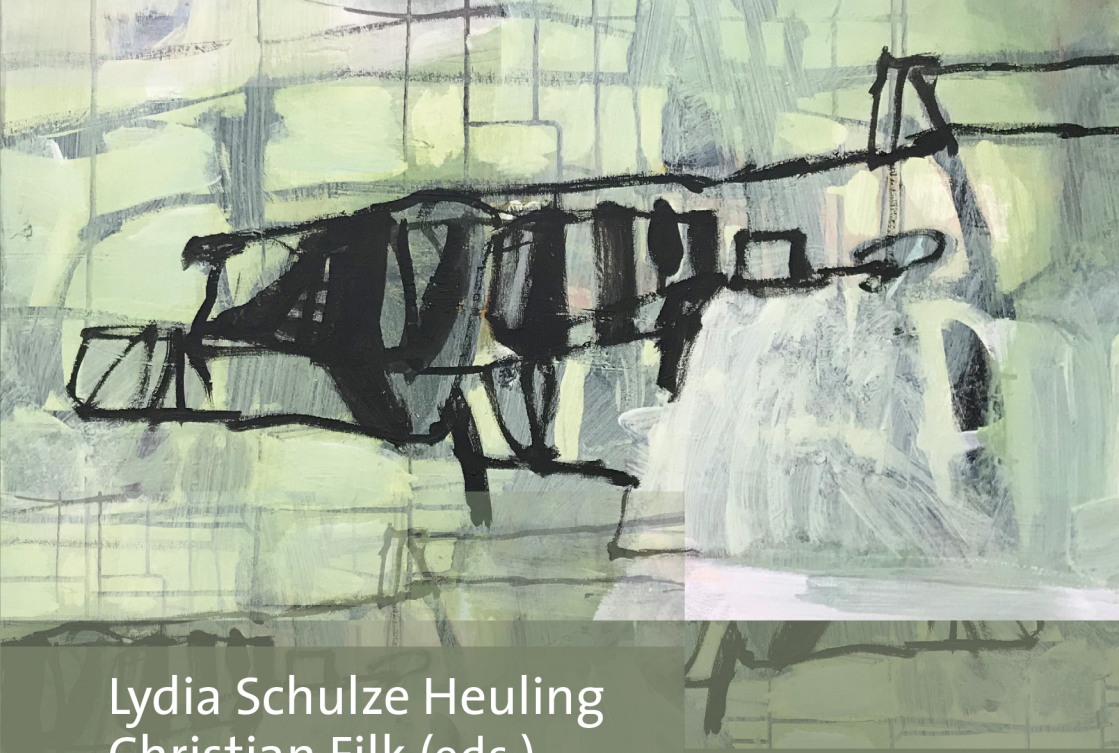

Lydia Schulze Heuling
Christian Filk (eds.)

Algorithmic and Aesthetic Literacy

Emerging Transdisciplinary Explorations for the Digital Age

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Introduction

Lydia Schulze Heuling, Christian Filk

Algorithmic and Aesthetic Literacy is a selection of texts aiming to extend current understandings of algorithmic and aesthetic literacy. The volume presents a wide array of transdisciplinary perspectives on computational and aesthetic practices and thinking. Drawing on computer and educational science, artistic research, designing and crafting, this collection delves deeply into societal and educational challenges in the wake of the digital transformation. The volume brings together diverse approaches and viewpoints to stimulate dialogue and awareness of the manifold ways in which algorithmic processes have become part of our lives. By extending our ability to respond to a data-driven world in creative and non-habitual ways, we will be better equipped to re-imagine and shape our collective future as meaningful and fulfilling.

We as editors are inspired by the idea that future-making education should dare to leave known grounds, face the unpredictable and seek to transgress disciplinary borders. This volume is inspired by the concept of STEAM, the integration of the arts in science, technology, engineering and mathematics. In this light, STEAM education is built on the idea that education creates participation and enables people and communities to respond resourcefully and creatively to ongoing changes. In this sense, the individual contributions advocate and inspire the proliferation of STEAM education across disciplines, foster awareness of its potential regarding somatic and aesthetic practices in education and research and give them a place in learning and creating.

The first two contributions in this volume are elaborate proposals to complement education in computer science and other technical disciplines with approaches from dance improvisation and design. **Susanne Martin** teaches students at the École Polytechnique Fédérale de Lausanne in Switzerland in the fundamentals of contact improvisation. In her article, she

makes a convincing case that this practice helps the development of transversal competencies in manifold ways. Practicing improvisation furthers creativity and teaches a bold approach to experimentation. It engages the students in collaborative inquiry through an empathetic and supportive attitude. Martin shows impressively how somatic practices and creative motion can guide the students to turn their awareness to their own bodies and invite them to exercise in sensory perception – dimensions of experience which are mostly excluded from the academic curriculum. Martin suggests that impulses from her work with the students can contribute to shaping the holistic engineer of the 21st century.

In a related fashion, **Simon Nestler**, **Sven Quadflieg** and **Klaus Neuburg** argue that informatics education may benefit substantially from design competencies. Design thinking employs experiment, intuition, and even improvisation. But more fundamentally, the multi-faceted training and the visionary attitude of designers allows them not to look mechanically for a solution to a given problem. On the contrary, they first study the problem and its context holistically until they arrive at a profound understanding of the situation. From this process, a redefinition of the original task may result. This ability to constructively rethink a problem is one of the core competencies to be developed in design education. The authors also emphasize the importance of manual activities such as drawing or creating physical prototypes in the design process. Manual activities can benefit the cognitive creative process, and with physical prototypes, stakeholders can easily be engaged to get feedback. This is of particular importance as most problems in informatics are "wicked". Wickedness can stem from, e.g., social complexity both in the development process and in the future use of a product. The authors present design competencies as a valuable education goal to tackle wicked problems.

The next contribution by **Ellen Harlizius-Klück** and **Alex McLean** also provides valuable inspiration for education. In this case the authors have a more fundamental, while at the same time broader concern: they aim to foster the notion that computational thinking is not a new, isolated skill that has emerged in the 20th century in connection with the invention of computers. Rather, they present a well-supported case that core aspects of computational thinking – decomposition, pattern recognition, abstraction, and algorithms – have been employed in the craft of weaving for thousands of years. Indeed, ancient Greek lyric poetry and philosophy suggest an aware-

ness of a connection between weaving and other areas of human social and intellectual activity. Harlizius-Klück and McLean are drawing on this connection in both educational and art projects: they have simulated ancient weaving techniques in software and have built their own semi-automated hand loom. By connecting these systems to live coding environments, they make explicit the close connection between traditional ways of describing weaving patterns and modern-day programming. The authors suggest that such an understanding helps better situating computational thinking in the history of knowledge, of practices, and crafts. Actual handweaving and similar practices could provide an opportunity to introduce manual activity and body awareness into, e.g., computer science education.

Hanno Schauer in his contribution (in German) presents a teaching concept to give a first introduction to people without a technical background to fundamental aspects of computational thinking. His concept can be applied equally well in secondary schools, vocational training, academic education or in any context of adult education. He focuses on a common problem which typically occurs in the planning phase of a software project: How can stakeholders with technical knowledge and stakeholders without such knowledge communicate so that they may arrive at a complete and accurate description of the requirements for the software to be developed? Schauer takes a different approach than the one followed in the preceding chapters of this volume, as he aims to educate the non-technical stakeholders and not the developers. To make it as easy as possible, he chooses a graphical language for business process modeling as a teaching tool. Business process modeling can be used to explain fundamental concepts of computational thinking without referring to computer science topics such as databases or programming languages. Schauer observes that even an incomplete, imprecise understanding of the graphical notation can in some cases foster communication within a project.

The next two contributions explicitly focus on school education. According to constructivist pedagogical theories, learning is an active, constructive process that has optimal success if the learner has at least some degree of freedom for self-directed, self-driven studying. **Michael Herczeg**, **Alexander Ohlei**, **Toni Schumacher** und **Thomas Winkler** have developed a digital infrastructure to support such a constructivist learning approach in schools. At the heart of their system there is a digital media library with teaching material. Students and teachers can upload their own works and

share them in class. Additionally, the system facilitates the discovery of related content from the internet. The developers have created a variety of access points, from large touch screens over standard PCs to mobile devices. Special applications guide the students to create videos or even augmented reality experiences with their smartphones. The system has already been deployed to more than 20 schools in Germany is currently being further developed in an ongoing research project.

Willy Noll (in German) proposes that traditional art education in schools be inspired by the maker culture as it can be found in maker spaces and fab labs. Noll argues that for a proper assessment of the role of art education in the context of digital transformation, it is necessary to acknowledge the fact that this transformation affects all aspects of society. He begins his exposition with a systems theory approach on society and on the individual and moves on to explain both learning processes and aesthetic experiences in terms of this theory. From the wide variety of phenomena emerging from the maker movement, Noll focuses on makers who intentionally produce machines or other artifacts which do not actually serve a practical purpose, but somehow come close (e.g., by comically failing). When such artifacts that are at least partially based on modern technologies reveal obvious failings or an ironical message, our conventional expectations towards technology are not met. Such a "disappointment" of expectations constitutes the beginning of an aesthetic experience and may initiate a learning process.

The next contribution presents an exploratory research process as artistic research. **Elke Mark** and **Lindsey French** have developed a micro-phenomenological interview technique to deeply investigate a person's memory of a previous sensorial experience. In the experiments, an olfactory experience was triggered by letting the participant open a jar containing a substance with an intense scent. In the interviews, participants were guided to focus less on the actual content of their memories than on the process of re-accessing it. Mark and French observed how bodily movements and gestures accompanied the process and typically preceded the verbal expression of a recollection. The authors extensively documented the process with video, accelerometers and other devices and used the recordings to create an interactive art installation which invited the visitor to take part in the reenactment of memories. Finally, the authors discuss the micro-phenomenological interview technique "as a technology" which can be used in the

context of algorithmic art as a method of reflecting on algorithms in general.

The following two contributions provide deep insights into the profound influence of algorithmic methods and digital technology on certain segments of contemporary music and art production. **Harry Lehmann** researches the transitions in the history of music that can be truly regarded as epochal caesuras. In this vein, he identifies the development of a comprehensive notation system for the Gregorian chants during the 11th and 12th century as the first historical break. Notation did not only serve as a storage and distribution medium, but also as a new medium of composition which enabled the creation of music for several voices and subsequently led to the development of a wide range of musical instruments, and to the creation of music for classical ensembles and orchestras. In the subsequent course of history, the invention of music printing, the record, the radio, and the digital distribution of music profoundly changed perception and performance practices – and allowed the development of a wide spectrum of differentiated musical styles – but sheet notation as the medium of composition remained largely unchanged. Lehman argues that the most recent development of composing in the medium of digital samples – and having digital players perform previously unplayable compositions – constitutes a second epochal caesura in the history of music.

Christoph Best's contribution focuses on the algorithmic generation of artworks by artificial intelligence systems. To enable a proper understanding and appreciation of such works, Best takes us on a quick tour through the history of computing and the history of artificial intelligence. The author then introduces us in quite some detail to the workings of Artificial Neural Networks – the most successful approach in modern AI. In a second historical walkthrough, Best explicates the origins of algorithmic art and the history of making art with computers. In passing, the author introduces the reader to fundamental concepts of computer programs. (Best's contribution may thus help readers of this volume to refresh their memory of what computers and programming are fundamentally about.) Having thus been through the fundamentals, we have the tools to understand how Generative Neural Networks can produce images which are new and unique, yet at the same time familiar and interpretable by a human observer. Best's contribution is extensively illustrated and includes reproductions of some of the most spectacular artificial artworks of the past several years.

In the final contribution of this volume, **James Bridle** investigates the abyss of child-oriented content on YouTube. The author starts out by asking: Why are there more videos depicting the opening of surprise eggs on YouTube than anybody could watch in their entire lifetime? Another major trope of the genre are countless variations of nursery rhymes. Videos of this kind, with their bright colors, soothing songs, reassuring repetition of a seemingly endless sequence of surprises can easily tie young children to the screens for hours. Not all such videos are harmless, though. Videos featuring children playing with toys sometimes devolve into gross-out scenes like food fights. Animated content of questionable quality, borrowing characters from popular movies or TV shows, depicts these characters involved in acts of violence and degradation. Bridle dissects the factors which have led to the creation of this abundance of questionable content: The financial incentives of the YouTube platform for the creators, the cheap availability of video equipment and the easy creation of animated content, the (semi-) automation of the production and the distribution processes on the platform, and YouTube's recommendation algorithm for related videos. Furthermore, Bridle discusses how it seems to be impossible to maintain platforms like YouTube as open forums for free speech and creative expression, while at the same time prevent destructive tendencies drawing on the exploitation of vulnerable groups, like young children.

Algorithmic and Aesthetic Literacy presents future-making thinking and practices beyond the individualization of disciplines. Inspirations drawn from the individual contributions should enable people and communities to respond resourcefully and creatively to continuing changes in the age of digital transformation. As editors we believe that this book makes a case for how a synergistic interplay of algorithmic and aesthetic literacy may help to prevent a gradual societal slide into a monoculturally data-driven technocratic future.

Dancing with Real Bodies: Dance Improvisation for Engineering, Science, and Architecture Students

Susanne Martin

Figure 1. Class *Dancing with Real Bodies*, Arsenic Lausanne, 27.02.2019
Photo: Ramiro Tau

1 Practicing Improvisation at a Technical University

How can dance improvisation contribute to learning processes within a technical university? This article proposes an answer to this question from the perspective of an artistic researcher and dancer who specializes in improvisation.

In a time in which digital technologies are entering and influencing more and more aspects of life, research about, and using, algorithms thrives at technical universities. Corresponding subjects of study have emerged, such as digital humanities, computational science and engineering, or data science. However, algorithmic thinking remains unable to answer or solve all of the questions that surround the complexities of teaching and learning in higher education (HE). Technical universities, and HE frameworks in general, have identified the need to support students and researchers in social and self-competencies, as well as creative and collaborative abilities within a globalized, and increasingly neoliberal, learning, research, and working culture (KMK 2017, EU 2017, EPFL 2019a, Schmid 2019). European universities currently struggle to facilitate the conflicting demands for economizing their structures, providing market compatible education, preparing the future generation to find more sustainable solutions for global problems, and keeping up with the humanistic idea proclaimed by Wilhelm von Humboldt in the 19th century, in which "the university [is] a place for character formation and self-cultivation (Bildung)" (Pinheiro 2015: 3-4, Höcker 2010). The mental health and well-being of students and staff in HE is becoming more and more problematized (Tormey 2019, Kruisselbrink Flatt 2013); traditional frontal teaching methods continue to be subjected to criticism (Sutherland 2012); and, specifically in engineering education, the desire to extend "bottom-up" and "hands-on" learning situations as well as creative and interdisciplinary projects is expressed regularly both by faculties and students (EPFL 2019b, Forest 2014).

The tools and knowledge of dance improvisation practice can potentially provide answers to the above-mentioned needs, as they bring imaginative, communicative, collaborative, decision-making, problem-finding and problem-solving aspects together with self-reflection and self-care (Albright and Gere 2003, Rose 2017, Schmid 2011). In other words, unlike proposing an artistic intervention to better understand and access algorithmic thinking (Grabowski and Nake 2019) or to criticize the progressive con-

Figure 2. Class *Dancing with Real Bodies*, Arsenic Lausanne, 27.02.2019
Photo: Ramiro Tau

centration on computable information (Bridle 2018), the special potential of dance improvisation practice for STEM (science, technology, engineering, mathematics) students could be of a different nature. The activation of a relational, situated, embodied, and reflective self within a shared artistic practice affords a still-relevant counterpoise to an abstract, instrumental, and solution-oriented algorithmic focus in education.

Dance as part of a curriculum for students who are not studying to become dancers or performers is not unprecedented. When looking at institutions known for groundbreaking technical, design, and architectural innovations in the 20th century, we find dance famously being practiced and performed, for example, at the Bauhaus (German Design School, 1919–1933), which on its centenary in 2019 was celebrated with publications, exhibitions, research projects, and conferences worldwide. At the Bauhaus, dance served, for example, to explore the physical and psychic effects of sound, form, and color. It was also an integral part of the theatre workshop led by Oskar Schlemmer, in which students interacted with and staged

materials, objects, and new aesthetic ideas (Baumhoff and Funkenstein 2016, Droste 1991, Le Masson et al. 2016).

Currently there is rather little contact or overlap between the practice, teaching, and research cultures of dance and science and technology. However, in 2017, the École Polytechnique Fédérale de Lausanne in Switzerland (EPFL) proposed a new course under the initiative of microengineering professor Simon Henein, head of the micromechanical and horological design laboratory (Instant-Lab), who is an experienced dance improviser. Henein, together with performance artist Joëlle Valterio, launched the course entitled *Improgineering – Collective Creation: Improvised Arts and Engineering* within EPFL's Social and Human Sciences program (SHS), in cooperation with the Arsenic Theater, a center for performing arts in Lausanne. It is a year-long weekly course (3 hours per week) offered at the Master's level and, as for all SHS courses, is a credited (6 ECTS credits) subsidiary course open to students from all faculties of EPFL. Here a short summary of the course content:

> This course contrasts improvisation in the performing arts (theatre, music, dance, performance) with engineering design. Collective creative processes will be studied and put into practice through student projects culminating with an improvised public performance. Students will design technical artefacts to enhance their performance and will be evaluated based on the interplay of their artistic and technical creations. (EPFL 2019c)

Twenty-five future engineers, scientists and architects engage practically and theoretically with a range of approaches to improvisation, to then form small work-groups to conceive and conduct improvised performances that include a technical artefact. Offering such an interdisciplinary course is part of an educational agenda EPFL conceptualizes as POLY-perspective.

> By POLY-perspective, we mean that future engineers and scientists should adopt a pluralist perspective on the challenges they face. The "holistic engineer" of the 21st century should be able to comprehend the complexities of today's problems and be capable of interacting with specialists in other fields in order to propose more effective solutions to these challenges. Our POLY-perspective vision is based on four interrelated pillars: interdisciplinarity, global awareness, active citizenship and creativity. (EPFL 2019a)

2 The ASCOPET Research Project

Following enthusiastic reactions from the first cohort of students, in autumn 2018 Henein initiated a joint interdisciplinary research project called *Performing Arts as Pedagogical Tool in Higher Education* (in French: *Les arts de la scène comme outil pédagogique dans l'enseignement tertiaire*, ASCOPET), together with professor of sociocultural psychology Laure Kloetzer from the University of Neuchatel (UNINE), Switzerland. Kloetzer, in her semester-long weekly undergraduate course *Psychology and Migration*, employs theatrical exercises and lets students perform biographical and poetic accounts of experiences of migration. Consequently, the ASCOPET research takes as its starting point the shared interest in offering tools and practices from the performing arts to students that are not training to be artists but, for example, psychologists, pedagogues (at UNINE), engineers, scientists, or architects (at EPFL). Both pedagogical initiatives aim "to organize boundary crossing for the students between their life and learning inside and outside of the university, between theory and practice, and between arts and science, with the intention to engage them fully – mind and body – in higher education" (Kloetzer 2019). Accordingly, the ASCOPET research aims at a better understanding of the role of performing arts practices in higher education learning situations.

Within the ASCOPET project, my colleagues Ramiro Tau (post-doctoral researcher at UNINE with a background in developmental psychology) and Laure Kloetzer focus on a comparative analysis of Henein's and Kloetzer's courses. I, in contrast, follow an artistic research approach, also called practice as research in the arts. Artistic research employs a first-person perspective; my task as an artistic researcher is to expose my ongoing artistic practice as a specific source of knowledge and as embedded in artists' knowledge traditions (Borgdorff 2007, Nelson 2013). In the case of this research project, it means that I conduct my own dance improvisation interventions within the EPFL context and use the documented interventions for analysis and further reflection on the potential of dance improvisation to contribute to learning processes in a technical university.

3 The Artistic Research Approach

During the practical, experimental phase of my research (August 2018 until June 2019), I spent time on the main EPFL university campus in Lausanne, as well as at the Neuchâtel EPFL Antenna hosting part of the Microengineering Institute (IMT). I involved students, professors, and researchers in the practice of dance improvisation in informal and formal presentations; in a series of interactive lecture-performances; and one improvisation class. In each of my encounters, the participants came from different branches of the engineering and science field, so attempting to comprehend and adapt to such a variety of practices and attitudes presented a challenge. Furthermore, the constraints of my own specific knowledge and perspective as an artistic researcher, and the given time-frame of only 18 months, did not allow for my developing advanced knowledge about the engineering fields in general.

Consequently, in the course of my research, I gradually stopped looking for significant communalities or meeting points between my improvisation practice and a "typical" engineering practice or mindset. It also became more and more clear that my original plan to involve students, lecturers, and researchers in experimental improvisation laboratories was too ambitious. I had wanted to offer body-based artistic practice and art-based formats for shared reflection and critique to conceive together how to make best use of the procedures, pedagogies, and transformative learning potentials of dance improvisation. However, I had underestimated the fact that my project was not set inside a community familiar and comfortable with performing arts. By this I mean that EPFL has no facilities for body-based practice and there was no art- or performance-based knowledge of (or even interest in) improvisation I could reliably build upon. Therefore, at EPFL it was not possible straight away to involve the different stakeholders in profound explorations that question the practice of improvisation.

I decided to step back and first find strategies to break down, simplify, and generalize certain aspects of dance improvisation for this science and technology community. Consequently, I worked on ways to offer them very basic experiences, situations, and concepts of dance improvisation. This artistic research process led me to conceptualize my overall strategy in this project as *foregrounding the body* and to conceptualize the core assets of dance improvisation I introduced to the EPFL community as *sense-ability,*

response-ability, and *play*. Through these general categories, which I discuss below, I aim to expose parts of the 'iceberg' of meaningful learning that can be found underneath the concrete activities that make up a dance improvisation practice.

4 Foregrounding the Body

The obvious specificity of dance improvisation compared, for example, to music or theatre improvisation, is that the moving body is usually the main medium and main artistic concern. Improvisation in the performing arts always involves "perceptual, motor and conceptual activity [which] are not separated" (Rose 2017: 121). All improvisation practitioners "inhabit their activity in the development of practice, engaging the whole self" (Rose 2017: 121). However, this is especially true for dance improvisation where bodily movement is the matter. Attending to and studying making art from one's own body in movement – in other words, foregrounding the body – is at the heart of teaching, learning, and performing dance improvisation (Martin 2017).

In the context of higher education, this creates an interesting tension: When describing the compositional aspects of dance improvisation in abstract terms, such as searching collaboratively for non-habitual, divergent responses or patterns, then they connect quite easily with engineering design questions (Wong 2017) and with the rather vaguely and inconsistently defined concepts of basic or transversal skills and competencies that are currently the object of much attention in EU and UNESCO education policies (Höcker 2010, Care et al. 2019). However, dedicating time and resources to the bodily side of becoming a more creative, innovative, holistic researcher, a more "complex self" (Csikszentmihalyi 1990: 41), or a student with transversal competencies is not part of the Western academic tradition (Tau et al. 2020).

I had rightly anticipated that to begin foregrounding the body in this science education context would require introduction and explanation. It also required some confidence-building efforts, since such a practice exposes people in a new way, and can activate social vulnerability (Goffman 1990, Butler 2004). However, I had not anticipated how strongly this particular setting would affect my own body. I found myself devoid of a place

where it would be physically – and especially socially – comfortable to lie on the floor, to be barefoot, to stretch, to sigh and breathe loudly, or to touch different parts of my body with my hands. In this surrounding, what I consider the usual basics of taking care of my body felt clearly non-normative and therefore vulnerable. It was extraordinary to experience and live through this cultural difference and it fuelled my interest for keeping the bodily aspects of improvising at the foreground of all my research activities.

5 Dancing with Real Bodies

In this section, I focus on the dance improvisation class entitled *Dancing with Real Bodies*, which I taught within the framework of the weekly *Improgineering* course on 27 February 2019 (see video)[1]. It was a 2.5-hour-long class given in a dance studio at the ARSENIC theatre, with 17 students present, as well as professor Henein and the performance artist Joëlle Valterio, who both took part. For me, this class was one of the most interesting moments of sharing dance improvisation knowledge at EPFL. The students had at that point already experienced a full semester of weekly improvisation classes and as a result they were ready and well prepared for a more advanced step in this field of practice.

Dancing with Real Bodies introduced the students to contact improvisation, which is a central practice in my own artistic work. Contact improvisation can be defined as being: "based on the communication between two moving bodies that are in physical contact and their combined relationship to the physical laws that govern their motion – gravity, momentum, inertia" (Paxton et al. cited in Sarco-Thomas 2014: 120). Bodies indeed become extremely foregrounded when they are touching each other. The experience of intercorporeally shared creative skills, such as moving through situations of shared weight and counterbalances, or recognizing and reacting to emerging patterns and possible trajectories, becomes palpable when exploring physical co-dependency by leaning into one another, or when lifting or being lifted by another during contact improvisation (Kimmel et al. 2018, Rustad 2019). Furthermore, by using the term "real bodies" in the class title,

1 https://vimeo.com/372570411. The five-minute video (camera: Sébastien Friess; editing: Andrea Keiz) offers some visual impressions of this dance improvisation class. It mainly shows moments from the exercises discussed in this text.

I aimed to playfully invite questions around what might be real for and about our bodies in dance, in science, and in today's digital information and communication culture. Knowing that we wouldn't have time to explicitly address such philosophical issues during the class, this title was rather meant to inspire further reflection for those with an ontological inclination.

As data for this article, I drew on the video documentation of the class, my own written class description and researcher logbook, and on the students' reflexive diaries, which they wrote weekly after each class. Treating this class as a case study allows me to flesh out, in a theoretical sense, what I mean by attending to sense-ability, response-ability, and play as core assets of dance improvisation. Based on this, I analyze data regarding the relationship between these core assets and the concrete activities of the class. Next, I relate this to the students' reflexive diaries and draw conclusions as to how dance improvisation can contribute to learning processes in higher education.

5.1 Sense-Ability

What I conceptualize in this text as attending to our 'sense-ability' is the activation and cultivation of our capacity to focus on, become more conscious of, and differentiate the specificities of sensory information. While my use of this term engages in wordplay through its similarity to the term 'sensibility', I try to emphasize sense perception as different to emotional sensitivity. Highlighting the difference between the sensorial and the emotional, while acknowledging their closeness, helps to articulate how I supported the students to concentrate on the sensory details they were able to perceive, to distinguish them from the emotional resonances they might generate, and to postpone interpretation and judgement. The term sense-ability also hints at the idea that such disciplined sensing is an actual skill that can be gained through improvisation practice.

The importance of studying and giving value to the senses is widely shared amongst improvisation practitioners, because the senses are the primary tools to orient oneself, to recognize and discern the present situation, and thereby to guide the act of composing in the here-and-now of live performance. Improvisation practitioner and theorist Kent De Spain describes it as follows:

> The senses are the snitches of the improvisational underworld. Not only do they provide the details of our interaction with the environment but they give us, literally, the "inside information" on ourselves (proprioception). What you discover if you spend enough time focusing your improvisational awareness on the products and processes of sensing is that there is more depth, more detail, more profound information available through the senses than we are taught what to do with in our workaday lives. (De Spain 2014: 102)

As a teacher and facilitator of dance improvisation and of artistic practices in general, I cherish the senses, just as De Spain does, for the dazzling diversity of experiences they offer once I allow myself to focus my attention on them. Any 'zooming in' on specific sensory information is, as De Spain articulates, far away from our everyday sensory habits. It is exactly this ability to discern and differentiate between sensations, while avoiding any reliance on biases or habitual patterns, that can lead to refreshing and new perspectives on how we relate to others, to materiality, and to ourselves as a resource for discovery. A differentiated awareness and use of the senses, therefore, feeds creative experimentations and enriches our perspectives on human collaborations. In the *Dancing with Real Bodies* class, I focused on the sense of touch, which is interesting because it brings attention to the materiality of the world and ourselves and, even more, because it is a mode of social interaction and communication that is largely excluded by academic education. The following is the class description I gave the students beforehand:

> Through improvisational games and scores, we attend to the three-dimensionality, weight, and perceptual availability of our bodies. By keeping a focus on partner work and touch, we stretch our perceptual tools, broaden our imagination and movement vocabulary. Overall, we are looking for composition arising from sensory exploration, from an active attention to gravity, and to the give-and-take of touch.
> (author's notes)

Early on in the class, I introduced our human senses of hearing, sight, smell, touch, taste, proprioception, interoception, and kinesthesia. I formulated the idea that this class is about moving and composing based on sensory information instead of abstract questions, concepts, or images. I then focused on touch, guiding the students from a rather broad emphasis on