A JOURNAL BY SISSA MEDIALAB

JCOM

PRACTICE INSIGHTS

Creating resonance with arts-based approaches to sustainability science communication

Marianne Achiam, Sabrina Vitting-Seerup, Louise Whiteley and Sofie Louise Dam

Abstract

Mainstream science communication has struggled to drive sustainability changes. We experimented with arts-based methods in a workshop series that sought to co-create new methods and formats for sustainability science communication with communicators, artists, scientists, and policy-makers. Here, we describe how we used Hartmut Rosa's notion of resonance to interrogate our experiences, prompted by the workshops and the artwork produced in them. We show how the elements of resonance: affection, emotion, transformation and uncontrollability, fundamentally reshaped the workshops in constructive ways that we could not have predicted. We conclude by drawing out three insights for science communication practice.

Keywords

Bridging research, practice and teaching; Science and technology, art and literature

Received: 22nd June 2024
Accepted: 14th August 2024
Published: 9th September 2024

1 ▪ Introduction

Scientists have warned of the consequences of unsustainable consumption of Earth's resources since the 1800s [e.g., Arrhenius & Holden, 1897; Fourier, 1837], but with lacking effect. Indeed, the looming catastrophes we are facing today attest to the long-term insufficiency of science communication to bring about the necessary large-scale changes in consumption patterns. Research shows that there are multiple reasons for this failure, for instance, the complexity of the problems at stake [Pidgeon & Fischhoff, 2011], the distance to the problems in terms of both time and space [Spence, Poortinga & Pidgeon, 2011], the difficulty of addressing sceptics and deniers [Dryzek & Lo, 2014], and lack of attention to the social and cultural identities of the participants [Fielding & Hornsey, 2016]. Clearly, providing the scientific facts is not enough. Communication strategies based on simple transmission-absorption or 'deficit' models are not effective when it comes to promoting sustainability [Hayhoe, 2021; Richards & Carruthers Den Hoed, 2017; Takach, 2016].

More recently, research has pointed to the potential of the arts in climate and sustainability communication [Galafassi, Tàbara & Heras, 2018; Moser, 2019]. Arts-based approaches may offer emotional and embodied experiences that go beyond facts and cognition, thus making climate problems present and urgent in new ways [Heinrichs, 2019; Verlie, 2022]. Further, arts-based approaches can prompt non-verbal interactions that allow participants to grasp relations between elements of complex issues [Greenwood, 2011; Sullivan & Lloyd, 2006] such as climate and sustainability. Finally, art emphasises knowledge as inquiry, rather than as a body of definitive statements — this means that it can support the co-creation of important questions, methods and interpretations for climate and sustainability [Heras et al., 2021]. After more than twenty years of debate and experience with the paradigm of the 'new production of knowledge' [Gibbons et al., 1994], the potential of arts-based sustainability science as a *new* new production of knowledge and communication paradigm should be more systematically explored and employed by transdisciplinary transformational sustainability science [Heinrichs, 2018]. In this *practice insight*, the four authors (in the following, 'we') report from a workshop series that worked as a starting point for such an exploration, and that, as we describe in the following, led to a transformation in our practices and research.

The workshops described in the following were designed to generate ideas for arts-based sustainability communication, by using arts-based methods as the methodology. In this text, we focus on how this methodology affected the workshops, or more specifically, how it came to inspire not just new formats for science communication, but also new questions for our research. In the following, we share insights and reflections from the interactions between three science communication researchers (authors 1, 2 and 3) and a graphic artist (author 4) who collaborated on the planning and implementation of the workshops.

Throughout the workshop series, we collectively strove to maintain the flexibility, openness and intuition required by arts-based methods [Leavy, 2020]. We knew from the beginning that we were interested in outcomes that were richer than simply the 'visual representation of narrative [...] that captures the content of a discussion' that characterises graphic recording [Dean-Coffey, 2013, p. 48], but still, we were not sure what to expect from our engagement with these methods. Even so, we were surprised by how our research questions became so interwoven with the artworks that the outcomes could not be cleanly separated into art and science. This unpredictability was what prompted us to use the notion of resonance to inquire into our shared experiences, as explained in the following.

2 ▪ Conceptual framing

Arts-based methods emerged in social research as a response to calls to democratise science. As Patricia Leavy observes, 'there is a moral or ethical imperative for researchers to use available resources, including new and transdisciplinary approaches to research, in order to serve the communities in which we are enmeshed' [Leavy, 2020, p. 22]. These new approaches entail a redefinition of the role of researchers and researched communities. Instead of being passive recipients or end-users of scientific knowledge, interested/affected parties become members of an extended peer community who collaborate with researchers to co-produce useful and accessible knowledge [Finley, 2005]. Arts-based methods can facilitate this collaboration by promoting critical conversations about the nature of social-scientific practice [Leavy, 2020].

Sustainability communication calls for exactly this kind of extended peer community [e.g., Block, Goeminne & Van Poeck, 2018; Brossard, Belluck, Gould & Wirz, 2019]. We thus wanted to explore how arts-based approaches to engaging citizens, educators, communicators, artists, researchers and others could bring about contextually situated, aesthetic processes and/or products that were responsive to the social dilemmas of sustainability communication [Finley, 2005], and that could be used to generate insights into the necessary societal transformations required by sustainability [Heras et al., 2021]. These processes and products, and the insights they give rise to, have their own distinct characteristics [Heinrichs, 2018]. In order to capture these characteristics, we wanted to emphasise *resonance* — the process of becoming attuned — rather than focusing on cognition [cf. Felski, 2020].

The sociologist Hartmut Rosa sees resonance as being defined by four crucial elements: affection (listening, or the experience of being touched or moved); emotion (responding, or the experience of responsive self-efficacy); transformation (the dynamic process of being in resonance with something; flow); and uncontrollability (the unpredictable nature of resonance) [Rosa, 2018, 2019; see also Tyfield, 2023]. Resonance thus brings both cognition and emotion into play, as well as analysis and affect, and prompts a process the outcomes of which cannot be known in advance [Felski, 2020]. Prior to these workshops, we were not familiar with Rosa's notions of resonance and unpredictability, but as we sought to understand our own interactions with the artworks, these notions provided us with ways to understand the transformations we experienced as researchers and artists.

Although Rosa himself considers experiences with art to be a way to encounter or experience resonance, we were only able to find two studies that use his notion of resonance empirically to understand interactions between people and art. In an exploratory study of meaning-making and visual art, Russel et al. [2023] employed resonance to understand the transformative potentials of the emerging relations between the participants and the artwork. Although their report is quite brief, the authors demonstrate how they were able to identify all four resonance characteristics in the participants' art perception processes. Weeseman et al. [2023] studied resonance relationships in a co-creation project involving patients, artists, and art materials. They were similarly able to identify the four characteristics in the interactions between artists, patients, and material, and observed how unpredictability or uncontrollability played a central role for the co-creation process. We used these two studies to guide our own analysis, as explained in the following.

Table 1. The three workshops in the project 'Co-creating Sustainability Communication'. About 50 people participated in each workshop, including scientists, communicators, educators, journalists, designers, civil servants, and artists.

Workshop theme	Date	Aim
Science communication FOR sustainability	Feb 2023	Map the sustainability communication landscape in Denmark, including challenges and opportunities
Science communication AS sustainability	Apr 2023	Explore promising perspectives on sustainability communication, and identify important potentials
Science communication FUTURING sustainability	Jun 2023	Draw out important ideas for concrete experiments with sustainability communication

3 ▪ Context

The present narrative is based on three co-creation workshops, held in Copenhagen, Denmark, in 2023. They were part of the project 'Co-Creating Sustainability Communication'. In the course of these workshops, participants were engaged in 1) mapping out the sustainability communication landscape in Denmark, 2) exploring promising ways to enact sustainability communication, and 3) concretising experimental ideas for sustainability communication (Table 1). The workshops were thus meta-communicative events, in which we co-created ideas about co-creative sustainability communication.

The workshops were planned as essentially interdisciplinary events. Specifically, we aimed to restructure existing approaches to science communication by focusing on sustainability [Suldovsky, McGreavy & Lindenfeld, 2018] as an issue that is not specific to any particular discipline or way of knowing [cf. Klein, 2010]. Thus, we invited speakers that offered different perspectives on science, sustainability, and/or communication, for instance a work package leader from the recent Horizon 2020 RETHINK project, professors of, respectively, science communication, sustainability and politics, and media and culture, and a climate scientist recently elected to the Parliament. Finally, the graphic artist on our team participated in all three workshops to create artworks inspired by the key discussions that took place. Originally, these artworks were meant to be shared with the participants after the workshops as one of several kinds of reporting, to help the participants concretise and recall the outcomes of the workshops. However, we quickly discovered how each artwork also became a point of departure for the following workshop, forming a kind of on-going dialogue between the participants in the workshops and us. In this text, we focus on these artworks, and the interactions and reflections they prompted among us. Specifically, we will draw attention to how the artworks became an important tool for us to collectively acknowledge our preconceptions, but also to envision new trajectories for our work.

Practically speaking, we the four authors followed up each of the three workshops with a meeting. These meetings served to consolidate our impressions of the workshops and discuss what we saw as important outcomes. All four of us shared our thoughts and ideas, and the graphic artist shared her first sketches for the artwork. Notably, where we had expected the researchers' role to be to help the artist finalise her work, instead the illustrations seemed to help us to collectively understand the key takeaways from our workshops and point out what to focus on in the subsequent co-creation work. After these meetings, the graphic artist would finalise the artwork and share it with the researchers and

the participants at the subsequent workshop. However, we the four authors also continued to reflect on the artwork in a series of repeat engagements, both collectively and individually. These repeat engagements, our detailed notes of these engagements, and our field notes and other materials generated during the workshops are what form the basis of the preliminary or 'proto' analyses shared in the following sections.

4 ▪ Workshop 1: science communication FOR sustainability

In the first workshop, participants investigated the existing landscape of science communication with respect to promoting sustainability. To ensure that different perspectives were presented, speakers included the RETHINK work package leader, a professor of science communication, and a climate scientist recently elected to the Parliament. All three speakers gave retrospective looks at established practices. The workshops had a relatively mainstream format consisting of short keynote presentations, two digital post-it sessions, and exploration of the science exhibitions featured at the science centre Experimentarium.

Given the sometimes-fraught health messaging that took place during the recent COVID-19 pandemic, it is perhaps not surprising that discussions in the workshop moved towards the role of science communication in an emergency. In her presentation, Professor Sarah Davies pointed out that, absent emergencies, science communication often intends to enable democratic, equitable societies. However, during crises such as the pandemic, she asked, is the emphasis on democracy a luxury that societies cannot afford? [cf. Davies, 2022]. Climate scientist and Member of Parliament Theresa Scavenius offered a counterpoint to this discussion by sharing her experiences with the everyday, practical functioning of the Danish parliament, and reflecting on the ideal of the Greek *agora* as a place where a variety of voices are heard.

During the course of the workshop, the participants' discussions gradually moved towards this tension between democratic and strategic science communication in relation to sustainability. A number of the participants reflected on how to widen participation in democratic processes, as exemplified in the following quotes.

> [During the workshop] I discovered and appreciated more challenges, mainly the importance of inclusivity; reaching out to and discussing with a more diverse target audience to involve many perspectives and interests. (workshop 1, padlet)
> How do we give the public agency to join the conversation and be part of a positive change? (workshop 1, padlet)
> It's both about the way we legislate, have public debates, engage in democratic processes, make science, etc. etc. (workshop 1, padlet)

Workshop 1 prompted the graphic artist to create an image of an hourglass, labelled 'persuasion' and 'democracy' (Figure 1). In the following sections, we describe how the artwork prompted — among us — the resonance characteristics: affection, emotion, and transformation [Rosa, 2018], and how these characteristics shaped our next steps. We discuss the last element of resonance, unpredictability, in a separate section, as it became apparent to us after the workshops.

4.1 ▪ *Affection (how did the artwork affect us, or call to us?)*

From our first contact with it, the hourglass spoke to us of the urgency of the sustainability and climate challenges we face. The hourglass is placed in a slanted position, as if on a tipping point, invoking a sense of time being of the essence. One of the chambers contains persuasive science communication, the other democratic science communication. The two forms of communication thus seem located at either end of a spectrum. Even so, the two chambers are connected, perhaps indicating that there is not a rigid dichotomy between the two forms of science communication — a point also discussed in subsequent workshops, including by a sociologist whose work assumes the entanglement of the two.

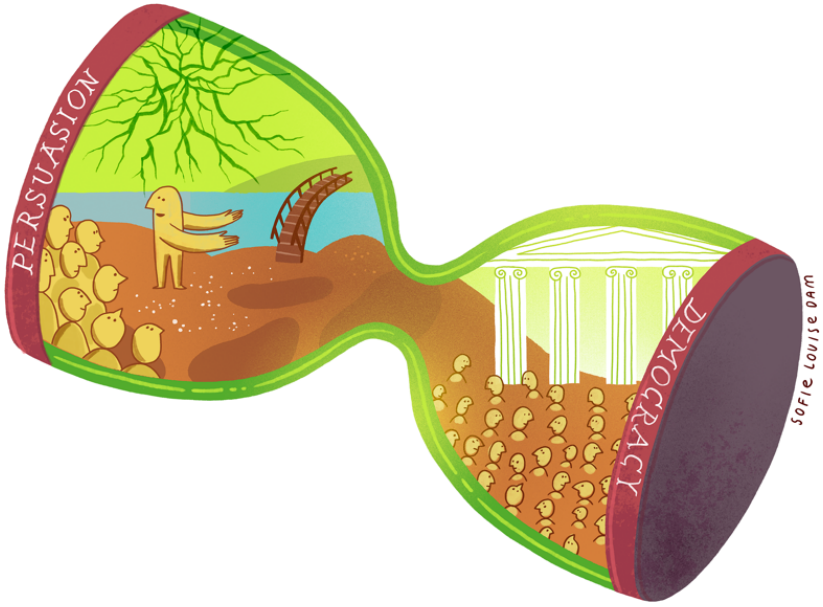

Figure 1. The image resulting from the first workshop, which aimed to map the sustainability communication landscape in Denmark, including its challenges and opportunities. Artwork by Sofie Louise Dam, © Department of Science Education, used here with permission.

The artwork also encouraged us to consider our own roles and agency in promoting sustainability. For us, the interconnected chambers of the hourglass reinforced the idea that sustainability science communication eludes categorisation in neat, mutually exclusive boxes, thus emphasising the salience of our inquiry into this domain. We were also confronted with the notion that different perspectives can generate 'truths' that are otherwise not accessible (e.g., that strategic and democratic communication can co-exist), and this underscored the idea that sustainability calls for multiple voices, even though it can be uncomfortable and feel alienating.

4.2 ▪ *Emotion (how do we answer, or reach out, in response?)*

Although we immediately recognised the hourglass, at the same time, it prompted doubt. We agreed that the tension between strategic and democratic sustainability science communication was indeed what we had discussed at the workshop, but even so, we still had to reflect on our interpretations at length before we could put into words what we saw. In fact, this dialectics between recognition and alienation became a general theme for our

encounters with the artworks. More concretely, the hourglass artwork caused us to confront our precognitions of democratic and persuasive communication and consider what they meant for the workshops, as described in the following.

4.3 ▪ *Transformation (how do we experience being in resonance with the artwork?)*

There seemed to be a consensus, during the first workshop, that democratic science communication was necessary — we *were* hosting a co-creation workshop after all! At the same time, we were also convinced that creating a more sustainable world was the goal of the arts-based sustainability communication we were co-creating. We came to the slightly uncomfortable realisation that we were, in a way, attempting to *persuade* the participants with our democratic formats to do sustainability the 'scientifically proven' way. Accordingly, we had to ask ourselves to what extent we could claim to be inclusive and co-creative, given that we had a predetermined goal for the workshops? Frustration and doubt became constant companions, replacing our otherwise complacent position of 'doing the right thing'. In this way, our interactions with the artwork created both positive and negative feelings. On the one hand, we were confronted with the seriousness of the present state of affairs (including our preconceived ideas), on the other hand, we felt validated in creating the workshops because they constituted a way for us to combat inaction through our different spheres of influence [cf. Amel, Manning, Scott & Koger, 2017].

These reflections, resulting from our interactions with the artwork, prompted us to think more carefully about the subsequent workshops. We decided to try more explorative engagement formats and, and the same time, we formulated more open-ended descriptions of the possible outcomes of these engagements. Finally, we decided to use concrete and material objects for the engagement activities, rather than the abstract and general questions that had prompted the outcomes of the first workshop.

5 ▪ Workshop 2: science communication AS sustainability

The second workshop explored promising perspectives for the promotion of sustainability through science communication. We invited two speakers: one a professor of sustainability and politics, and the other a professor of media and culture. In his presentation, Professor Harald Heinrichs drew on a number of artworks [e.g., music, street art) that in various ways demonstrated the potential of art to 'generate insights into sustainability that go beyond cognitive-based scientific understanding' [Heinrichs, 2018, p. 132], while Professor Stephen Duncombe shared his reflections on the ability of utopias the impossible to help us think about possible futures [cf. Duncombe & Lambert, 2017]. We invited these professors because they had somewhat counter-cultural ideas about transformation and sustainable futures, rather than because they were experts on science communication *per se*.

Intertwined with the presentations were creative and open-ended group activities, e.g. drawing maps of sustainability science communication and designing imaginary exhibitions about sustainability with no budgetary or institutional limits. Here, all participants (including the speakers) worked together to create ideas and imaginaries about promoting sustainability through science communication. The discussions and interactions in the second workshop were more playful than in the first workshop, and the participants evaluated the day more positively than they did Workshop 1. The participants' questions and

engagement were also quite different. In Workshop 1, participants mostly asked clarification questions ('What are we supposed to reflect on?' — 'What should I look for in the exhibits?') and sought to comply with what we wanted them to do. But in Workshop 2 things changed. When we asked the participants to draw maps, one group started folding theirs, and another group looked for scissors to cut holes and asked for clay or playdough to extend the map in three dimensions. A participant pulled one of us researchers aside to discuss whether sustainability science communication could indeed be described by a map, or whether it should rather be conceptualised as an ecosystem - this led to an elaborate metaphor with a number of concrete examples. In retrospect, it seemed that when the workshop format became more playful and less outcome-oriented, the participants were less worried about challenging the tasks we set; this, in turn, led to deeper, more inspiring conversations.

Workshop 2 prompted the graphic artist to create an image of a dragon inscribed with the word 'imagination' (Figure 2). The image was inspired by, among other things, a sea creature visible in the image of Thomas More's Utopia (by Abraham Ortelius, ca. 1595) that Professor Duncombe presented in the workshop. In the following sections, we describe how this artwork prompted us to experience resonance.

Figure 2. The image resulting from the second workshop, which aimed to explore different perspectives on sustainability communication, and identify important potentials. Artwork by Sofie Louise Dam, © Department of Science Education, used here with permission.

5.1 ▪ *Affection (how did the artwork affect us, or call to us?)*

The dragon illustration spoke to us in a very different way than the hourglass illustration. The dragon curves sinuously around the words 'utopia' and 'immersion', binding them together in an infinity symbol. It brought to our minds the unknown and uncharted, in the form of fairy tales, or ancient maps marked 'HIC SVNT DRACONES' (here there be dragons). Traditionally, dragons signal danger or duplicity, but this particular dragon seemed benign, even friendly. We wondered: Could the uncharted landscape of arts-based sustainability science communication be equal parts frightening and joyful — like the dragon in the artwork?

The artwork also prompted thoughts about sustainability science communication as uncharted territory that has not yet been described or categorised. It is out of our reach, as the image's reference to utopia reinforces. The prompt 'immersion' challenged us to think more holistically about sustainability, and to trust our senses 'beyond the purely cognitive analysis and (re-)construction of phenomena' [Heinrichs, 2018, p. 132].

5.2 ▪ *Emotion (how do we answer, or reach out, in response?)*

We were in higher spirits after the second workshop, having witnessed how well it worked to invite our participants to draw, design and perform. When we saw the dragon artwork, we first laughed at the sight of the smirking dragon, before we again fell into deeper thoughts that triggered other emotions. 'Immersion' (which we understand to be the suspension of time and place, cf. Mortensen [2010]) is a longed-after place for researchers and science communicators like us, but we also know it is a luxury few people treat themselves to in modern life. Even the word 'utopia' seemed bittersweet, despite our choice of this exact topic to lead us towards hope. Utopia literally means 'no-place'; in other words, it's an impossibility, like a smiling dragon. Is a sustainable world a 'no-place' — and an impossibility? Why did we reach for the impossible when were attempting to shape a better future? Perhaps these emotions are exactly what we must handle when working with sustainability science communication: Hope, fear, and regret must go hand in hand for us to chart new territories.

5.3 ▪ *Transformation (how do we experience being in resonance with the artwork?)*

The dragon artwork responded to and acknowledged the question about dichotomies raised by the hourglass artwork in Figure 1. Immersion and utopia seemed to signify powerful avenues for sustainability science communication, but it was clear to us that without careful consideration, these notions could also be counter-productive. Specifically, immersion and utopia can both be means for either constructive or destructive communication. This idea became the point of departure for the final workshop, where we decided to examine the co-existence of hopes and fears in sustainability science communication.

6 ▪ Workshop 3: science communication FUTURING sustainability

The third, online workshop was designed to consolidate the findings from the first two workshops and generate concrete ideas for sustainability communication experiments. The vast majority of the participants had also attended the first two workshops. The first and third authors each gave brief presentations followed by discussions, while the second author facilitated a number of group activities.

The group activity 'Dreams and Nightmares' explored participants' ideas of 'dreamy' and 'nightmarish' sustainability communication, while the presentation by the third author, 'Playful Escapes from the Utopia/Dystopia Dichotomy' addressed how similar utopias and dystopias can be when we explore them thoroughly. The overarching theme that coalesced during the workshop was that emotion and speculation are powerful tools for sustainability communication — a point made by communication professionals, sustainability consultants, and scientists from different disciplines. Two sub discussions emerged: 1) While artists are

often comfortable with using emotion and speculation in their practices, researchers are typically not, indicating an important role for arts-based methods; and 2) dichotomies (e.g., dystopia/utopia, strategic/democratic, qualitative/quantitative, ready-made science/science in the making) are not necessarily useful qualifiers for sustainability science communication. For instance, one participant wrote how 'what is a utopia for one person could be a dystopia for another person' (workshop 3, chat), while another discussed that what is effective communication cannot be reduced to a binary, but 'messaging should always be tailored to the target audience group [...] it depends on the ideas and behaviour of that audience group what will work best, when'. These responses emphasised the point that dichotomies need to be handled with care in order to make participants aware they are there to be challenged.

Workshop 3 inspired the artist to create an image of a Renaissance-era court jester or fool with several faces, trailing three banners with the texts 'Multiple Perspectives', 'Truth in Ambiguity' and 'Communities of Collaboration', respectively (Figure 3). In the following sections, we describe how this third artwork prompted us to experience resonance.

6.1 ▪ *Affection (how did the artwork affect us, or call to us?)*

Traditionally, jesters were truth-tellers, and had the right to talk and mock without being punished. Indeed, this particular jester may be presenting three inconvenient truths with its three banners. Further, the jester is depicted as striding purposefully ahead, evoking in us a clear sense of movement into the future. Just as Latour's [1987] Janus figure, the jester has both forward-looking and backward-looking faces. This ambiguity was appealing to us, because we did not know exactly what arts-based methods could contribute to sustainability science communication, but we knew *something* could be gained — and that we wanted to learn more.

The artwork made us think about sustainability science communication as something that defies definition and can wear different faces depending on the conditions. The words 'Truth in Ambiguity' and 'Multiple Perspectives' made us reflect on how the conditions for sustainability science communication are ever-shifting and uncertain. Perhaps sustainability science communication must take the role of the court jester, we thought, transgressing boundaries and speaking truths, protected by the jester's privilege.

6.2 ▪ *Emotion (how do we answer, or reach out, in response?)*

The role of the jester as both jokester and truth-teller somehow reassured us: Our colleagues might be laughing at our arts-based approaches, but that did not make our findings any less meaningful — perhaps quite the opposite? The jester's determined stride forward also reinforced our fighting spirit by urging us to move ahead. Where the first artwork left us with simultaneous experiences of recognition and doubt, and the second both provided and questioned our hope for the future, this final illustration gave a strong sense of momentum and progress. Even though it was the final artwork after the last workshop, the feeling of wanting to keep moving was very intense among us all.

6.3 ▪ *Transformation (how do we experience being in resonance with the artwork?)*

The jester artwork seemed to definitively scuttle the question of dichotomies that had periodically resurfaced during the workshops. Even though dichotomies are often intuitive,

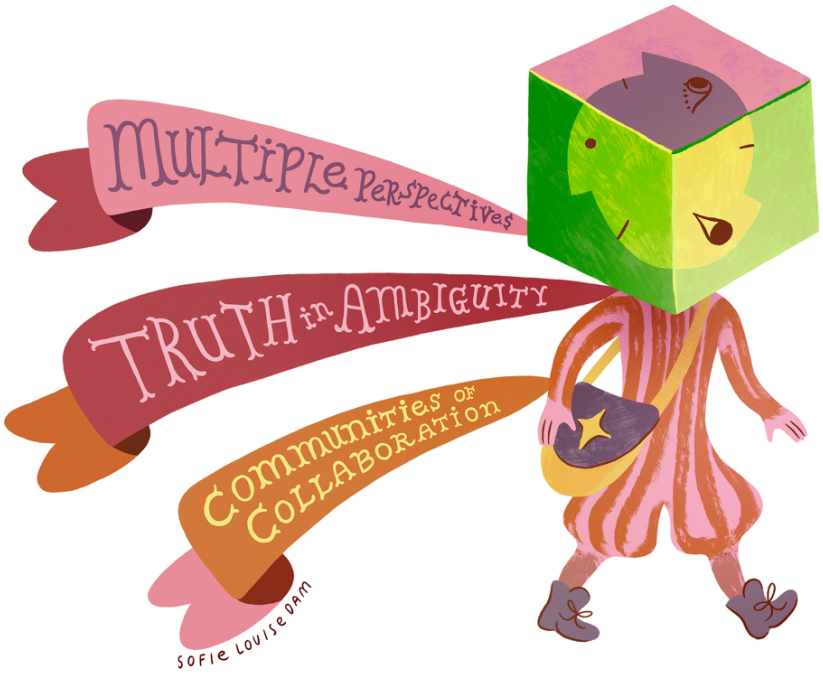

Figure 3. The illustration resulting from the third workshop, which aimed to draw out important ideas for concrete experiments with sustainability communication. Artwork by Sofie Louise Dam, © Department of Science Education, used here with permission.

they tend to simplify the world in ways that are not productive [Barbe, 2001] — and the jester artwork brought this to the forefront of our attention by slyly circumventing easy categorisations. But this process of circumvention was itself part of challenging the dichotomy — rather than banning dichotomies, perhaps we can treat them playfully and ambiguously, so they can become jesters that reveal their own limits? Further, even though the jester is striding towards an unknown future, we were energised by the image's power to point us in the direction of not-yet-existing sustainability science communication.

7 ▪ An unpredictable theme: our own progression

Having described how the processes of affection, emotion and transformation played out between us and the three artworks, we now turn to the final element of resonance: unpredictability or uncontrollability. Rosa [in Tyfield, 2023] explains the unpredictable or uncontrollable element of resonance in terms of other profound experiences: falling in love, attempting to understand a religious text, or communing with nature: It is exactly their unpredictability that is the power of such experiences. In the following, we describe how for us, unpredictability emerged from the processes of affection, emotion and transformation [cf. Weeseman et al., 2023].

Even though research from several domains points to the power of arts-based approaches for climate and sustainability science communication, we didn't know from the outset in what directions those arts-based approaches would take. Nor did we know how the experiences would affect us. In retrospect, we realise that we collectively underwent our own journey as we engaged with the three artworks. Rather than being graphical devices that could simply

help prompt the participants' memories from workshop to workshop, these artworks became one of our most important tools for consolidating the knowledge and experiences of the past workshops and for providing a creative impetus for designing the following ones in ways we had not foreseen.

Generally, the three images reflect our progression: The hourglass as a manufactured tool to measure the known and ready-made world reflects our initial thinking about workshop outcomes in terms of numbers and measurements, which is the norm in the natural and health science faculties the three researchers are located in, and that the artist has worked with. As the workshops and our shared reflections about them gradually opened 'new ways to think about knowledge-building: new ways to see' [Leavy, 2020, p. 303], we became better equipped to embrace meaning or description, rather than numbers or categories. This was captured in the dragon: A wholly imaginary or mythical beast that describes the unknown and in-the-making. Finally, for us, the court jester evoked mockery of existing structures, calling into question our attempts to tabulate the workshops and the insights generated there in neat and discrete packages.

Specifically, and as we have discussed in the preceding sections, our resonance relations with the artworks caused us to shift from unproductive, dichotomous thinking about good/bad in sustainability communication towards thinking about how 'good' and 'bad' can co-exist in the same communication tool, situation, or institution. Finally, we came to value how there probably is no 'good' or 'bad', but rather, that the power or efficaciousness of a sustainability science communication practice is always contextual and relies on an understanding of the limitations and strengths of different approaches [cf. Bucchi & Trench, 2021]. In other words: We abandoned the idea of 'good' and 'bad' sustainability science communication, and gradually embraced the idea of working with several perspectives simultaneously, in creative formats, with no predetermined outcomes.

In these ways, our shared resonance relations with the artworks, in interaction with the workshops, helped us to come to value different kinds of content, formats and trajectories of inquiry than are normally present in the natural and health sciences. This enabled us to recognise sustainability science communication in new ways — new ways that we will continue to explore in our current research programme 'Addressing Sustainability with Arts-Based Science Communication' (December 2023 – May 2027).

8 ▪ Insights and take-aways

The workshops and our art-science collaborations have left us with a range of experiences that we have condensed into the three following key insights for practice. However, it should be noted that this text constitutes a fairly delimited narrative of the project. We don't mean to suggest that our interactions with the artworks are the only or even the most important outcomes of the workshops — on the contrary — but we share these experiences here as one set of perspectives on the potential of arts-based methods for sustainability science communication.

8.1 ▪ *Embrace the uncontrollability*

Hartmut Rosa discusses how the notions of uncontrollability and unpredictability contradict modernist ideals that see the world as something that can be controlled and predicted

through scientific methodology [Tyfield, 2023]. Indeed, for people trained in the natural sciences for whom the default modus operandi is one of analysis and dissection, uncontrollable and unpredictable outcomes seem antithetical to good practice, whether in science or science communication. When we advocate for embracing uncontrollability, then, we are indicating a seemingly radical departure from what has been termed as 'evidence-based science communication' which involves applying findings from systematic research to engagement initiatives [Jensen & Gerber, 2020].

We do so consciously. Rosa's notions of uncontrollability and unpredictability align with the reality that complex sustainability challenges cannot be fully controlled or predicted through traditional scientific methods alone. The shift from control to engagement and adaptability that our methodology enabled was vital, we argue, for achieving the meaningful and sustainable insights we achieved. We thus suggest that by acknowledging and embracing the uncontrollable and the unpredictable, science communicators can better engage participants in generating collaborative, flexible strategies to address the dynamic and interconnected nature of environmental and social issues.

8.2 ▪ *Allow for — and support — change*

As the reader has no doubt noted, our limited experience of arts-based science communication meant that we struggled to reconcile our preconceived notions of effective workshops with the often-contradictory insights we gained from our resonance relations with the artworks. Even though the resonance experiences felt real and concrete during our work and discussions, they were difficult to internalise and operationalise into concrete activities. And retrospectively, although the creative and multifaceted outcomes of Workshops 2 and 3 seemed to speak for themselves, we have wondered whether we would've had the courage to replace our mainstream workshop formats had we not been in a group where we could support one another.

However, with the support of the group, we experienced how our ability evolved to respond to the artworks. We found ourselves gaining self-efficacy, that is, we gained confidence in our abilities to react to, and have our ideas and plans be transformed by, the artworks [cf. Rosa, 2018]. Accordingly, our advice to others employing arts-based methods is to allow plans to change in response to the resonance experiences of the communication team or the larger collective of participants. Further we recommend that team members consciously and frequently support and encourage each other in spite of what might feel like misgivings or lack of scientific evidence.

8.3 ▪ *Acknowledge the more-than-cognitive*

Our experiences with the artworks demonstrate what Fuchs [2020] describes as a series of dialogic exchanges between affectivity and emotion. These experiences thus represent forms of knowledge that have more-than-rational characteristics such as creativity, imagination, motivation, and values [Kagan, 2011]; in other words, they constitute the middle term between thought and feeling rather than its antithesis [Midgley, 2013]. In this way, our experiences and the insights they gave rise to illustrate the importance of acknowledging the role played by the body and sensorimotor processes in our capacity to know and understand the world [Canfield & Chatelain, 2024].

Embodied experiences such as materiality and affect have often been downplayed in science and science communication. Even so, scholars have argued that these non-discursive features are as much as part of the scientific endeavour as discursive elements such as rationality and cognition, and science communication initiatives should thus be designed to enable 'the expression of knowledges and perspectives in modes which go beyond the discursive' [Davies, 2014, p. 97]. A final insight from the present study is thus that arts-based methods can foreground affect and materiality in science communication initiatives in ways that demand to be acknowledged — and that this is an important element of science communication.

9 ▪ Final remarks

In recent years, a push has been made towards a 'science of science communication' [see, e.g., Akin, 2017; Gottschling & Kramer, 2020; Kessler, Fähnrich & Schäfer, 2020]. This push has brought about more funding opportunities and research positions within academia, and perhaps more respect from colleagues in other scientific disciplines. After our experiences with arts-based methods in science communication, one question that remains is whether these methods and their prioritising of resonance over transferability or generalisability might undermine this new standing, and thus risk moving us away from these hard-won academic privileges. We argue therefore for broadening our concept of 'science' when it comes to 'the science of science communication', embracing a more inclusive definition of knowledge production, and building bridges to arts-based and other qualitative research traditions.

Still, our findings underscore the importance of moving beyond conventional science communication paradigms and embracing interdisciplinary approaches that harness the power of art to foster meaningful engagement with sustainability and climate issues. We believe they are useful for researchers seeking to advance the field of science communication as well as practitioners striving to effect tangible change in consumption patterns and promote sustainability.

For professional science communicators, we want to assert: These arts-based formats were able to transform us, and they have the potential to transform you and your participants as well. It does, however, demand that you open yourself to the uncontrollable, and that you allow the unpredictable to guide your work. That does not mean going into these processes unprepared, quite the contrary: 'You can't blow an uncertain trumpet', as Theodore M. Hesburgh famously wrote — you need a vision to guide you. But embracing the new and unexpected is what might finally lead science communication to new and effective ways of promoting sustainability.

Acknowledgments

The workshops discussed in this text were generously supported by the Novo Nordisk Foundation, grant number NNF22OC0077128, and by the University of Copenhagen. We extend our warm thanks to the participants in the three workshops. Special thanks are also due to Pia Maria Lie, Christina Larsen and Nadja Nordmaj for assisting with the logistical challenges of the project.

References

Akin, H. (2017). Overview of the Science of Science Communication. In K. H. Jamieson, D. M. Kahan & D. A. Scheufele (Eds.), *The Oxford Handbook of the Science of Science Communication* (pp. 24–33). doi:10.1093/oxfordhb/9780190497620.013.3

Amel, E., Manning, C., Scott, B. & Koger, S. (2017). Beyond the roots of human inaction: Fostering collective effort toward ecosystem conservation. *Science 356*(6335), 275–279. doi:10.1126/science.aal1931

Arrhenius, S. & Holden, E. S. (1897). On the influence of carbonic acid in the air upon the temperature of the Earth. *Publications of the Astronomical Society of the Pacific 9*(54), 14–24.

Barbe, K. (2001). The dilemma with dichotomies. *Language & Communication 21*(1), 89–103. doi:10.1016/s0271-5309(00)00006-9

Block, T., Goeminne, G. & Van Poeck, K. (2018). Balancing the urgency and wickedness of sustainability challenges: three maxims for post-normal education. *Environmental Education Research 24*(9), 1424–1439. doi:10.1080/13504622.2018.1509302

Brossard, D., Belluck, P., Gould, F. & Wirz, C. D. (2019). Promises and perils of gene drives: Navigating the communication of complex, post-normal science. *Proceedings of the National Academy of Sciences 116*(16), 7692–7697. doi:10.1073/pnas.1805874115

Bucchi, M. & Trench, B. (2021). Introduction. Science communication as the social conversation around science. In *Routledge Handbook of Public Communication of Science and Technology* (3rd ed., pp. 1–13). Routledge.

Canfield, K. & Chatelain, C. (2024). Using science communication research to practice iterative engagement in collaborative nutrient management. *Journal of Science Communication 23*(03). doi:10.22323/2.23030801

Davies, S. R. (2014). Knowing and Loving: Public Engagement beyond Discourse. *Science & Technology Studies 27*(3), 90–110. doi:10.23987/sts.55316

Davies, S. R. (2022). Science Communication at a Time of Crisis: Emergency, Democracy, and Persuasion. *Sustainability 14*(9), 5103. doi:10.3390/su14095103

Dean-Coffey, J. (2013). Graphic Recording. *New Directions for Evaluation 2013*(140), 47–67. doi:10.1002/ev.20073

Dryzek, J. S. & Lo, A. Y. (2014). Reason and rhetoric in climate communication. *Environmental Politics 24*(1), 1–16. doi:10.1080/09644016.2014.961273

Duncombe, S. & Lambert, S. (2017). Lessons from Utopia. *Visual Inquiry 6*(2), 253–272. doi:10.1386/vi.6.2.253_1

Felski, R. (2020). Resonance and Education. *The Fatigue of Critique? 3*(9). doi:10.17899/on_ed.2020.9.2

Fielding, K. S. & Hornsey, M. J. (2016). A Social Identity Analysis of Climate Change and Environmental Attitudes and Behaviors: Insights and Opportunities. *Frontiers in Psychology 7*. doi:10.3389/fpsyg.2016.00121

Finley, S. (2005). Arts-based inquiry. Performing revolutionary pedagogy. In N. K. Denzin & Y. S. Lincoln (Eds.), *Sage Handbook of qualitative research* (3rd ed., pp. 681–694). SAGE Publications Inc.

Fourier, J.-B. J. (1837). General remarks on the temperature of the terrestrial globe and the planetary spaces. *American Journal of Science 32*(1), 1–20.

Fuchs, A. (2020). Resonance: a normative category or figure of uncertainty? On reading Hartmut Rosa with Thomas Mann's The Magic Mountain. *Journal of Political Power 13*(3), 353–365. doi:10.1080/2158379x.2020.1828756

Galafassi, D., Tàbara, J. D. & Heras, M. (2018). Restoring our senses, restoring the Earth. Fostering imaginative capacities through the arts for envisioning climate transformations. *Elementa: Science of the Anthropocene 6*. doi:10.1525/elementa.330

Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P. & Trow, M. (1994). *The new production of knowledge. The dynamics of science and research in contemporary societies*. Sage. doi:10.4135/9781446221853

Gottschling, M. & Kramer, O. (2020). Recontextualized Knowledge: Introduction: A Rhetorical View on Science Communication. In *Recontextualized Knowledge* (pp. 1–14). doi:10.1515/9783110676310-001

Greenwood, J. (2011). Aesthetic Learning, and Learning Through the Aesthetic. In *Key Concepts in Theatre/Drama Education* (pp. 47–52). doi:10.1007/978-94-6091-332-7_8

Hayhoe, K. (2021). *Saving us. A climate scientist's case for hope and healing in a divided world*. One Signal Publishers.

Heinrichs, H. (2018). Sustainability Science with Ozzy Osbourne, Julia Roberts and Ai Weiwei: The Potential of Arts-Based Research for Sustainable Development. *GAIA - Ecological Perspectives for Science and Society 27*(1), 132–137. doi:10.14512/gaia.27.1.8

Heinrichs, H. (2019). Strengthening Sensory Sustainability Science—Theoretical and Methodological Considerations. *Sustainability 11*(3), 769. doi:10.3390/su11030769

Heras, M., Galafassi, D., Oteros-Rozas, E., Ravera, F., Berraquero-Díaz, L. & Ruiz-Mallén, I. (2021). Realising potentials for arts-based sustainability science. *Sustainability Science 16*(6), 1875–1889. doi:10.1007/s11625-021-01002-0

Jensen, E. A. & Gerber, A. (2020). Evidence-Based Science Communication. *Frontiers in Communication 4*. doi:10.3389/fcomm.2019.00078

Kagan, S. (2011). Aesthetics of Sustainability: A Transdisciplinary Sensibility for Transformative Practices. *Transdisciplinary Journal of Engineering & Science 2*. doi:10.22545/2011/00014

Kessler, S. H., Fähnrich, B. & Schäfer, M. S. (2020). Science communication research in the German-speaking countries: A content analysis of conference abstracts. *Studies in Communication Sciences 19*(2). doi:10.24434/j.scoms.2019.02.012

Klein, J. T. (2010). A taxonomy of interdisciplinarity. In *The Oxford Handbook of Interdisciplinarity* (pp. 15–30). Oxford University Press.

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Harvard University Press.

Leavy, P. (2020). *Method meets art: Arts-based research practice* (3rd ed.). The Guilford Press.

Midgley, M. (2013). *Science and Poetry*. Routledge. doi:10.4324/9780203187944

Mortensen, M. F. (2010). Designing immersion exhibits as border-crossing environments. *Museum Management and Curatorship 25*(3), 323–336. doi:10.1080/09647775.2010.498990

Moser, S. (2019). Not for the faint of heart. Tasks of climate change communication in the context of societal transformation. In G. Feola, H. Geoghegan & A. Arnall (Eds.), *Climate and Culture: Multidisciplinary Perspectives on a Warming World*. doi:10.1017/9781108505284

Pidgeon, N. & Fischhoff, B. (2011). The role of social and decision sciences in communicating uncertain climate risks. *Nature Climate Change 1*(1), 35–41. doi:10.1038/nclimate1080

Richards, G. W. & Carruthers Den Hoed, R. (2017). Seven Strategies of Climate Change Science Communication for Policy Change: Combining Academic Theory with Practical Evidence from Science–Policy Partnerships in Canada. In *Handbook of Climate Change Communication: Vol. 2* (pp. 147–160). doi:10.1007/978-3-319-70066-3_11

Rosa, H. (2018). The idea of resonance as a sociological concept. *Global dialogue 8* (2), 41–44.

Rosa, H. (2019). *Resonance: A sociology of our relationship to the world*. Polity Press.

Russel, S., Westerhof, G., Scherer-Rath, M., Camuti, F., Kamstra, S., Bood, Z. M., … van Laarhoven, H. W. (2023). Art-Based Learning in the last stage of life: An exploratory study on how cancer patients create meaning in relation to artworks. *Palliative Medicine 37*(8), 1280–1282. doi:10.1177/02692163231180655

Spence, A., Poortinga, W. & Pidgeon, N. (2011). The Psychological Distance of Climate Change. *Risk Analysis 32*(6), 957–972. doi:10.1111/j.1539-6924.2011.01695.x

Suldovsky, B., McGreavy, B. & Lindenfeld, L. (2018). Evaluating Epistemic Commitments and Science Communication Practice in Transdisciplinary Research. *Science Communication 40*(4), 499–523. doi:10.1177/1075547018786566

Sullivan, J. & Lloyd, R. S. (2006). The Forum Theatre of Augusto Boal: A Dramatic Model for Dialogue and Community-Based Environmental Science. *Local Environment 11*(6), 627–646. doi:10.1080/13549830600853684

Takach, G. (2016). Environment, Communication and Arts-Based Research. In *Scripting the Environment* (pp. 1–20). doi:10.1007/978-3-319-40433-2_1

Tyfield, D. (2023, February 16). Resonance and uncontrollability, with Hartmut Rosa [Audio podcast episode]. Retrieved from https://podcasters.spotify.com/pod/show/david-tyfield/episodes/Episode-8---Resonance-and-uncontrollability--with-Hartmut-Rosa-e1v2i1u

Verlie, B. (2022). *Learning to live with climate change. From anxiety to transformation*. Routledge. doi:10.4324/9780367441265

Weeseman, Y., Scherer-Rath, M., Christophe, N., Dörr, H., Helmich, E., Sprangers, M. A. G., … van Laarhoven, H. W. M. (2023). Co-creative art processes with cancer patients from the artists' perspective: a qualitative study exploring resonance theory. *Supportive Care in Cancer 31*(5). doi:10.1007/s00520-023-07744-0

About the authors

Marianne Achiam (Associate Professor, University of Copenhagen) leads a research group on science communication. Her research and teaching focus on using interdisciplinary methods to create effective science communication for sustainability. She has published research in international, peer reviewed journals in the fields of museology, science education and science communication, has authored a number of chapters for peer-reviewed anthologies, and has co-edited books published by Springer and Routledge.

achiam@ind.ku.dk @MarianneAchiam

Sabrina Vitting-Seerup (Assistant Professor, University of Copenhagen) has significant science communication experience from both research and practice. Her PhD focused on the ways art-based products affect our understanding of the world, and her further research has been on sustainable science communication. Alongside her academic career, she has run a science communication company for nearly 10 years.

svs@ind.ku.dk @VittingSeerup

Louise Whiteley (Associate Professor, University of Copenhagen) is interested in how ideas about ourselves and our place in the world get formed between biomedical science and everyday cultures. She makes collaborative exhibitions and events alongside her research at

the Medical Museion in Copenhagen, where she has a focus on how we communicate ethos and emotions when we talk about science.
lowh@sund.ku.dk

Sofie Louise Dam (Graphic Artist, self-employed) is a Copenhagen-based comics artist and illustrator with a BA in Graphic Storytelling from The Animation Workshop in Viborg, Denmark. Specialising in science communication, non-fiction storytelling, and children's illustration, she has worked on a variety of freelance projects including picture books, comics, and background design for animation. Sofie is passionate about visual storytelling and continuously seeks new challenges in the field.
sofielouisedam@live.dk @sofielouisedam

How to cite

Achiam, M., Vitting-Seerup, S., Whiteley, L. and Dam, S.L. (2024). 'Creating resonance with arts-based approaches to sustainability science communication'. *JCOM* 23(06), N01. https://doi.org/10.22323/2.23060801.

ISSN 1824-2049. Published by SISSA Medialab. jcom.sissa.it