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RESEARCH ARTICLE

Losing control, learning to fail: leveraging techniques from improvisational theatre for trust and collaboration in transdisciplinary research and education

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This article explores the transformative potential of improvisational techniques in reshaping interdisciplinary and transdisciplinary (ITD) learning environments offering art-based exercises and tools for this work. By integrating active research with improvisational methods from theatre and music, we propose a pedagogical shift that transcends traditional academic roles and disciplinary boundaries, fostering a culture of co-creation, mutual learning and innovation. This approach aims to tackle the inherent challenges of ITD research and thus enhance ITD research groups' ability to address complex societal 'Grand Challenges'. We argue that improvisation within both ITD research and educational communities serves as a crucial catalyst for nurturing trust, embracing failure as a growth opportunity, and redefining success. Embodied practices based on improvisation help bridge the gap between theoretical knowledge and practical applications, enabling academics to navigate the complexities of collaboration and engage in shared learning experiences. This article introduces techniques from improvisational

theatre aimed at fostering trust and collaboration in transdisciplinary research and educational settings. Drawing on over 25 years of combined research experience, we show how these tools enhance mutual understanding and collective problem-solving among students and research teams. Ultimately, we advocate integrating conventional knowledge delivery models with a framework characterised by regenerative practices, care and explorative processes. This integrated approach would offer new opportunities for addressing the intertwined wicked problems our world faces today, promoting a more inclusive, participatory and creatively fulfilling academic community.

Introduction

Inter- and transdisciplinary (ITD) research has received significant attention since the 1960s, promising to combine, increase and improve the knowledge provided by different disciplines (Klein, 1990; Huutoniemi et al, 2010). Despite this enduring interest, successfully organising and completing ITD endeavours is no small feat, in part because of a divergence of perspectives on its nature and methodologies (compare Efstathiou and Mirmalek, 2014; O'Rourke et al, 2016; Hulme, 2018; Sonetti et al, 2020). Universities typically anticipate higher outcomes from interdisciplinary research teams buoyed by their diverse expertise (Silvast and Foulds, 2022); however, attaining such outcomes is not straightforward.

Challenges with interdisciplinary integration become further amplified when academic research aims to address complex 'Grand Challenges' or 'missions' like climate change, health or energy (Efstathiou, 2016; Kaldewey, 2018; Mazzucato, 2018). Implicit in these efforts lies the assumption that these grand issues could be partitioned into (at least some) scientifically solvable problems. According to this type of approach, academics and educators assume the role of purveyors of authoritative knowledge on 'topics' and 'problems' addressed by scientific disciplines, imparting wisdom through academic institutional channels. The hope seems to be that individual scientific and technological successes can line up and combine through ITD work to successfully solve the puzzles that grander societal problems present. However, linear and stable interpretations of success and failure no longer suffice when ITD research comes face to face with complex challenges (Funtowicz and Ravetz, 1993; Pohl et al, 2017; Saltelli et al, 2020; Efstathiou et al, forthcoming).

This article does not propose to offer *a solution* to these problems. However, we do explore how improvisational theatre techniques can enhance teaching practices and collaborative research in transdisciplinary settings by addressing trust and creativity challenges. We propose that incorporating work from improvisational

theatre into ITD education and research arenas helps adapt science to address Grand Challenges. We argue that developing such approaches, including practical tools inspired from improv, can boost social group cohesion and foster skills for working dynamically in unpredictable research settings as one often must within ITD arenas. By 'improvisational theatre techniques', we here refer to structured exercises drawn from the theatre arts that promote spontaneity, creativity and mutual understanding (Loeng et al, 2022). In the context of ITD work, these techniques facilitate effective collaboration, fostering trust by lowering the stakes for failure and familiarising participants with risk-taking. These tools we discuss are thus relevant for students, educators and researchers engaging in transdisciplinary work.

The complex ITD connections and negotiations between science, knowledge and society have been discussed by historians, philosophers and social scientists studying science since at least the 1990s. Research has addressed societal demands through hybrid science (Gibbons et al, 1994; Nowotny et al, 2013; Felt et al, 2016), examined the roles of experts and expertise in policy governance (Jasanoff, 1997; Collins et al, 2007), fostered knowledge integration across domains (Klein, 2010; Mourik et al, 2021), and discussed the role of societal values while doing science, with and for society (Harding, 1986; Funtowicz and Ravetz, 1993; Owen et al, 2012; 2013; De Grandis, 2016). ITD academic endeavours often involve navigating chaos and complexity, as science and technology studies (STS) scholar John Law suggests (Law, 2004). This can happen especially in collaborations across fields with diverging methodologies: like science, technology, engineering and mathematics (STEM) collaborating with the arts, social sciences and humanities (Norton et al, 2023; Arrobbio and Sonetti, 2021). The difficulty of combining and aligning divergent concepts, methods and values in understanding the world and intervening in it can make ITD work into its own grand challenge (De Grandis and Efstathiou, 2016).

The interrelation between the arts, higher education and transdisciplinarity has also been the subject of recent research (for example, Fam et al, 2018). Van Baalen et al (2021) conducted a systematic literature review on this intersection of topics, identifying 458 scientific papers published by 2018. More recently, a review by Brauer et al (2024) identified more than 3,000. These literature reviews identified several crucial contributions that the arts make in higher education transdisciplinary work, such as helping student engagement and fostering openness, curiosity and creativity. Brauer et al (2024), for instance, acknowledge that while uncertainty and unpredictability are inherent in transdisciplinary settings, a high level of uncertainty can also challenge efforts to foster creative processes. Therefore, they argue that 'teachers must actively monitor, negotiate, and balance such creativity-related paradoxes and contradictions by becoming empathetic and reflexive creative practitioners' (Brauer et al, 2024: 19). Van Baalen et al (2021: 40) mention the importance of moving 'the conversation to *power* in transdisciplinary collaborations'. However, we have yet to find contributions focusing on practical, *in situ* approaches to overcome such power asymmetries and help teachers facilitate and balance tensions or challenges educators face in fostering creativity within ITD settings. These settings are particularly complex because they involve diverse participants, goals and disciplines, which amplify the inherent contradictions in creativity. This article offers practical approaches that translate key principles of improvisational theatre into pedagogical tools for ITD research and education.

Improvisational theatre is a form of theatre where most or all of what is performed is created spontaneously by performers, without a script. Early developers of the

art were Viola Spolin (1963) through her book *Improvisation for the Theater*, Clive Barker's (1977) book *Theatre Games*, and Keith Johnstone's (1979) book *Impro: Improvisation and the Theatre*. Improvisers invest considerable time in warm-ups, icebreakers and light-hearted games. As we will argue, the rationale behind such exercises extends beyond mere physical and mental preparation. It also levels the field of participation and fosters an atmosphere of trust and mutual acknowledgement, which we argue is key for establishing collaborative learning contexts. Improvisational theatre relies heavily on the principles of collaboration, active listening, failing, adaptability and being in the moment (Berk and Trieber, 2009). There are multiple resources in the world of improvisational theatre, which repeat some of the key tenets of improvisational work. This includes principles like adopting the attitude of: 'Yes, and…', of accepting what suggestion is offered by your partners in a scene and building on this. This attitude contrasts to questioning, negating or otherwise resisting others' offers, and thus trying to control the outcome of a scene. Another central tenet is cultivating the skill of openly listening and attending to the action ongoing in a scene, as opposed to being in one's head, and computing one's individual responses. The pioneering work of Johnstone (1979; 1999), for instance, warned against striving for perfection, rather advising going with your initial thought, and focusing on your partner's progress, ensuring that they have fun.

The results of recent transdisciplinary research on arts–based methods and sustainability highlight the 'more-than-cognitive', or 'more-than-rational' aspects of learning and knowledge (Galafassi et al, 2018; Heras et al, 2021). Such approaches stress the importance of considering '*all* the dimensions of the human being' within education and research (Nicolescu, 2018: 75, emphasis in original). Some budding research has focused on the value of improvisational theatre in higher education teaching (for example, Berk and Trieber, 2009; Holdhus et al, 2016). Building on such research we provide practical tools and key insights into the details of navigating and engaging bodies in ITD educational and research contexts by presenting a set of exercises and interventions based on improvisational theatre techniques. Thus, we seek to answer the question: how can improvisational theatre techniques foster trust and collaboration in transdisciplinary education and research? We approach this question based on our 25 years of collective experience with improvisational techniques, and with their applications in education and ITD research.

Feelings of failure, of inadequacy, or of things not going to plan are commonplace in research and teaching, especially within competitive and stressful academic contexts (Horton, 2020; Turner, 2020) or when pursuing research with social and transformative ambitions (Blanchard and Bjørnerud, 2025). The prospect of relinquishing control over one's authority kindles the dread of a form of failure not relating only to falling short of scholarly standards but of losing 'face' and social status. This type of challenge becomes compounded in ITD environments, where one's authority can be challenged on a further level, in terms of its disciplinary background (for example, 'Do we really need a philosopher here?'). We see this attachment to authority as an integrated part of the challenge faced by Western-centric modern universities, and the struggle for emancipation from Eurocentric, capitalist, colonialist or patriarchal ways (Santos, 2017). The key point we make in this article is that the activities and experiences offered by improvisational theatre are an asset for cultivating skills and mindsets for embracing failure and uncertainty. These skills and mindsets are crucial in the transdisciplinary work needed for addressing Grand Challenges or bringing the benefit of research to local

communities. More broadly, these skills and mindsets can be useful in 'rehumanising the university' in the sense that they offer concrete and embodied approaches that allow for alternative, epistemologies and cognitive justice, that is, avoiding privileging one kind of knowledge (Mignolo, 2009; Dawson, 2020).

Our methodology is based on a collection of field studies and interventions, which we all, individually and collaboratively, in different settings, developed. This article collects and organises this set of approaches, systematising their insights to flesh out tools for fostering dynamic and adaptable ITD work on complex Grand Challenges. The article aligns with existing research on the contributions of the arts to ITD learning, as well as with work viewing 'failing' and 'failure' as nuanced concepts integral to collaboration and teaching (Horton, 2008; Veine, 2006). But we also bring examples and exercises for broader community use, drawing on our previous experience.

Improvisational theatre, failing and ITD

In the following two subsections, we will argue that improvisational theatre techniques are beneficial within ITD work through their ability to help deal with uncertainty and cultivate joy, in rethinking control, and in valuing failure as part of a creative process.

Complexity, uncertainty, control and learning

Sociologist and STS scholar John Law's treatise *After Method: Mess in Social Science Research* (2004) questions how social science methodologies should deal with complexity. Should methods be simplified or made more intricate, mirroring the phenomena they seek to elucidate? Which approach yields more accurate insights? Or should scientists, as philosopher Paul Feyerabend provoked, turn *Against Method* (1975)?

Rather than simplification, Law proposes going more into detail, meticulously describing and understanding each case, as too-simple theories risk causing harm (Law, 2004). Highlighting the social-relational dimensions of applied research, the philosopher of science Isabelle Stengers (2015: 50) adds: 'There will be no response other than the barbaric if we do not learn to couple together multiple, divergent struggles and engagements in this process of creation [of coming to terms with Gaia], as hesitant and stammering as it may be'. Feminist scholar Donna Haraway (2016: 4) concurs, advocating resilience in the face of challenges, urging us to 'stay with the trouble', form alliances, and address emerging dilemmas: 'Staying with the trouble requires making oddkin; that is, we require each other in unexpected collaborations and combinations, in hot compost piles. We become-with each other or not at all'.

But how are scientists to do this new work? 'If much of the world is vague, diffuse or unspecific, slippery, emotional, ephemeral, elusive or indistinct, changes like a kaleidoscope, or doesn't really have much of a pattern at all, then where does this leave social science?' (Law, 2004: 2). Without providing a definitive response, Law asserts that 'one thing is sure: if we want to think about the messes of reality at all then we're going to have to teach ourselves *to think, to practice, to relate, and to know* in new ways' (2004: 2, emphasis added). As established in Portuguese sociologist Santos's (2017) ground-breaking book *Decolonising the University*, dominant university knowledge is based on modern science and Eurocentrism highly shaped by global capitalism and drives for efficiency. Indeed, 'commodification, competition and ranking have become the new normal' (Dawson, 2020: 74), driving us into a fast-paced, knowledge economy

at the cost of a slow, more reflective, responsible science (Stengers, 2018). This 'old' science aspires to be certain, objective, successful and clear. A radically new approach might therefore lie in embracing playfulness in science. In the spirit of feminist theory, Stengers (2015) suggests joy as a potential way forward, cultivating and harnessing the joy overshadowed by pursuits of competitiveness, growth or success – the joy intrinsic to playfulness. This, we would add, also involves moving away from 'Western ways of knowing as a superior way of producing universal knowledge' (Dawson, 2020: 86).

Organisational psychologist Roger Schwarz (2013) delineates two contrasting approaches to group work: unilateral control and mutual learning. The unilateral control approach, akin to 'the one leader in the room', tends to prevail when teams, whether led by team leaders or participants, confront substantial challenges (Argyris and Schön, 1974; Schwarz, 2017). Conversely, the mutual learning mindset advocates learning alongside and from others to achieve shared objectives. This mindset acknowledges, 'I possess insights, as do you. Let us learn and progress collectively'. You are open to being influenced by others, and at the same time, you seek to influence them. The mutual learning mindset does not imply that a consensus must always be reached. Instead, it means that each participant, whether in a classroom or workshop, is responsible for helping to lead – taking the initiative and sharing accountability for the group's functioning and results (Schwarz, 2013: 23). In essence, ITD environments require a mutual learning approach.

This extends to how we engage with stakeholders beyond the academy in transdisciplinary work. Inspired by the influential work of the educator and philosopher Paolo Freire's *Pedagogy of the Oppressed* (1970: 70), Augusto Boal's work in applied theatre and the applied arts is an early example of how theatre could be used to work with oppressed communities in emancipatory modes (Boal and McBride, 2020). Boal offered people a space and mode to practise engaging with socially controversial issues from the safety of the arts, inviting them to take the position of the 'spect–actor'. Similarly, we argue that ITD pedagogies can foster critical thinking and readiness for action. This can also be articulated as a shared pursuit of 'mutual humanisation' among teachers and students. In Freire's work, humanisation implies constant work to become more fully human through educational and collaborative processes involving both reflection *and* action. Cultivating skills for improvising and risking, especially in the face of structural inequalities, is critical to developing effective pedagogies to address complex problems such as Grand societal Challenges.

Improvisational theatre and failing

Improvisational theatre is inherently playful and offers numerous tools (exercises, games, principles, mantras and so on) that can help embrace the present moment: listen actively, accept and build on one another's ideas rather than rejecting or controlling them, and allowing oneself and others to fail – multiply, individually and collectively, in the process – without losing one's joy. Improvisational theatre techniques have been used not only in performance art but also as a tool for team-building and problem-solving in various fields, including education, corporate training and therapy – often referred to as 'applied improv' (Dudeck and McClure, 2018). Its emphasis on collaboration and quick thinking makes it a valuable practice for enhancing communication skills and fostering a collaborative spirit. For instance, within educational development, Rossing and Hoffmann–Longtin (2016) identified

improvisational theatre's utility in three areas: building a classroom community, fostering organisational growth and cultivating research collaboration. The pioneering work of psychologist and expert on creativity, collaboration, and learning Keith Sawyer (2004, 2019) highlights a delicate balance between structure and freedom to cultivate 'creative knowledge', distinguished by its depth and interconnectedness, transcending shallow, memorisation-based learning (Sawyer, 2019).

Principles like 'the right to fail' and 'mistakes are gifts' resonate profoundly within applied improvisation (Dudeck and McClure, 2018: 283). Embracing errors establishes an environment of trust that kindles creativity and learning (Tuckman, 1965). Since making mistakes is human, daring to fail is daring to be more ourselves. Schinko-Fischli (2018: 66) defines this as 'error tolerance', adding that no clear distinction between right and wrong exists in the pursuit of creative solutions to complex challenges. Success and failure share a symbiotic relationship: 'successes can't go up unless failures go up, too. And because we won't have the successes without the failures, we need to create organisational cultures that cherish failures' (Sawyer, 2007: 163–4). Constructing such cultures entails perceiving failure as a repertoire of skills and cognitive frameworks. However, internalising this mindset remains challenging and requires iterative training (Veine, 2006).

Thus, improvisational theatre provides useful techniques for navigating uncharted questions and sustaining motivation in the face of uncertainty and failing (Alon, 2014: Holdhus et al, 2016). Yet, existing research has yet to identify practical exercises to practise 'failure' and losing control, inevitable in ITD settings. Drawing from the authors' collective experience, this article furnishes actionable insights for educators and researchers alike.

Methodology

Our research methodology is based on field studies in pedagogical and research settings. We have built these insights through observational research and autoethnographic reflection complemented by theoretical work in the fields of ITD science and improvisational theatre. The analysis encompasses two sets of cases including activities pursued by the authors, either independently or collaboratively. First, we draw insights from academic research workshops, specifically focusing on 'Storytelling workshops' conducted in 2017–18 and 2021–22, alongside two speculative, game-based workshops held in 2021 ('Project failure' and 'Virtuous and vicious design'). Second, we tap into experiences derived from our teaching, including an interdisciplinary PhD course centred on sustainability during 2021–22, in addition to interdisciplinary courses in philosophy, ethics, sound and anthropology. Notably, the foundation of our insights extends to the authors' extensive background in ITD workshops aimed at both academic and non-academic participants, facilitated through their involvement with an improvisational theatre group. Each workshop was designed with the primary goals of fostering mutual understanding, enhancing creative problem-solving and promoting trust in team settings.

The methods we use for educational and research settings are similar, as our underlying aspiration is to move towards modes of learning, whether in a research team or in a classroom, which cultivate care and collaboration. In that manner, our project is common: to decolonise academic practices, in research and education, moving them away from patriarchal, Westernised models of authority in these settings by flattening

the received hierarchies in the room, and empowering participants to contribute to and shape modes of education or research that are inclusive and emancipatory.

For clarity, we have categorised our empirical material into two distinct sets, each with three different cases: Set 1 encapsulating experiences from academic workshops, and Set 2, encompassing experiences from higher education teaching. We can roughly think of these two sets of cases as regarding research and teaching settings. Within Set 1 cases, workshop participants boasted diverse academic and non-academic backgrounds spanning the social sciences, humanities, sciences, industry, governmental bodies and civil society – a transdisciplinary setting. Group sizes ranged from 15 to 30 participants, and participants were invited through direct contact, with a sampling purpose of covering representation from a wide arrange of sectors and backgrounds.[1] Each workshop addressed a particular challenge at hand, such as 'how can we make our community more sustainable?' or 'how do we deal with failure?' The final subsection details our methodologies and approach to these exercises. The workshops were fertile grounds for exploring the confluence of diverse disciplines and backgrounds, in a collaborative learning space.

Exercises and approaches from Set 2 further amplify our experiential insights through our engagement in higher education teaching. In the interdisciplinary PhD course on sustainability conducted in 2021–22, we confronted the intricacies of cultivating an effective pedagogical environment for students navigating complex global challenges. The course included around 30 students from diverse backgrounds within both STEM and social sciences and humanities. Some of the students encountered such interdisciplinary work for the first time, while others already had experience with it. Furthermore, and following students' feedback, these activities, when taught within philosophy, sound and anthropology courses, yielded valuable methods for getting students to connect with their emotions, and activate their senses, while cultivating skills for active listening.

Apart from the storytelling workshops (with the following publications: Sonetti et al, 2020; Mourik et al, 2021; Korsnes and Solbu, 2024), the data used here have not been generated for specific research purposes about learning approaches. Rather, we build many of the insights shared in this article on our collective experience as teachers, improvisers and researchers through observational and autoethnographic reflection. The methodologies we develop remain rooted in improvisational art and theatre principles to cultivate collaboration, mutual learning and experiential understanding. These principles are especially critical in ITD research, where bringing together varied perspectives and knowledge systems requires collaboration and a willingness to learn from and adapt to others' viewpoints. Our approach thus aligns with the transformative ethos of this special collection, as we leverage these unconventional methodologies to navigate the multifaceted terrain of interdisciplinary teaching and research. By fostering an environment where participants engage experientially and embrace both uncertainty and collective problem-solving, these exercises are designed to strengthen collaborative capacities crucial for ITD research. The intention of these activities was to create an environment conducive to trust and collaboration. Observations during the workshops indicated that participants often developed a greater sense of trust, as evidenced by their willingness to contribute with honest content to open discussions and teamwork. Participants engaged in improvisational theatre exercises such as 'Yes, And' and 'Mirror Exercises', which emphasised collaboration

and mutual trust. These activities reduced hierarchical dynamics and supported participants in navigating the paradox of structure versus freedom, fostering open communication and shared creativity in ITD workshops. Through these kinds of dynamic approaches, we try to shed light on the practical mechanisms that enable the embrace of uncertainty and foster shared learning experiences. Lastly, we should mention that the writing of this article has been assisted by a generative AI tool to enhance readability and language.

Set 1: Trust, failure and reflection in academic workshops

In ITD work researchers face several trust-related challenges. Möllering's analysis of trust helps to illustrate this point. Möllering identifies three main models in the understanding and study of trust (2006). The first model understands trust as a rational choice based on weighing costs, or risks, and payoffs. The second model sees trust as a type of social habit embedded in practices and institutions, that is, as consolidated routine. The third model sees trust as emerging from reflexive interactions between actors. To complement these models, which he considers useful, but ultimately incomplete, he proposes to see trust as a leap of faith, in which the elements of uncertainty and vulnerability of the situation are bracketed or suspended. This typology is very useful both to highlight the trust challenges met in ITD encounters, and for understanding the value of improv exercises in facilitating ITD research and education.

The circumstances of ITD pose a challenge to the first model of rational trust, because risks with ITD work are high: the quality of the results is considered uncertain, and the payoff doubtful (Lake and Thompson, 2018; Müller and Kaltenbrunner, 2019; Vantard et al, 2023). ITD ways of working also pose a challenge to routines, because they require researchers to do things differently and in not-consolidated institutional settings (Efstathiou and Mirmalek, 2014; De Grandis, 2025). Finally, ITD research challenges interpersonal trust as researchers often need to work with new partners, with whom they are not acquainted, and whose expertise is unfamiliar. In ITD settings, thus, common grounds for trust, no matter how we conceive it, get taken away and the sense of vulnerability is heightened.

Improv games, for example among an ITD research team, will put participants in a similarly vulnerable situation. But the context of theatre and play is a setting with low stakes and, comparably, low risks. It offers a space to experiment and build up trust in new settings, performing new tasks and interacting with new people. In other words, improv games can give participants the chance to accept vulnerability, practise risk-taking and overcome, through play, a trust challenge that mirrors the trust challenge which ITD circumstances generate. Through improv, researchers can thus get to experience the pleasure and rewards of trusting through a leap of faith, creating a positive precedent for the ITD research that will follow.

Case 1: Storytelling and transdisciplinarity

Our first case study emanates from a series of storytelling workshops tailored to deal with complex issues related to sustainability and justice. The workshops aimed to build trust among participants, enhance collaborative learning and encourage open communication in transdisciplinary projects. This case highlights the significance of

'trust' among participants and among participants and facilitators for collaborative endeavours, and how improvisational practices and principles facilitate it. Within improvisational theatre, 'trust' means a shared sense of safety, non-judgement and togetherness that fosters spontaneity, creativity, sharing and the willingness to undertake tasks and activities as a team. This notion sees trust as a temporary and situated social atmosphere that demands nurturing through clear task comprehension and purposeful warm-up and icebreaking exercises.

The storytelling workshops aimed to explore and conceptualise the notion of transportation in a 'future society' by encouraging participants to share their ideas and imaginative visions. Before the workshop, attendees were prompted to prepare their thoughts on specific themes (for example, factors contributing to urban sustainability or potential improvements). Participants brought a wealth of diverse experiences, stories and backgrounds. During the workshops, participants were divided into groups and handed a 'story spine' sheet to help participants develop their stories. The sheet contained the starting sentences of a structured story, like 'Every day I…', 'This is because…' and so on (for further details, see Appendix A, and Mourik et al, 2017). Each participant was given time to reflect on and write their story, and they then shared their stories with the group. After this, an open dialogue unfolded, through which participants reflected on the stories shared. The final phase of this storytelling exercise entailed the creation of a collective narrative envisioning the future: 'This is how I envision future society'.

Designed to expose and strengthen transdisciplinary aspects of thinking and empathising, this workshop encouraged participants to share their personal stories, reflect on their perspectives and the perspectives of others, and collaboratively weave these narratives into a cohesive whole. Notably, this exercise demanded open social interaction, empathy and a willingness to take risks and share openly – a feat necessitating group trust. For this, we used exercises emphasising sharing, taking risks and embracing mistakes as both safe and desirable (for sample exercises and further details, see Appendix D). They lay the groundwork for recognising the interpersonal connections essential for sharing and building trust.

Our workshop employed verbal and physical exercises to set participants in motion within their space and alongside fellow group members. Through a series of activities that were sometimes seen as silly, participants established connections, experienced empathy and acclimatised to the idea that taking risks is acceptable and encouraged. After each exercise, a brief round of reflection and feedback followed, allowing participants to articulate their thoughts, sensations and the impact of the exercise. The participant feedback underscored the importance of creating a comfortable environment by dismantling conventional work attitudes, promoting openness, setting clear expectations and cultivating a present moment focus to foster group cohesion.

In workshops where we encourage participants to share their imagination rather than assert authority, group trust is crucial but fragile. It is difficult to determine the amount of time spent on these activities. Nevertheless, as we have experienced, the conduct of the facilitator(s) is central to building trust, as they should model humility, vulnerability and failure when leading others (Loeng et al, 2022). In our experience, without a foundation of trust participants will likely withhold the creativity, openness and empathy essential for effective learning. This applies not

only to academic workshops but also to interactive teaching settings. Drawing from improvisational theatre: we discern that 'trust' in this context pertains to the collective trust required to undertake activities fostering spontaneity and creativity. This trust is cultivated over time, with the initiation of warm-up exercises playing a critical role, and through space for feedback and reflection after each exercise. Reflection moments also create a powerful platform for rehumanising academic spaces, allowing students and scholars to recognise the richness of multiple perspectives without privileging any single epistemology.

Case 2: Project Failure: embracing failure with confidence

The Project Failure workshop was developed by Sophia Efstathiou and Giovanni De Grandis and offers a prime illustration of how to work with the concept of failure in interdisciplinary settings. Developed as part of the annual meeting for an interdisciplinary network (AFINO),[2] this exercise invites participants to share and embrace experiences of failure. The intention of the workshop was to promote participants' comfort with messiness in collaboration, train them in seeing new possibilities and solutions, and help them to see new opportunities for getting help in the face of failure. As with the previous workshop, the Project Failure exercise hinges on storytelling, collaborative engagement and the willingness to share both experiences of failure and the fear of it.

The workshop invites participants to share cases of failure – be it participants' past experiences within their own academic pursuits, or fears and concerns with current projects. This happens in a setting that encourages reflection and dialogue, but also actively uses humour. In pairs, participants are allotted four minutes to jot down their responses on a worksheet provided by the facilitators (see Appendix B). Subsequently, they share their reactions with each other and engage in collaborative reflections. Participants are prompted to envision situations where matters could have worsened (due to a 'project demon') and alternatively, where conditions could have improved (owing to a 'project superhero'). The fictional and hyperbolic features help create a minimum distance and lower defences.

This process encourages participants to engage with their challenges, progressively diminishing their emotional attachment to potentially distressing experiences they may be inclined to avoid. Participants are prompted to adopt a more positive and creative perspective as the exercise adopts a more imaginative and light-hearted stance. This shift enables them to view their colleagues and collaborators differently, identify opportunities for mutual support and explore new avenues for solutions. Feedback from participants showed how efficient such a guided imagination exercise could be for building awareness of vulnerability and trust among group members and for making substantive steps in navigating a troublesome experience. The collective acknowledgement of participants' emotional and social experiences forms the bedrock for effective learning through this workshop. It creates an opportunity to acknowledge and discuss failures and their roles in academic and professional life using principles rooted in improvisational theatre. These activities felt like really moving towards a rehumanised academic space, where the emphasis on collaboration, shared learning and vulnerability directly opposes traditional hierarchies of knowledge in academia.

Case 3: Virtuous (and Vicious) Designs: engaging ethical reflection through play and designed failure

Games have been an active area of research within the field of Responsible Research and Innovation (for example, Felt et al, 2018; Okada et al, 2019). The game Virtuous (and Vicious) Designs, developed by Sophia Efstathiou, invites participants to spend four minutes redesigning familiar objects to become paragons of virtue (or vice). The possibility of 'failure' is live whenever a task is presented and instructions are given, and the rationale behind using a tight time constraint is to push people to act quickly, despite this risk of failure.

The Virtuous (and Vicious) Designs exercise operates by blending the formats of a card-based game and open-ended improvised performance (see Efstathiou et al, 2019).[3] Participants are grouped into teams of three to five individuals and presented with cards from two decks (Figure 1). These cards are held face-down until a four-minute timer initiates the exercise. One deck is composed of 'virtueise' or 'vicen' verbs, describing the act of designing an object to promote a virtue or a vice, while the other deck of cards specifies objects to be redesigned (referred to as the missing Xs in Appendix C). For instance, participants might be tasked to '*Fairorise* an alarm clock', meaning redesigning the alarm clock, so that it can now promote fairness (a virtue), or '*Sadate* an alarm clock', redesigning the alarm clock to create sadness (a vice, in this frame) (see Appendix C for a list of the virtueise verbs). Each team member gets a worksheet prompting them to sketch their design, assign a name to it and provide a brief description. In the initial round, participants within each team independently address the prompt cards. Following this, a second four-minute round ensues, where participants share their designs and collaboratively devise a composite design for the team, either selecting one of the suggestions or amalgamating their characteristics into one uber-invention (see Figure 2.). The game involves two teams receiving the same object card, with one team picking a 'virtueise' verb and the other a 'vicen' verb.

The process of collaborative design is fun and works as an icebreaker for diverse teams. It also allows for the introduction of ideas from STS regarding the 'scripts' that technology comes with (see Latour, 1992) (compare Bruno Latour's work), as well as how technology should be used and what is 'good', 'ethical' and '(ir)responsible'

Figure 1: Virtuous Designs: cards from the game
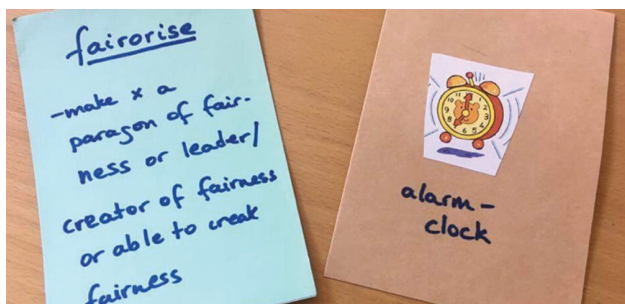
Source: Photo by Sophia Efstathiou.

Figure 2: Forgivinate + Sleeves: the shared-sleeves shirt
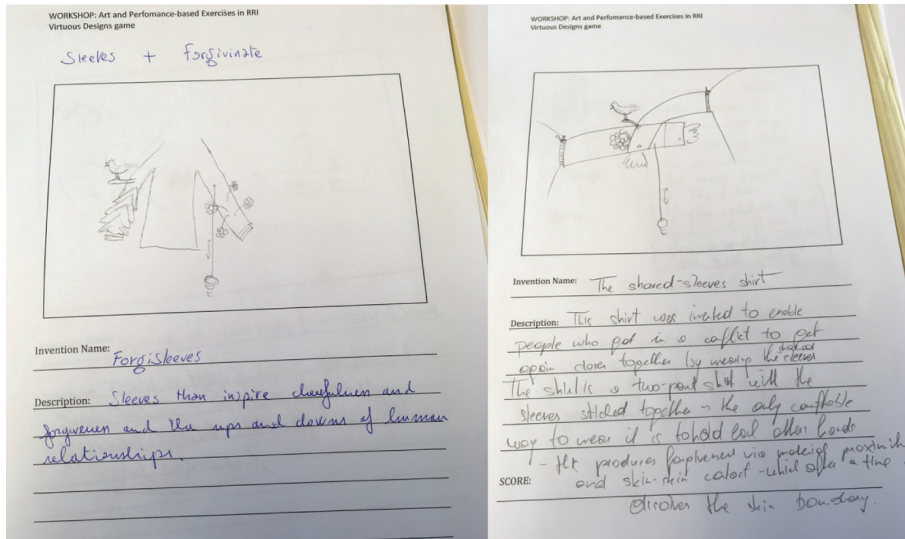
Notes: The forgivesleeves are two shirts with one sleeve joined that would be worn by people who are in a conflict and need to forgive each other. The only comfortable way to wear the shirt would be to hold hands, which the designers say, would enable forgiveness through skin-to-skin contact and by transgressing the social boundary. The drawing has added features from the forgivesleeves design (bird perch and yoyo), as it was chosen for the winning design for that team. These two designs were made during a Society for New and Emerging Technologies (SNet) conference workshop, 14 October 2016.

Source: Photo by Sophia Efstathiou.

design. We find that by using time pressure and humour, this exercise introduces spontaneity, creativity and often failure, fostering free thinking and willingness to undertake calculated risks. An underlying method for improvisation is the swiftness required for participants to think and act, almost inducing a sense of urgency. From our observations, the imposed four-minute constraint prompts a creative rather than a critical response, necessitating the acceptance and incorporation of ideas to achieve rapid outcomes rather than stopping at each step for exhaustive analysis and critique.

In terms of improvisational theatre, this four-minute constraint means participants will act, irrespective of the pressure to succeed in this task. This kind of detachment from 'success' and 'failure' is good because when the moment of critical reflection happens next, it gives us the raw material we need to reflect on the nature of technological scripts and responsibility and irresponsibility in design (Pérez et al, 2019). Virtuous (and Vicious) Designs thus ingeniously bakes a tolerance for failure into the game's rules, and also its humorous and playful spirit, encouraging participants to imaginatively challenge pre-established scripts connected to designs and technologies.

For example, in Figure 2, we see images taken from two stages of game playing. The shared-sleeves shirt, invented by participants offers an example of a redesigned object (shirt) to challenge the script of wearing it for comfort or style, for example, to wearing it to cultivate forgiveness. The creativity and reflection that we see here are stimulated by the game format, showing the close link between playing, failing and reflecting as a way of learning and understanding often difficult ethical issues playfully. This exercise further supports ITD research by having no threshold for participation: acting as an

icebreaker or warm–up exercise for a team, where some participants might even be tasked with designing technologies as part of their professional roles, to introduce new parameters into their design process. Virtuous (and Vicious) Designs highlights the balance of risk and innovation in collaborative design. Active participation, risk–taking and failure serve as cornerstones for subsequent reflection and mutual learning.

Set 2: Experiences from teaching

Case 1: Teacher and facilitator roles in an interdisciplinary PhD course

Just as inter– and transdisciplinary academic workshops benefit from exercises that cultivate empathy for diverse perspectives, so teaching in interdisciplinarity also benefits from such tools. However, when teaching interdisciplinary courses, we find that particular attention must be paid to the roles of students and teachers, along with role of warm–up activities and icebreakers in establishing expectations. What follows builds on the experiences of Marius Korsnes and Giulia Sonetti in teaching an interdisciplinary PhD course on the topic of sustainability.

On the first day of this PhD course, several warm–ups and icebreaking games (see Appendix D) were employed to facilitate introductions among participants. These activities aimed to foster a sense of trust – an environment wherein making errors and mistakes carries no adverse consequences. This foundation then facilitated open discussions about professional matters, encouraging participants to candidly share uncertainties within and beyond their own fields. Additionally, the course leader integrated three exercises (Appendix D) into a specific lecture.

One of these exercises, Binoculars, required participants to move, stand and sit while holding imaginary binoculars 'glued' to their face by holding them up consistently. While pondering the concept of interdisciplinarity, participants were physically confronted with the limitations imposed by a restricted field of view. This exercise compelled participants to acknowledge the necessity of depending on others' perspectives for guidance. At first experienced as somewhat silly by the participants, the success of this exercise hinges on the trust that participants place in each other and the teacher.

For successful facilitation, the teacher guides students towards interactive learning rather than providing authoritative instruction. In these exercises, the traditional role of a judgemental 'teacher' who distinguishes between right and wrong is eschewed. The facilitator, too, embraces vulnerability and fallibility, for example, by participating in group exercises, including exercises like Drawings, where students depict the connection between their research and society to establish a shared platform (Appendix D). When students and facilitators present and discuss their drawings, a sense of parity emerges, extending to their understanding of the relationship between research and society. This exemplifies 'vulnerable facilitation', a practice that dispenses with the facade of professional lecturer authority, creating an environment conducive to failures, errors and non–judgemental exploration (see also Loeng et al, 2022).

Case 2: Sounding identity: learning from students' experiences

The efficacy of interactive and improvisational exercises in creating learning moments lies in their facilitation, encompassing two critical stages. First, facilitators must possess a pedagogical understanding of learning objectives and design exercises that elicit

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specific experiences, for example, as we discuss in what follows, through methods like time constraints, drawings or storytelling. Second, facilitators must emphasise that the source of learning is not restricted to authoritative statements from the teacher but extends to students' own experiences and reflections. Facilitation, when employing improvisational techniques effectively, guides students towards their own experiences as sources of learning.

Facing Sound is a workshop developed by Sophia Efstathiou and Marianthi Papalexandri Alexandri that probes the meeting of ethics and sound through affective experience. Ethics is understood here following Emmanuel Levinas. Levinas's phenomenological understanding claims that ethics is an experience: the experience of pausing one's spontaneity, when coming face to face with an Other, radically different being (Levinas, 1969; Efstathiou, 2019). The workshop was built on five exercises originally developed by Sophia Efstathiou to cultivate these moments of pausing, and attending to the Other, while also adding dimensions of sound and music from Marianthi Papalexandri Alexandri's work (Appendix D).[4] Among these exercises, consider Sounding Identity. Participants are grouped and presented with a group of identical-looking objects – for example, marimba keys, pencils or matches. They are then tasked with selecting one of these objects, and asked to observe this chosen object so closely, that they can identify it once it is placed back in the group. Participants are then invited to give a name to their object and to devise a story for it, describing how this object got its distinguishing marks. This is followed by identifying unique sound features for this object. The facilitator then tests participants' familiarity with their objects by asking them to identify their object, after playing all objects' sounds from behind a screen.

How we relate to other people, and to things around us, recognising their uniqueness, involves acknowledging 'otherness' as a starting point for inclusion, recognition and ethics. Through this exercise, the facilitators introduce 'facing' as an ethical aspect of encounters with also non–human beings (see Efstathiou, 2019). The approach invites participants to reflect on their objects' strangeness and uniqueness by considering sounds as extensions of their perception of the objects' identity, or 'face'. By anchoring the learning process in students' aesthetic choices and experiences, the exercise invites reflection about our ethical relationships to the material world around us, its uniqueness, and our encounters with our surroundings. At the same time, the exercise relies on students' own attentiveness to their object, and their storytelling to make this point, rather than any imposed one. Incorporating the senses and sound allows students to experience the world of objects as alive and full of unique characteristics and potentials, thus enhancing the understanding of abstract concepts like 'facing' and phenomenology through a facilitated teacher–student rapport. By inviting participants to be creative and devise stories about their objects that will be obviously false, the approach encourages participants to be comfortable with what is unreal and 'wrong', as part of the creative process, while contemplating the ethical dimensions of their encounters with the world around them, thereby promoting attentiveness and care.

Case 3: Storytelling Fieldnote exercise: fostering ethical exploration in ethnographic research teaching

The Storytelling Fieldnote exercise developed by Martin Loeng capitalises on the idea that field-noting is inherently a form of storytelling. This approach, developed in the context of teaching an anthropology course, transforms what is conventionally a

solitary, text-based and theoretical subject into a practical, social endeavour – mirroring the social nature of storytelling shared between two listeners. The exercise expands fieldnotes beyond mere discussion material into a communal practice where people engage with each other's narratives. Making use of storytelling and improvisational theatre principles like listening and learning to fail, the exercise explicitly sets participants up for failure, and acceptance of failure, to achieve actively engaged students using multiple – including emotional – intelligences (Berk and Trieber, 2009).

The goal of this exercise is collaboration: setting the stage for failure helps transforming a research method and its corresponding questions into a topic of discussion. By involving participants in the setup process, facilitators empower them to control the tasks of listening, retelling stories and embracing errors. The exercise uses warm-ups, short moments of lecturing about field notes and narrative theory, and culminates in the Storytelling Fieldnote exercise. For facilitation, it is critical to explicitly state that the main exercise of the workshop is meant to be difficult and provoke failures. For details on how to conduct this exercise, see Appendix D.

Reflection and discussion: implementing the exercises

In this section, we summarise why improvisational theatre techniques can successfully support ITD work, through three key insights: creating an atmosphere of trust, flexible facilitation and delegation of authority, and the significance of feedback and shared reflections. These outcomes can be observed both in the education and the research settings we worked in.

These features are particularly crucial for ITD work because collaboration often involves participants from diverse professional, disciplinary or cultural backgrounds, where diverse perspectives need to coexist and reinforce each other in dynamic, context-sensitive ways (Efstathiou and Mirmalek, 2014; Fam et al, 2018). Participants are called to contribute their expertise but must do so in a flexible and reflexive manner that accommodates the needs and constraints of others. This fluidity often leads to feelings of insecurity owing to a lack of clear structures and predefined roles (Williams, 2006; Sayer, 2011; De Grandis, 2025). Yet, embracing this ambiguity through trust-building, flexible facilitation, mutual listening, accepting others' contributions and open feedback allows for genuine collaboration, fostering creativity and responsiveness. The process of navigating this space of uncertainty is where techniques from improvisational theatre come in handy since the workshops successfully met their goal of fostering trust, as evidenced by participant feedback and observed group dynamics.

Key insight 1: Building an atmosphere of trust

Warm-up activities and playful exercises create a foundational atmosphere of trust that is essential for integrating diverse perspectives into collaborative problem-solving. Icebreakers and warm-ups help create a relaxed atmosphere in which failure is acceptable, fostering a safe space for sharing and listening by ensuring participants:

- Understand the session's theme, tasks and roles;
- Attend to each other's contributions without judgement;
- Feel a sense of belonging;

- Perceive care and guidance from facilitators and peers;
- Feel safe from judgement, encouraging risk-taking without fear of criticism.

We observed that the participants became increasingly comfortable sharing ideas and acknowledging their mistakes, indicating that the trust-building activities were effective. As we have seen through different exercises, trust enables risk-taking. 'Silly' games like Binoculars demonstrate that risks are embraced, not judged. Facilitators play a crucial role in valuing participants' risks, reinforcing a sense of care. In a trusted environment, 'failure' is redefined as a commitment to tasks while embracing risks. Learning to fail involves participating in activities where failure is expected, shared and celebrated with humour, as for example in Virtuous (and Vicious) Designs. Humour helps alleviate tension associated with errors, making mistakes approachable and fostering learning moments. Our study confirms that exercises like the Project Failure workshop develop empathy and collaborative problem-solving skills, critical for addressing global challenges. Also, participants engaged in the Group Story Creation exercise, where each person contributed one sentence to a collective narrative. This activity encouraged active listening, adaptability and mutual respect, fostering an environment where participants felt confident to share and collaborate openly. Through playful engagement, participants can acclimatise to the unpredictability of ITD work, allowing them to take risks and embrace failure as part of the learning process. As research shows, humour and the willingness to embrace mistakes foster creativity and problem-solving skills (Sawyer, 2019).

Our findings align with previous research suggesting that art-based methodologies, such as those used in improvisational theatre, facilitate deeper engagement with complex societal issues (Heras et al, 2021). Based on participant behaviour and feedback, we observed that improvisational activities facilitated a positive environment for collaborative learning, in both educational and research settings: the non-hierarchical nature of improvisation created a space in which participants from different backgrounds felt empowered to share their perspectives. This finding supports the argument that art-based methods can play a role in emancipating knowledge creation from established structures and hegemonies (Nadar, 2019; Heras et al, 2021; Brauer et al, 2024). Furthermore, we argue that techniques from improvisational theatre are particularly suitable as they excel in navigating uncertainty.

Key insight 2: Flexibility in facilitation and teaching – overcoming hierarchies

Employing improvisational theatre games requires adopting distinct teaching and leadership approaches. What we call 'vulnerable facilitation' embodies teaching that engages participants' emotions and moods, being fully attentive and engaged in the current emotional experience. Facilitators play a dual role as both participants and guides, adapting to the group's needs and encouraging spontaneous contributions. This approach prioritises experiential learning and co-creation over didactic teaching, aligning with participatory methods that are increasingly recognised for their efficacy in tackling societal issues (for example, Zaragocin and Caretta, 2021). Adapting these techniques can be challenging in certain situations, institutions or countries. Critical pedagogy scholar Brookfield (2017) points out that students, especially those paying high tuition fees, anticipate a level of seriousness and concrete results, and a sense of being taught important facts. This potentially clashes with the less structured nature

of a wicked problem where difference must be nourished (see Escobar, 2017), and the new demands of a decolonial university where paradigmatic questions need to arouse a certain degree of perplexity (Santos, 2017).

Effective facilitation in ITD settings requires flexibility, especially when participants may initially resist engaging fully. Icebreakers, simple name games and drawing activities can help overcome hesitation and acclimatise participants to an environment where mistakes are accepted and celebrated. This facilitation involves relinquishing some control, allowing participants to take ownership of the learning process, fostering creativity and collaborative problem-solving. As Holdhus et al (2016) point out, 'golden moments' for learning often occur when the facilitator, teacher or student is taken by surprise. Acquiring skills to utilise such moments of uncertainty demands practice and experience.

Shifting from traditional lecturing to improvisational techniques can be challenging. Facilitators must balance the need for structure with openness to participants' input. Traditional educational environments often resist this shift due to entrenched power dynamics, time constraints and expectations for concrete results (Brookfield, 2017; Santos, 2017). For example, the value of spending 30 minutes on warm-up activities may not be evident in a time-constrained environment. Attempts at participation and risk-taking can be thwarted by negative reactions, resulting in reluctance to engage. Therefore, it is essential to recognise the possible adverse effects of authority-centric approaches when employing improvisational techniques in hierarchical settings like universities. Facilitators need to be sensitive to these challenges while striving to create more inclusive and participatory learning environments. Embracing the possibility of failure is exactly what is needed.

'Vulnerable facilitation' aims to level disparities by engaging participants equally, embracing risks and vulnerability. When authority figures freely make mistakes and do not perform impeccably, they redefine expectations and invite others to share and redefine interaction boundaries. Emphasising 'vulnerable facilitation' as practised by individuals from diverse cultural and geographical backgrounds is a conceptual advancement, recognising the importance of adapting teaching methods to various contexts to maximise impact. While this approach challenges established authority, it is important to acknowledge that power dynamics persist and must be understood to create a productive and respectful learning environment (Brookfield, 2017). Balancing hierarchical structures and innovative improvisation techniques presents a unique challenge.

Key insight 3: Sharing reflections – empowering diverse voices

Reflection is a crucial component of improvisational exercises, turning lived experiences into shared learning moments. Structured reflections after each activity allow participants to process what they experienced, articulate insights and co-construct knowledge. Group activities that invite equal participation are crucial for mutual engagement and integrating diverse perspectives, including marginalised and Indigenous viewpoints, into interdisciplinary discussions on global challenges (for example, Zaragocin and Caretta, 2021). While much of the existing literature on transdisciplinary studies focuses on collaboration between and beyond disciplines (Klein, 1990; Huutoniemi et al, 2010), there has been little focus on how these collaborations can be inclusive of diverse ways of knowing. Reflection and feedback

practices help decentralise dominant knowledge systems and validate diverse ways of knowing, thus promoting cognitive justice in ITD settings (Dawson, 2020).

While participants' experiences with any improvisational game are open-ended, it takes time to reflect on these experiences and focus on what is learned. With improvisation workshops, every exercise comes with a brief moment of reflection in pairs or in the whole group. We do this to understand: (1) how the exercise was experienced and (2) what the participants contributed to. The group reflections after each exercise form part of the 'making aware of what happened'. This makes the lecturer open and vulnerable to student feedback, and the students are open and able to feed into and shape the course of the class. This step should not be left out, as it can be considered what 'realises' or completes the exercise (Spolin, 1963: 43). This means that facilitators must first prepare exercises and conduct them, then 'make students aware' to maximise the potential of techniques from improvisational theatre in the teaching process.

Encouraging participants to reflect on their experiences fosters an inclusive space, in which all perspectives are valued. By focusing on the learning value of mistakes rather than avoiding them, participants can transform discomfort into productive dialogue. This non-hierarchical approach empowers participants to voice their insights without fear of judgement, thereby enriching collaborative problem-solving.

Facilitators must guide participants through reflective exercises to ensure that the potential of improvisational techniques is fully realised. By centring reflections on both personal experiences and collective learning, these sessions become spaces where vulnerability is embraced, mistakes are redefined as learning opportunities and diverse voices are amplified.

While this study highlights the value of improvisational theatre techniques in fostering trust and collaboration, several limitations must be considered. First, participant variability plays a significant role in the effectiveness of these exercises, as individuals with different personalities or cultural backgrounds may respond differently to activities requiring spontaneity and public participation. Second, the success of these techniques is highly dependent on the skill and adaptability of the facilitator, underscoring the need for proper training. Third, the context-specific nature of improvisational activities means they may not be universally applicable, particularly in highly formal or hierarchical settings. Additionally, the subjective nature of measuring outcomes limits the ability to generalise findings, suggesting that future research should incorporate mixed-method approaches for a more comprehensive evaluation. Finally, the time required to build comfort and yield meaningful results may pose challenges in time-constrained environments. Addressing these limitations will be crucial for refining the application of improvisational techniques in diverse educational and research settings.

Conclusions

This article explored how improvisational theatre techniques can enhance interdisciplinary and transdisciplinary approaches to learning, with the goal of addressing complex global challenges. This study draws on over 25 years of collective experience among the authors, developed through facilitating workshops that employ improvisational theatre techniques to foster collaboration and trust in educational and research settings. By embracing unpredictability and fostering collaborative creativity,

improvisation is more than just a pedagogical tool; it is a catalyst for innovative problem-solving. Somewhat counterintuitively, relinquishing control and authority in teaching environments may be crucial in tackling grand societal challenges. This shift reflects the evolving demands of ITD work, where rigid structures often fall short in fostering creative and inclusive learning environments (Silvast and Foulds, 2022; Sonetti et al, 2020).

Our research identified four central themes that demonstrate the potential of improvisational techniques:

1. Reframing 'failure' as an asset: we have placed failure and failing at the centre for cultivating the joy of learning and encouraging safe risk-taking. Embracing failure in a supportive environment encourages risk-taking and fosters resilience, which are essential traits for navigating uncertainty in both academic and collaborative settings. While our focus was predominantly on academic workshops and teaching, we believe the tools proposed and inspired by improvisational techniques, like celebrating 'failure', can help achieve authentic leadership and collaboration in any project.

2. Building atmospheres of trust: trust is fundamental for effective ITD collaboration. Dedicating time to playful warm-up exercises, icebreakers and transparent introductions creates a safe environment where participants feel empowered to take risks and engage openly. These seemingly simple activities lay the groundwork for creative problem-solving by breaking down barriers to participation. Such environments are particularly crucial when integrating diverse perspectives, where openness to new ideas and a willingness to embrace uncertainty are key. We argued that when such atmospheres of trust are established, these exercises become more transformative because they rely on active, empathic participation, usually with a certain degree of smiles and laughter that break the tension.

3. Encouraging 'vulnerable facilitation': whereas traditional lecturing permits instructors to wield authority and dictate the transmission of information, shifting from lecturing to facilitating learning involves relinquishing this control. As we have seen, theory from improvisational theatre urges facilitators to level asymmetries and reject the 'teacher's authority' because it can be directly counterproductive. We argued that 'vulnerable facilitation' means letting go of controlling the narrative, by giving participants specific problems to solve. Examples from our exercises were designing an alarm clock that makes people fairer in four minutes; imagining how a bad academic situation could get much worse or better; or telling, listening, remembering and retelling personal stories in hectic rotation. Drawing on improvisational theatre, we argued that facilitators should 'let the exercises do the work', encouraging participants to co-create knowledge rather than merely receiving it. This shift aligns with broader methodological transformations in academia, emphasising the co-production of knowledge and participatory approaches (Dawson, 2020; Santos, 2017).

4. Structured reflections as transformative moments: incorporating time for paired or group reflections transforms participants' experiences into deeper learning opportunities. These reflections allow participants to process their experiences, share diverse perspectives and turn perceived mistakes into

valuable learning moments. This practice reinforces an inclusive, non-hierarchical environment where all contributions are valued, fostering dialogues that can lead to richer understandings of complex issues.

Overall, our discussion highlights how improvisational practices can effectively bridge gaps between diverse epistemologies, fostering interdisciplinary collaboration crucial for addressing societal challenges. The emphasis on 'plurality and incompleteness' (Lélé and Norgaard, 2005) aligns with the evolving needs of academia to address pressing global concerns like climate change, social justice and inequality.

The approaches identified emphasise a rethinking of failure and failing – while facilitation, delegating authority and making room for reflection are key techniques to cultivate trust and a safe space for failure. Nevertheless, this article does not claim that everything will be better if we improvise more, nor that every aspect of academia should always introduce improvisational techniques to foster ITD research and education. Transforming established academic norms around success and failure takes time and intentional effort, especially given the deeply rooted benchmarks and evaluative structures in higher education (Santos, 2017; Turner, 2020). While these improvisational techniques can open new avenues for creative collaboration, they must be applied thoughtfully, acknowledging the complexities of academic and institutional contexts.

In positioning improvisational theatre as both a pedagogical and methodological innovation, we advocate for its potential to transform traditional academic spaces into more inclusive, participatory and decolonised environments. By integrating embodied, alternative knowledge systems, these practices offer a pathway towards a rehumanised university that embraces diverse ways of knowing. Ultimately, embracing the constructive potentials of 'failure' and promoting inclusive dialogue can foster a more dynamic and transformative academic landscape, better equipped to tackle the challenges of our time.

Notes

[1] See also this website for images and video material from the workshops: https://shapeenergy.eu/.

[2] See website for more information: https://www.ntnu.edu/afino/.

[3] See https://www.ideobics.com.

[4] This phenomenological understanding of ethics as a type of experience contrasts normative approaches to ethics which equate or try to define the 'good', for example, in terms of rules, duties, principles or the maximisation of utility, and develop general frames for achieving this. Rather, considering ethics as facing is an account which looks at what types of experiences open up to vulnerability of the Other. See Efstathiou (2019).

[5] The Binoculars and Drawings exercises were adapted from Cynthia Mitchell and Dena Fam at the Institute for Sustainable Futures, at the University of Technology Sydney.

AI declaration

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Data availability statement

This article does not report primary data that require a formal data availability statement. The authors take full responsibility for the integrity of the data, the accuracy of the analysis, and the interpretation of findings. Any supplementary material related to the methodology and exercises described is available upon request.

Conflict of interest

The authors declare that there is no conflict of interest.

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Appendices

Appendix A: Example of a story spine focusing on transport, adapted from Mourik et al (2017)

Today's challenges

Title(What is the title of your story?)	
Name	
Occupation	
Every day I… (How do you normally transport yourself? How does an average day look like?)	
This is because… (Describe challenges you face, and why they become challenging)	
As a consequence… (What are the consequences of these challenges? For whom?)	
Therefore I… (What has been done to solve these issues? Who does what? What does this lead to?)	

Appendix B: Worksheet from PROJECT FAILURE – Demons and superheroes!

You are invited to share an experience of failure, something that went wrong in your research in the past, or that you experience or fear going wrong in a current research project.

Imagine things going even worse! What could happen? Among your stakeholders who would be in a better position to ruin things? How would that feel? What repercussions would it have?

Now imagine things going better than you ever expected! How would this happen? Which stakeholders would be in a good position to boost or fix or rescue things? Which superpower would they (or you) have? How would that feel? What repercussions would it have?

Appendix C

Virtue-ise and vice-n

'Virtuous Designs' takes the form of a card game (designed in English).

The game is played through two decks of cards (Figure 1). One deck contains cards with mundane objects (practices/biological entities) to be redesigned. The other deck contains virtue–ise verbs (Table C.1).

These verbs are invented by turning a noun that stands for a virtue into a verb. Note that here we are thinking of virtues as positive attributes that a person or another entity might have. Table C.1 lists examples of verbs we have been playing

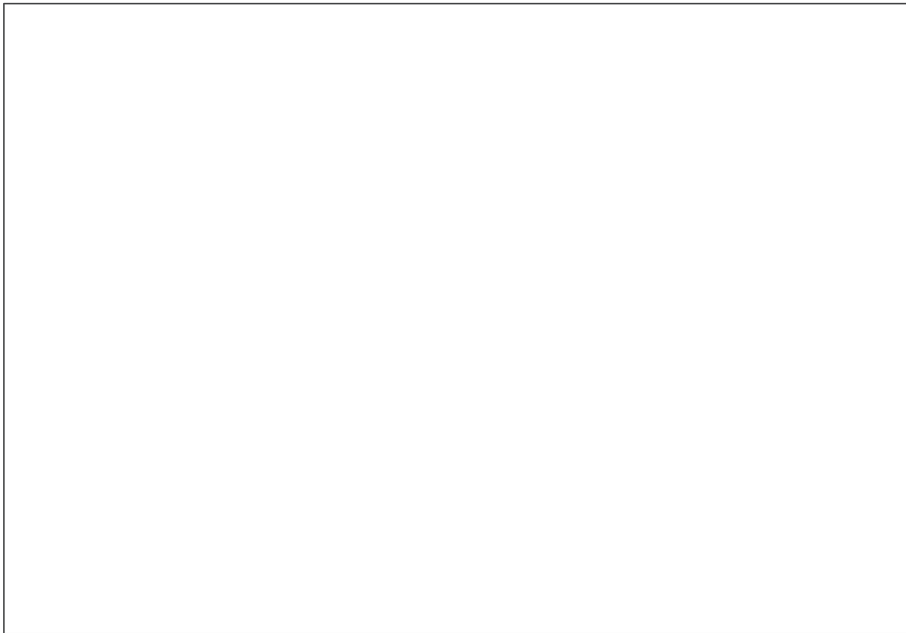**Table C.1:** Virtuous Designs: virtue-ise verbs and their meanings

Virtue-ise	X
1. Deprocrastinate	Make X prevent or discourage procrastination
2. Fairorise	Make X a paragon of fairness or a leader/enabler of fairness or able to create fairness
3. Feelify	Make X inspire emotional intelligence and feeling-awareness
4. Patientise	Make X inspire patience, produce patience or enable patience
5. Braverise	Make X inspire braveness or enable braveness
6. Kinderise	Make X kinder in action or enabling kindness
7. Lovify	Make X produce lovingness or being lovingly
8. Forgivinate	Make X inspire forgiveness or enable forgiveness or produce forgiveness
9. Honestify	Make X honest or honesty conducive
10. Peacefulate	Make X create or enable peacefulness or make X peacefulness conducive
11. Generositise	Make X more generous in action or inspiring generosity
12. Respectfulise	Make X secure or ensure respect
13. Collegialate	Make X enable collegiality and team spirit
14. Joyrate	Make X inspire joyfulness or to enable joy
15. Reflectivate	Make X conduce critical reflection
16. Dedicatise	Make X produce dedication or commitment, or resilient belief
17. Enthusirate	Make X stimulate enthusiasm and motivation
18. Sincenerate	Make X induce sincerity, reward or encourage sincerity

with. The verbs still invite participants to imagine that they, as designers, can help bring about virtue in others, and create things that will enable virtue. This aspiration overidentifies with a vision of researchers and innovators that *can* innovate responsibly, and *can* create technologies to achieve desired ends.

The game is played by teams of two to five people, in two phases. In phase one, each participant is given a playsheet. The playsheet has a designated space for each designer to draw their design, a prompt to name it, and some space for them to describe their invention and to score it. Each team picks just one action card and one object card from the pack, face down. All teams then get four minutes. Players in a team use the same cards but work individually to design a new virtuous thing. In phase two the teams get four more minutes and one more playsheet per team. In that time, they are to discuss their designs with each other and pick a design to represent the team. This design could be one person´s design, or it can combine features of different designs.

The process of collaborative design is fun and works as an icebreaker for diverse teams. It also allows for the introduction of ideas from STS regarding the 'scripts' that technology comes with and how it constrains our use of it (compare Bruno Latour's work). Virtuous Designs invites participants to reflect through play on the role of values and virtues in material artefacts, and to imagine new scripts for their usage.

Virtuous – and vicious – designs!

Invention Name:
Description:

Appendix D

Exercises from Set 1: Storytelling and speculative, game-based workshops

Case 1: Storytelling workshops

Presentation and greeting: this opening exercise emphasises welcoming those in the group we have not yet met, or who we do not know very well yet. The exercise starts by walking around the room, greeting people and presenting oneself. The focus is placed on maintaining eye contact. The exercise progressively increases the degree of closeness of people, deepening relationships without forcing, leaving freedom for each participant to relate to one another in a more or less intimate way according to their own comfort level. The facilitator instructs the participants using the following steps: (1) participants begin exploring their own area; (2) move in relation to each other and move together; (3) move apart, but somehow stay in contact (a rhythm, eye contact, rushing past each other and so on); (4) come back together; and (5) make a group sculpture based on a topic related to the workshop. The purpose was to reconcile the individual with the greater whole and increase non–verbal communication. Comments from participants after this exercise often concerned their awareness of their personal and shared spaces.

Scenography construction: one person steps forward and says for instance 'I am a tree'. Then, each participant, one at a time, binds to the scenography declaring who or what they are in relation to this (whether it be an object or a character), for example, 'I am the apple hanging from the tree', 'I am the caterpillar inside the apple'. This exercise asks participants to position themselves in relation to each other and to represent the objects they propose. The exercise works on the concept that everyone can be or become an essential piece of a more significant construction and that, via working in collaboration and with their creativity, different people may come to discover an unexpected realisation that unites everyone's ideas without preconceptions.

Related words: 'I said "xxx" because he said "yyy"'. The exercise takes place in a circle, in which progressively each participant says a related word. For example, the first one: 'I say PIZZA'; the second one: 'because you said pizza, I say tomato'; the third: 'because you said tomato, I say plant' and so on. When everyone has expressed their word connected to the previous one, they are instructed to backtrack the process, up until returning to the starting word. This can also be done by having a time limit, say of two minutes before the participants backtrack the words. The authors have conducted this exercise many times, and it has never been the case that the group has not been able to backtrack the words to the starting word. This exercise makes us aware of the value of attention and connection, and to the value of the 'hive mind' – the participants realise that they can trust that the group as a collective knows how to solve the task. Explicitly connecting with the previous word brings out new connected words and opens up new possible unexpected ideas.

Presentation in pairs: in turn, each member tells the other in two minutes what they want the other to know. Not only work-related, but also things like: 'I like cats, I love ice cream, I wanted to be an astronaut'. After this first phase, couples are exchanged and each one presents themself to the new person as if they were the first partner, remembering what they were told. A tip is telling the new partner what they want them to know about the person they are now pretending to be, not only about their job. Using imagination is also encouraged. Tales, photos on the phone or a piece of clothing were prompts to start conversations about what is important to

the participants. The aim of the exercise is to cultivate and practise listening, paying more attention to what we are told than to what we say, paying attention to the other, to be able to construct a coherent, collaboratively produced and positive interaction.

(There is no additional material for Case 2, as it was thoroughly described in appendix B.)

Case 3: From the speculative, game-based workshops

Flipping scripts – name/clap and stand/sit: this is a typical warm-up used in improvisational theatre. The exercise used here asks people to say their names all together, out loud, and to clap, followed by standing up and sitting down. We then flip the meaning of the instructions: when the facilitator says 'name' people have to clap, and when the facilitator says 'clap' people are to say their names. The same with sitting down and standing up: people should sit when told to stand and vice versa. This is a simple exercise inviting people to 'break the rules' – by instructing them to act differently to what they are told, opening up the possibility for 'failing' to follow the rules as the right choice and part of the game – while of course participants also fail to flip the scripts, for example, saying their name instead of clapping. At the same time the facilitator fails too, often, to follow their own instructions providing a good example of how improvisational theatre exercises can help shake hierarchy and expectations – and cater for failing as an embedded in the practice. This warm-up was followed by the card-based gameformance Virtuous and Villainous Designs.

Exercises from Set 2: Experiences from teaching

Case 1: Exercises from the PhD course

Mentimeter, an interactive presentation software: this technique was used to find out more about expectations for the course, existing knowledge of the topic, the basic information about the students, such as where they are from and their disciplinary backgrounds. Mentimeter is useful in the beginning of the lecture to map interests and activate all students. The technique was good at getting the students to quickly get to know each other and what experiences and expectations they had.

Binoculars:[5] about halfway through the lecture, everyone was asked to get up and see the world through the 'binoculars' that they made with their own hands glued to their face. This exercise is good because the students must stand up and move around a little, at the same time as they think through what this means for the topic, namely interdisciplinarity. The point is that one sees 'narrower' when one only looks through one's own perspective. Also, when the hand is glued to the face, it is more difficult to get up and sit down – implying that getting help from others might be necessary. This technique involves activating the bodies of the participants. It invites them to 'accept' the limitations imposed by a limited field of vision. Reflections after the exercise showed that some were able to connect the exercise with the topic of interdisciplinarity, as an illustration that it can be difficult to see only through their perspective.

Drawings: students were asked to *draw* their perception of the connection between their research and society. After five minutes, they then discussed their drawings with a partner and later in a group reflection. This method effectively engaged students, as noted by facilitators and in follow-up interviews. The different disciplinary and cultural backgrounds led to varied understandings of societal connections and research

usefulness, something which is useful to acknowledge in ITD work. Students would typically say things like 'I am not good at drawing', but they were nevertheless encouraged to draw. The facilitator specifically encouraged spontaneous drawing, with low expectations for artistic quality (and a deliberately short time limit), fostering support and collaboration among participants.

Case 2: Exercises in teaching of philosophy and sound, developed as part of the Facing Sound workshop at Cornell University (spring 2019)

The Response–Able Walk: we started with this exercise, developed by Sophia Efstathiou, as a warm–up, as it involves movement and sound elements but of a simple nature. In this exercise students walk any way they like within a defined area of the classroom. The exercise then asks people to spot a person in the room, and to keep walking, making sure this person is always on their left. Next, students are asked to spot a person and make sure they are walking with that person on their right. Last, they are asked to walk in relation to two other people, keeping one of them on their left and one on their right (Figure D.1). In musical ensemble terms, students walked as a solo, then a duo and, last, a trio: in relation to two other people. At the third stage a pattern often forms, like a cluster or circle of people, though no one intends it. Inspired by the work of philosopher Donna Haraway the exercise explores the social emergence of collective action, and the notion of responsibility as an ability to respond to each other.

Sophia Efstathiou and Marianthi Papalexandri Alexandri then experimented with adding singing: we asked people to sing a note – any note they wanted – and then to take the next pitch from the person in their duo creating different harmonies. When

Figure D.1: Image from the Response-Able Walk exercise, at the stage of the double constraint or trio walk

Source: Photo by Marianthi Papalexandri Alexandri.

sound and rhythm were attended to, we observed shifts in social and behavioural organisation: for instance, participants tended to want to talk, and engage verbally with each other, while walking. When they were asked to be silent, there was a sharpening of engagement and listening – a different quality of attention surfaced. When participants were asked to match the pace of the person they were attending to, the whole group tempo gradually synchronised. Adding rules gradually helped explore the shift from the individual to the collective, and from the sonic to the musical. Training active listening and an ability to respond to others in the group while also creating collective experiences helped build individual and group awareness and connection – key for training a group who are to work together, as one might want to in an ITD setting. Participants were tasked to manage distances, attending to each other's position and moving together as a group while respecting social norms, and all this happened in a fun way, bringing the body into a task that can be intellectually very hard to train and demanding of people in a work setting.

Ideobics Parts 1 and 2: we then moved to another movement–based activity developed by Sophia Efstathiou which helps as an icebreaker as it is also often experienced as fun and energising. In this activity, students were led by the facilitator in a set of ten exercises, targeting particular body parts, from one's head to one's feet. The idea behind these exercises dubbed Ideobics, is that we can exercise both our body and our mind together. Ideobics is inspired by Jane Fonda's aerobics, her set of physical exercising. Aerobics is etymologically possible to analyse in the words aero– meaning air in Greek, and –bios, meaning life in Greek. This indicates a set of exercises for living in air, or for our consumption of air. Inspired by German holist neurobiology, which considers organisms in their milieus, we see that in the case of human organisms, we would need to exercise not only in air, but also by considering the ideologies and discourses we live in, and thus exercise with the ideas that we are consuming besides air. Adding new–age practices like 'positive' thinking or affirmations, Ideobics complements physical exercises with particular concepts, taken to be 'positive' ideas. Ten physical motions, targeting body parts with particular significances were matched to ten spoken words and concepts: for example, 'acceptance', is uttered with the motion of nodding one's head up and down, the head and face symbolising our personality or identity and the concept we are exercising being accepting ourselves. The concept of 'choice' is uttered and exercised through the neck, which holds our head, our selves, and turns them to consider what is past (left), present (ahead) and future (right), and to accept our choices in the past, present and future. And so, we exercise free 'choice', by moving our head from left to right. Each body part has a particular meaning and is coupled to a concept which affirms and strengthens it through thinking. The set of exercises can be both deep and superficial, experienced as funny and as revealing.

Building on this shared bodily experience of exercising, speaking – and laughing – together, students were then divided in trios. They were then prompted with the three concepts mentioned already, to improvise, compose and perform a musical piece using the same type of object as an instrument (for example, using pieces of tracing paper). Students shared one object, as an instrument, playing this among them, during the performance. This improvisation exercise in trios moved from word and physical movement to sound, from the ensemble to groups within it, from the full body to the hands handling an instrument, and from the human voice to the sound of the object. Shifting from the individual to the collective

and creating a shared composition offered an evocative way to work again with concepts of giving up control and entering a collaboration in an embodied, experiential manner.

Sounding Secrets Parts 1 and 2: in the third exercise, we started with Sophia Efstathiou's exercise of Sharing Secrets, which engages students on an individual and personal level. Participants were invited to take two sticky notes of different colours, for example, yellow and pink, to take some space from each other, and to write down, on the yellow sticky note something about themselves that they did not mind sharing ('personal public information') and on the pink, a secret: some information about themselves that they did not, under any circumstances want to share with the class ('personal private information'). Participants are invited to fold both sticky notes so that they would not be legible, to come together in a circle, and to hand over both of their sticky notes to the person next to them. This activity invites them to experience what it is like for others to have potential access to their secret, to give this access, and to have access to others' secrets. Given the structure of the exercise, you would know whose secret you are holding, and who is holding your secret.

After an invitation to read out loud the public information and make inferences from it, we invited participants to throw the sticky notes holding secrets in the middle of the room (but first to anonymise the private information). Students were asked whether they were now OK to read one of the secrets (given they were anonymised), to prompt and reflect on this emotional reaction, and to pick out their own pink sticky note (secret) from the floor, if they could, without looking. We distributed one balloon to each student and asked them to blow it up and insert their sticky note into it. By moving the balloon like a shaker, students could 'listen' to their secrets (Figure D.2). We then repeated the three selected Ideobics exercises, but this time, holding a balloon with their secrets inside. Finally, we burst the balloons, collected them and discarded the papers.

Figure D.2: Sounding one's secret inside a balloon resonator

Source: Stills from video; photo by Marianthi Papalexandri Alexandri.

In the second part of the exercise, students performed their secret as a sound piece, choosing from a set of preselected everyday objects, such as paper, pieces of fabric, threads and small percussion instruments. Two versions of the gameformance were tried: first, a performance behind a screen; second, a performance with the performer's face obscured. These versions used screens and objects already designed by the author's students (see Figure D.3).

In both cases, students used the structure of their written secret – its rhythm and pacing – as a mental framework for their sound performance. Through their deep engagement, even the simplest sounds and moments of silence became profound and deeply personal, as students later discussed in their feedback. A discussion on Levinas's conceptual approach to ethics that emphasises relationality and responsibility as facing the Other and the 'secret' life of the Other followed the performances.

Based on their feedback following the class, students felt as if they could hide and shield themselves from the world around them by using sound as an invisible yet audible blanket: Sounding Secrets allowed students to engage emotionally with their secret and the possibility of someone discovering their secret, as well as with

Figure D.3: Sounding one's secret by performing behind a screen (left) or with one's face hidden (right)

Source: Stills from video; photo by Marianthi Papalexandri Alexandri.

the experience of expressing their secret through their performance, while being free of the risk of people actually discovering it. This situation of designed, shared vulnerability also aimed to strengthen trust within our group. The improvisational pieces trained students to reflect on and sonify their experiences, emotions and concepts in a safe mode. Doing this together as a group created a shared experience of vulnerability, where our secrets could be shared safely, which also added to the class's social atmosphere of trust, Marianthi Papalexandri Alexandri found, as teaching progressed through the semester.

SWARM was a workshop developed by Sophia Efstathiou and Marianthi Papalexandri Alexandri with funding secured by Marianthi Papalexandri Alexandri for the Cornell Biennial Festival and held online. The workshop invited students from graduate and undergraduate courses. Taking place during COVID-19 remote teaching, SWARM developed analogue, in-person activities based on the Facing Sound workshop (discussed in the main text) into an online version, designed to activate the technology available on Zoom. For example, instead of performing secrets live while visually hidden behind a room divider, students were invited to voice their secrets on screen with their microphone muted. Instead of a visual absence (screen) and sound presence, we experimented with silence, or an absence of sound, replaced by visual presence – a kind of mediated deafness. Removing sound while retaining a visual image flagged the importance of sound in communication while the experience of speaking one's secret, in the group, while their microphone was muted highlighted the agency of technology in shaping our interactions. In another version of the Sounding Identity exercise, each student was asked to pick one matchstick, identify it visually, give it a name and story, and then record the sound of this matchstick burning. Students were then tasked with identifying the sonic imprint of their matchstick among other matchstick sound prints.

Improvisational tools such as game formats, open-ended instructions and group activities stimulated creativity and expression, but also offered protection to create a safe and playful environment for students. These workshops highlighted how new game-based methods can innovate traditional teaching in our field, for example philosophical ideas of identity, responsibility and privacy, or musical notions of rhythm, synchronicity, performance and ensemble/solo work. Structured improvisation infused our fields and students with new energy, cultivating new modes of sonic and ethical awareness and action. In this way, the workshop experimented and developed formats mixing the moral, material and musical in real time.

Case 3: The Storytelling Fieldnote exercise

- **First round:** each participant has a short moment to read a pre-printed short fairytale card or recall a short personal story (something that does not require participants to expose themselves too much). During the first round, they sit in pairs facing each other and tell each other their stories.
- **Subsequent rounds and grapevine storytelling:** in the next round, each participant forms a new pair and tells the new person *the story they just listened to*, trying to listen for narrative elements that come out in the story. Each round, they must tell the story they just heard. For two to four (or more) increasingly mentally chaotic, but fun, rounds, each participant must tell, listen to, remember and retell several of the other participants' stories as

the pairs rotate (and none of them twice). In addition, for each round the facilitator gives them instructions to listen for a particular narrative element of the story (actions, sense, emotions, setting and landscape). This is where it becomes (deliberately) overwhelming.

- **Public round:** in the public round, the group sits with the facilitator in a circle, and each participant must tell the story they most recently heard to the group – with an instruction from the facilitator to try to include the narrative elements. Each participant also gets to hear their own story told by another after many retellings.

- **Reflecting on retelling failures:** once everyone has told a story, everyone has heard *their own* story told through several pairings of a grapevine. Participants are encouraged to talk openly about what the difference between their own told story and the last telling of their story. It is important to take time to talk about the 'mistakes' that were made here, because those are the moments of learning. We find connections between these experiences and the art of taking fieldnotes.

The moment of learning by failing we are looking for in this exercise is when Participant A is telling Participant B back to them (with an empathetic audience that will not laugh at them) and they get something wrong or have changed emphasis in some way. Participant B says it out loud. When participants accept failures, and do not punish participants for the failure they were designed to do, recognising discrepancies and failures prompts further reflection: what was the point of the story as it was communicated? Was it a story of the senses and affect? The experience of (not) fitting in? To what degree has the recounter reshaped the story? Continuously during this exercise, things that were implicit or unspoken were made explicit, misunderstood or perhaps even recounted in a way that resonated better with the original storyteller. Realisation, learning and critical reflection was found when we accepted and owned each other's failures within the context of the exercise.

In the Storytelling Fieldnote workshop, participants are told the exercises are designed to be difficult, and that failure is intended. Our aim is to make the students aware of the fallible nature of hearing/telling stories, and to realise this extends taking fieldnotes By having participants rotate pairs, each time telling, listening to and then retelling a different story, participants and facilitator release control in the sense that a lecturer has 'control' over the narrative of a lecture. This is meant to give everyone an equal starting point, to release the stress of making mistakes in public, preventing others from punishing or judging mistakes, and enabling risk-taking, creativity and the all-important humour and acceptance. This is what we mean by participants' co-producing a safe environment' with the teacher or facilitator; they too encourage others' participation and forgo punishing mistakes. All this facilitation leads up to the learning moments, when participants share their mistakes and others use that mistake to build dialogue of critical reflections.