethnicity etc.) provides scope for a richer exchange of ideas and viewpoints and potential to develop more creative solutions (Sarabipour 2020; Sarabipour et al. 2021). Participants at CDE's Transformation Stream workshops reported that gender and age differences were less obvious in online meetings.

Figure 5: Preconditions for inclusion. Source: Own illustration based on Sarabipour (2020) and Achakulvisut et al. (2021)

6.1 Digital skills
6.3.1 Participation and inclusion
6.4.3 Safe space

5.2   Contributive fairness

However, merely attending an event does not equate to being heard. The relative share of talk by different collaborators in a discussion has been used to measure "contributive fairness", although there is no general benchmark and it is argued that group participants usually have strong feelings as to what constitutes a fair distribution of talking (Meeker 2020). How much each participant talks is relevant in the context of power and equality, because shares of talking are commonly associated with e.g. social status or gender, both within and outside of the group. Status within the group can be related to perceived competencies and knowledge on the issue at stake. However, status and rank established outside of the group can be purposely transported into the group and if others are deferent, can lead to a pecking order in taking the floor and in unequal shares of talking. With the same screen space provided to each person irrespective or rank or status, discussions taking place online may hold some advantage over physical meetings. Indeed, people who are more introverted in face-to-face meetings may thrive in online meetings (Williams and Castro 2010). In online discussions, moderators are equipped with functions to enforce certain codes of conduct, such as avoiding interruptions by muting all collaborators but the presenter.
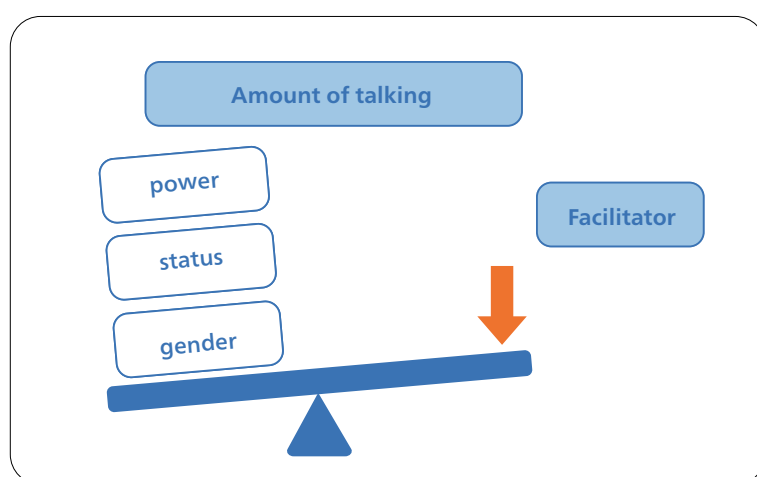
Figure 6: Barriers to contributive fairness. Source: Own illustration based on Meeker (2020)

6.3.2 Contributive fairness

5.3   Trust

The Transformation Stream workshops found that trust helps to homogenize power, and that it is important to build capacities and relations over time, not just with people but also with technologies.

Trust between group members is critical for collaborative work, especially when dealing with complex problem settings (Vries et al. 2018). By creating a friendly, open atmosphere, the facilitator can empower and motivate the team to contribute actively to decisions. Transformative change is not possible without mutual trust (Fernandez and Shaw 2020). Trust develops based on group members' assessments of each other's trustworthiness, which is often a composite measure of ability (i.e. relevant skills), benevolence (i.e. motivation to be helpful without expecting any extrinsic reward for this behaviour, not lying), and integrity (i.e. adherence to an accepted set of principles; congruence between saying and doing) (Mayer et al. 1995).

Assessments of ability, benevolence, and integrity are based on current impressions, usually formed in face-to-face settings – but also on past experiences and/or reputation. Face-to-face interaction can foster bonds between team members, conceptualized as "touch" or interdependencies between people, which are positively associated with cooperation, member satisfaction, and team effectiveness (Williams and Castro 2010).

Specifically investigating how trust evolves in early phases of online collaboration, Vries et al. (2018) found that perceived mutual trustworthiness increased with interaction among collaborators and was facilitated through clear structures, contents, and processes that established transparency. Of the three dimensions of trustworthiness, perceptions of ability and integrity were most relevant for the formation of trust in online settings. Without face-to-face interactions, benevolence remained difficult to assess and was thus not a major contributor to the establishment of trust.
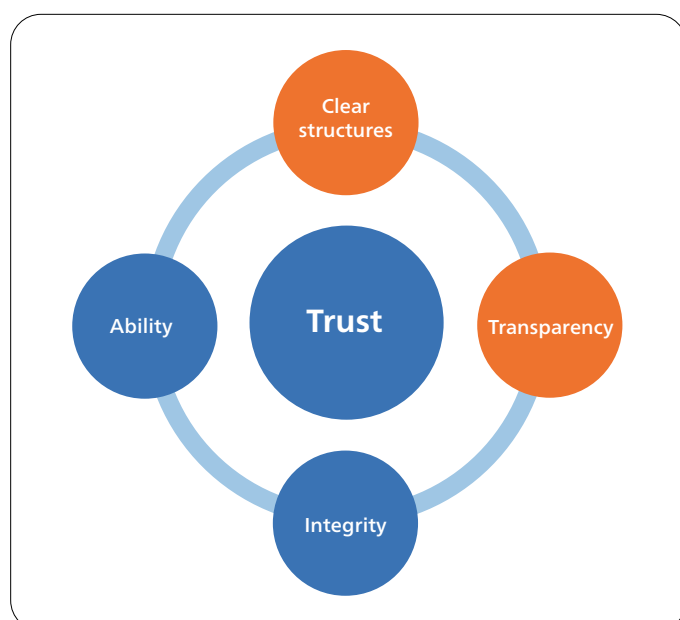
Figure 7: Conditions for trust in online collaboration. Source: Own illustration based on Czerniewicz et al. (2020: 955) (orange: content-related, blue: facilitator-related)

Find Skills   6.3.3 Trust

5.4   Willingness to learn

Achieving *participation and inclusion, contributive fairness,* and *trust* in a transdisciplinary setting requires a willingness to learn. Mezirow (2000: 8) explains the importance of changing the conventional understanding of learning to a transformative understanding of learning, i.e. to "[l]earning that transforms problematic frames of reference – sets of fixed assumptions and expectations (habits of mind, meaning perspectives, mindsets) – to make them more inclusive, discriminating, open, reflective, and emotionally able to change." In a transdisciplinary setting, transformative learning can be achieved through negotiation and dialogue. An attitude of learning is key to deep listening and self-reflection within co-creation. Transformative learning can be emancipatory and promote relational thinking (Klein 2018; Lange 2019). Especially in times of crisis, such as the Covid-19 pandemic, it can be helpful to use disorienting dilemmas as learning moments to face the complexity and uncertainty of our times and develop new competences. In uncertain times, unquestioned assumptions no longer work and open up reflective spaces for critical thinking and self-reflection. Transformative learning is an important adaptive strategy in times of unknowing and uncertainty in a so-called VUCA world (Eschenbacher and Fleming 2020). Due to the increased emotional challenges and stress associated with various crises, it is important to note that *safe enough spaces* are needed to facilitate transformative learning (Singer-Brodowski et al. 2022).

6   Skills

Figure 8: Model of competences and skills within online settings. Source: Own illustration

Preparing activities in the digital space does not simply entail a one-to-one transposition of the physical activity online but is likely to require significant changes and preparatory work.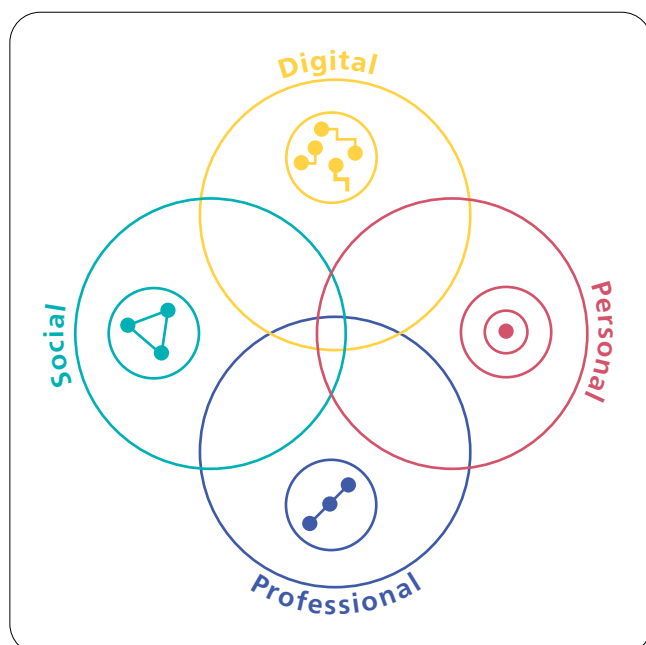 The skills needed to design and facilitate online activities may also be different. This chapter provides an overview of skills that support transformative research and teaching – some general, others specific to the digital space. The skills inspired by Herweg et al. (2021) are subdivided into four competences and should be thought of as interdependent. Most of the suggested skills have been developed from experience with video application formats such as Zoom. However, they can also be applied to other remote settings such as phone calls or Mural.

All participants should be involved in selecting the most appropriate technology (Nworie 2021). On the one hand, suitability, access, and data security must be considered. Discussions at the Transformation Stream workshops revealed that while methods like using cell phones are accessible to a wide range of people and thus more democratic, video applications like Zoom generate more sociability. On the other hand, digital literacy can help to overcome language barriers and illiteracy, and empower people to tell their own story through pictures, as long as the virtual tools are not too complex. So it can also be worthwhile to use meetings as an opportunity for collective learning processes of digital competencies. Balancing these challenges and advantages (see Table 3) requires substantial preparation.

Table 3:   Challenges and advantages of a digital setting. Source: Own illustration

Main advantages Digital settings…	Main challenges experienced in digital settings
…reduce physical access as a barrier	Barriers to access due to a lack of technical infrastructure
…make it possible to provide visual online options if participants are illiterate	A certain level of digital literacy is required among participants
…enable participation through less tangible power structures	Inactive participants may be difficult to reach
…provide the opportunity to talk about emotions	It is more difficult to gauge the atmosphere, due to a lack of sensory perception of gestures or facial expressions

The next chapter, in which we explore digital skills, is based on the following three sources:

1. An explorative literature research based on key words such as "e-learn*, e-teach*, transformative e-learning, e-conference, e-research", as well as "digital, distance, remote, and online". We also actively searched for new articles during the Covid-19 pandemic.

2. Interview with lecturers at the start of the pandemic. During the Corona-Mercator Project ("Social innovations evolving from the Corona pandemic and their potential for a social-ecological transformation"), 15 interviews were conducted with higher education and university lecturers in German-speaking parts of Switzerland during the spring semester of 2020. The goal was to document transformative moments in teaching which could potentially contribute to a transformation towards sustainable development (Karrer et al. 2020). We have extracted the most important learnings from this documentation.

3. CDE's "Transformation Stream workshops" of October and November 2021. Insights from these workshops provided additional good practice examples.

6.1   Digital skills

In the digital space, awareness of the medium we are interacting with is just as important as decades ago, when McLuhan (1967/2016) coined his famous phrase about the medium being "the message". First, we present different technologies (6.1.1) and then a few strategies (6.1.2–6.1.7) that help to **facilitate the relationship between technology and participants, and foster transparency and guidance in online settings**.

6.1.1   Choose the right technology

The digital tools listed below are a selection of the numerous tools available today. As each tool has pros and cons depending on the intended use, there are several points to consider. The most important point, of course, is the digital access and digital literacy of the participants.

> ### Digital tools
>
> **Digital tools for transdisciplinary and transformative research and learning**
> - ☐ Zoom
> - ☐ Teams
> - ☐ Skype
> - ☐ Cisco Webex Meetings
> - ☐ BrightTalk
> - ☐ Jitsi
> - ☐ Prezi
> - ☐ Google Meet
> - ☐ Wonder.me
> - ☐ Mural
> - ☐ Miro
> - ☐ Slack
> - ☐ Podcasts and Slidecasts
> - ☐ Videos/movies
> - ☐ Video games
> - ☐ Virtual Reality Technology
> - ☐ Mobile phone (WhatsApp, phone calls etc.)
> - ☐ Camera
> - ☐ Remote desktop
> - ☐ Radio
> - ☐ Digital touch (Jewitt et al. 2020)
> - ☐ Timezonewizard

6.1.2   Hybrid settings

The online shift has made hybrid settings increasingly popular. However, hybrid settings can create challenges in terms of participation, inclusion, and preparation – and they can foster inequality. Critical reflection is needed on questions like "do people in the face-to-face setting have more power?" or "do hybrid settings really lead to equal inclusion?". Further, reflection on the use of hybrid settings or other alternatives like shifting responsibility to partners in place, e.g. local partners within North–South contexts, is necessary and can lead to a decolonization of power structures in North–South contexts.[10] And there is the question of cost: setting up hybrid workshops and conferences is bound to be more expensive, as everything needs to be organized for in-person as well as online participation. Moreover, operating a hybrid programme requires a mastery of both offline and online communication needs.

6.1.3   Include the physical space

Guidelines

☐ Sensitively address spatial and physical surroundings, e.g. noise, room size, private sphere, concentration (Czerniewicz et al. 2020)
☐ Locate learning spaces and safe spaces of participants, e.g. discuss possibilities for creating a safe space
☐ Include sensual experiences and the body, e.g. send haptic supports, such as a booklet or objects that are representative of the topic. For example, in a seminar on sustainable viticulture, wine samples were sent to the participants.
☐ Create a feeling of movement by using break-out rooms or other platforms

Methods

Use check-in routines and warm-up activities, e.g. picture association
(Hanke et al. 2020)

How to track the energy in an online meeting: Rees McCann
Tell your story by means of an object, using a Mural online digital workplace

6.1.4   Strengthen relation to technology

Guidelines

☐ Focus on the technology first to set a safe space for all participants, e.g. locate digital affinity, fears, or pleasure of participants and facilitator
☐ Understand the advantages and limitations of online settings and reflect on these with the participants
☐ Use the importance of digitalization as a motivation for digital learning and curiosity for the tools, e.g. make visible the advantages of digitalization for the participants
☐ Strengthen understanding and trust in the relationship with technology, e.g. set up a space for instructional technology and/or technology support
☐ Include different technological options, e.g. phone, mail, video
☐ Resolve digital barriers (IREX [updated 2021]), e.g. organize accessible possibilities such as shared devices, or use technology and tools without digital barriers

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[10] Empirical data from ongoing experiences are still expected and will provide insights into possible scenarios as well as a scientific foundation for reflections on hybrid settings.

6.1.5 Promote concentration

Guidelines

☐ Have breaks, e.g. every half hour
☐ Keep the time in digital space short, e.g. not over one hour without breaks
☐ Activate and motivate participants through different exercises and formats (see "Methods")
☐ Be aware of "Zoom fatigue" and create alternative ways to reduce screen time, e.g. recommend to your participants to switch off their cameras once in a while (see "Methods")

Methods

Flipped classroom

PenCasts, videos and recordings for knowledge transfer

Think-pair-share

Digital sensors, e.g. live polling (Herweg et al. 2021)

Traffic-light feedback (Ampelfeedback, currently available in German only) (Hanke et al. 2020)

Peer feedback (in German) (Hanke et al. 2020)

Tips for overcoming Zoom fatigue and exhaustion

6.1.6 Create orientation

Guidelines

☐ Use a clear and simple structure for the meeting, e.g. start with a process overview
☐ Create regularity and rituals, e.g. check-in/check-outs (Biester and Mehl-mann 2020)
☐ Limit the output to a minimum (be aware that an online setting minimizes the receptivity of participants)
☐ Adapt learning output to digital media e.g. video, blog post

Methods

Use participation tools like google.docs, Mural etc. for creating a collective learning process and orientation opportunities through others.

To start, you can write an agreement on netiquette for the meeting together (speaking time, break time, etc.). This will help you familiarize yourself with the values and norms in the group.

Use a theory of change as a monitoring tool to obtain a flow diagram.

6.1.7 Communicate clearly

Guidelines

- ☐ Select communication channels according to the preferences of the participants involved (accessibility, manageability, variety), e.g. select the channel with the lowest digital barrier
- ☐ Find a balance between content and relational level, e.g. calculate the same amount of time for exchange and input from your side
- ☐ Provide guidance and participation by teaching visioning (learning objectives or research goals) as a collaborative and dynamic process, e.g. set learning objectives in a participatory process, paying attention to the impact of the digital setting
- ☐ Use a transparent communication strategy (Fernandez and Shaw 2020), e.g. verbalize your choices and uncertainties

6.2 Professional skills

The online shift and the importance of digitality in society have spawned new method overviews and toolkits that provide a valuable resource for researchers and educators dealing with the digital space.

6.2.1 Shift as a system

Guidelines

- ☐ Use an adequate method for the project, knowing that context and content are interconnected and must be considered together (Faxon 2021)
- ☐ Be aware of new opportunities and limitations within the digital space
- ☐ Reflect on research and education in the digital space on an ethical level
- ☐ Manage uncertainties and incomplete knowledge in regard to the online space
- ☐ Know about different concepts, digital tools, and their suitability.

6.2.2 Research

For researchers, we recommend the following two collections for **choosing adequate technologies and methods for an online setting.**

Remote Research

- ☐ Doing fieldwork in a pandemic or the YouTube Webinar Series "Breaking Methods"
- ☐ Remote Data Collection Toolkit

We also provide further literature on research methods during a forced shift online like the one that occurred during the Covid-19 pandemic.

Research during the Covid-19 pandemic

- ☐ Low and middle-income countries (LMICs)/Global South research during the pandemic
- ☐ Research ethics in Covid-19
- ☐ Creative and sensory methods
- ☐ Adapting research methodologies in the Covid-19 pandemic
- ☐ Secondary data and Covid-19 data
- ☐ Changing research practice: Undertaking social science research in the context of Covid-19
- ☐ Doing research remotely
- ☐ Tips for collecting primary data in a Covid-19 era

Qualitative research

- ☐ Doing qualitative research
- ☐ Research methodology shared interest group
- ☐ Qualitative data collection in an era of social distancing
- ☐ Methods in the time of Covid-19: The vital role of qualitative inquiries

Interviews
- ☐ Wayfinder guide to adapting interview practices for Covid-19
- ☐ Alternatives to interviews

Participatory research
- ☐ Researching with participant groups with additional challenges
- ☐ Participatory and deliberative methods
- ☐ Focus group: Qualitative data collection in an era of social distancing

Ethnography
- ☐ Doing ethnography in the pandemic
- ☐ Ethical considerations and challenges for using digital ethnography to research vulnerable populations

Surveys
- ☐ Survey and longitudinal methods

6.2.3   Education

For educators in online settings, we recommend the following literature on online transformative learning. For more insights, visit the Experimenter's library of Legacy 17.

Online Transformative Learning

- ☐ Online transformative learning. An ongoing enquiry
- ☐ Online alchemy: How to boost transformative learning online. A practical guide
- ☐ Online transformative learning in higher education opportunities and challenges for improving educational practices

6.3   Social skills

A facilitator can help to plan and to moderate meetings, and to provide summaries of what was discussed. Most importantly, however, the facilitator can shape the atmosphere during discussions while being attentive to participation and inclusion, trust creation, contributive fairness, and the willingness to learn. It is expected that decisions developed in an environment of trust and free speech are based on multiple perspectives and reflect a rich deliberation process. The facilitator can be the project leader or teacher, but – especially in large and complex projects and learning environments – this role can also be assigned to another collaborator who is equipped with the resources necessary to fulfil the task.

6.3.1   Participation and inclusion

Guidelines

☐ Include stakeholders in agenda-setting, e.g. discuss resources, needs, and alternatives with participants

☐ Use leadership skills and delegate leadership responsibilities, e.g.
  – avoid micromanaging (Fernandez and Shaw 2020)
  – select participants and assign roles by skills and character traits (consciousness, agreeableness, openness, diversity, cultural differences) and if necessary, form teams by using remote working models
  – support self-organized learning processes

☐ Provide adequate resources, e.g. stimulus worksheets, power points, or podcasts

☐ Engage in problem-solving, innovation, and change, e.g. empower participants by giving them possibilities to speak up

☐ Use inclusive and participative formats, e.g.
  – provide scheduled real-time online discussions for individuals or group-coaching (e.g. during a seminar or project) (Keegan 2011)
  – provide moderated, asynchronous seminar discussion forums (Keegan 2011)
  – use Mural/Miro or something similar for content-related discussion and action-based co-creation

☐ Ensure diversity and the inclusion of change agents, e.g. address different social groups explicitly and think about possible barriers to participation

☐ Involve transdisciplinary and transnational partners, e.g. include them in the process of your project realization

Methods

Conversation Cafe for thinking together aloud online – Learning moments (learning-moments.net)

Create a chart of the "Top 10" topics of interest to participants (in German: "Hitparade") (Hanke et al. 2020)

6.3.2   Contributive fairness

Guidelines

☐ Joint reflection on best practice in the group
☐ Be aware of inequalities in terms of share of speaking and access to information
☐ Ensure equitable distribution of outputs and findings

Methods

Use tools to track speaking time, e.g. Woman Interrupted App, speaker times in Jitsi meet
Use red cards to enforce the rules of the game (e.g. timekeeping)

6.3.3   Trust

Guidelines

☐ Be aware of the context of the event (Biester and Mehlmann 2020), e.g. culture, political situation, power structures, rules, learning
☐ Find out what you know/do not know about the participants and what you want to know (Biester and Mehlmann 2020), e.g. awareness of actors of change: who benefits, who might feel marginalized?
☐ Use eye contact, e.g. directly to camera, even if this feels uncomfortable at the beginning
☐ Use moderation skills to translate non-verbal into verbal expressions, e.g. verbalize what you are doing on screen while changing a setting
☐ Be aware of language barriers, e.g. inform yourself about possible language barriers, as a digital setting might limit your non-verbal perception
☐ Talk about emotions, e.g. use your own emotions to open up spaces for reflection and to normalize verbalizing emotions; create an open space for exchange
☐ Communicate different views, e.g. use drawings to visualize different perspectives
☐ Invite advice and criticism, e.g. create rounds of reflection
☐ Provide personal and professional support (Fernandez and Shaw 2020), e.g. inform participants about support possibilities
☐ Postulate data security and data hygiene (Faxon 2021), e.g. inform yourself and participants about the rights of the chosen tool
☐ Strengthen one-to-one relationships, e.g. through phone calls or break-out sessions
☐ Build a culture of listening (see Methods below)

Methods

To create an affirmative culture of listening and co-creation, you can start your session with a short game. One person says "Let's…" the other responds with "Yes, what I like about your idea is … and after we could …", keep on going with the "Yes, … " for a minute (Insights of the Conference World of Wisdom)

Use trust-building activities to start

Exercise: Choose an animal and a city and create a story. After one word another participant continues (Insights of the Conference World of Wisdom)

Use a check-in and check-out for every meeting or "Well-being assessment" (Hanke et al. 2020)

6.3.4   Willingness to learn

Guidelines

☐ Put yourself in the learner's shoes when adapting to online formats and use the insights for personal reflection and empathy for other participants

☐ Understand uncertainties and insecurities as transformative learning moments

☐ Check whether people are willing to transform, and if not, what do they need to be willing to transform

☐ Invite dialogue and negotiation for transformative learning moments

☐ Create "safe enough spaces" for transformative learning for yourself as well as other participants

☐ Trust and respect power shifts by understanding everyone as learners

Methods

Practice deep listening: the kind of listening that requires one to place oneself along the others, in an apprenticing rather than a hierarchical expert relationship. Be present – be aware – understand yourself

How to listen in a video meeting

6.4   Personal skills

Every participant[11] can contribute to a transformative learning process – and the values and attributes it aims at – by questioning their own "ontological, epistemic and normative premises" (Förster et al. 2019) to **strengthen emotions, reflexive consciousness, and critical awareness**.

Below is a structured list of questions that can serve as a starting point for the consideration of emotions and reflexive consciousness for all people involved. Some of these aspects and questions apply to transdisciplinary and transformative projects in general, while others are specific for online settings. In any case, learning, unlearning, and relearning of (non-) sustainable behaviour and thinking are important steps in developing transformation literacy and opening up pathways for new perspectives (Schneidewind and Singer-Brodowski 2014).

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[11]   In these guidelines, everyone (including researchers and teachers) is understood as a participant.

6.4.1   Values and ethics

Guiding questions

☐ What norms, values, or perspectives have led to your event?
☐ What values do you need to lead through the planned process? (Biester and Mehlmann 2020)
☐ What struggles or dilemmas could occur? How do you want to deal with them? (Biester and Mehlmann 2020)
☐ How can you reflect on your behaviour, values, norms, or perspectives?
☐ What are ethical challenges within the digital space?
☐ How do you present yourself in the digital space? Are you visible or not visible?
☐ Be prepared for uncertainties and changes (Faxon 2021)

Methods

Outcome spaces framework
Letters to myself

6.4.2   Emotions

Guiding questions

☐ What emotions do you have and which of these do you wish to communicate?
☐ What fears do you have or may other participants have? How do you want to face them? (Biester and Mehlmann 2020)

6.4.3   Safe space

Guiding questions

☐ What do you need to feel to be in a safe space? How does your experience help you build a safe space?
☐ What do you do already, to help other participants feel safe?
☐ What blockages do you recognize?
☐ How could you erase or address these blockages? (Biester and Mehlmann 2020)
☐ How do you understand the power dynamics within your event?
☐ How do you position yourself within the event? (Biester and Mehlmann 2020)

Methods

Have a look at these **tips** on creating safe online spaces

Use tools to locate power dynamics and different positions, such as the Venn diagram tool or the Actor constellation

7   Conclusion

These guidelines explored new possibilities for transformative science within the digital space. We included tips for choosing the right digital tools and methods for your purpose – and for the phase of your project, i.e. whether you are a finisher, a bridger, or an explorer. We emphasized the importance of the knowledge, attitudes, and skills related to co-creation for sustainable development and needed to acquire four types of competence – digital, professional, social, and personal.

Understanding the importance of emotions and non-verbal communication elements in the digital space is key to the successful co-creation of knowledge. Related to this is an understanding of the values and attitudes that underlie co-creation. We covered the attitudes that are considered essential to co-creation: ensuring participation and inclusion, fostering contributive fairness, building trust, and fostering a willingness to learn.

To help you put these attitudes into practice, the last chapter provided an overview of relevant skills and methods, complete with links. We invite you to use these guidelines on your journey of becoming an accomplished transformative learner within the digital space.

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University of Bern
Centre for Development and Environment (CDE)
Mittelstrasse 43
3012 Bern
Switzerland
www.cde.unibe.ch