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

Verlag Barbara Budrich  
Opladen • Berlin • Toronto 2021

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This essay was published in:

Schulze Heuling, Lydia and Filk, Christian (eds.) (2021): Algorithmic and Aesthetic Literacy. Emerging Transdisciplinary Explorations for the Digital Age. Opladen: Verlag Barbara Budrich.



This contribution is available for free download in the Open Access section of the publisher's website:  
<https://doi.org/10.3224/84742428.02>

ISBN 978-3-8474-2428-4

DOI 10.3224/84742428.02

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

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*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 19<sup>th</sup> 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 20<sup>th</sup> 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 inter-related 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 Neuchâtel (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 *Impro-gineering* course on 27 February 2019 (see video)<sup>1</sup>. 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 'sensitivity', 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

touching the floor to a tightly framed exercise on touching with one hand a partner's hand and forearm (see "Touching hands" in the video). This partner exercise on different intentions and qualities of touch can be roughly summarized as:

- A, eyes closed, touches B to sense the details of his/her own hand and forearm (duration: 1 min.)
- A, eyes closed, touches B to sense the details of B's hand and forearm (duration: 1 min.)
- B, eyes closed, touches A to sense the details of his/her own hand and forearm (duration: 1 min.)
- B, eyes closed, touches A to sense the details of A's hand and forearm (duration: 1 min.)
- A & B, eyes open or closed, make a "hand dance", looking for aesthetic pleasure (duration: 2 mins.)
- A & B have a verbal exchange about the exercise (duration: 2 mins.)

This is a short version of an exercise I learned from Lisa Nelson.<sup>2</sup> The special quality of such an exercise lies in its specificity. Participants focus on only a small part of the body. They are guided relatively strictly and have clear active versus passive roles. The attention-span and involvement needed is short and known in advance. Hands and lower arms are probably the most socially normalized parts of the body to be touched and to touch with. Therefore, this kind of hand dance can be expected to constitute a relatively low threshold for engaging in the intimacy of a duet in physical touch. From my experience with doing and teaching this exercise, I would claim that these supportively tight boundaries offer a heightened awareness of the abundance of physical details (different skin textures, many bones, ligaments, temperatures, tone, movements) and compositional meanings. Or, in the words of one student from the *Improengineering* course (see Fig. 3):

2 Lisa Nelson is a US American dance artist most known for her practice called Tuning Scores (Nelson 2008). Her practical research into the senses in relation to compositional decision-making process since the 1970s has been influential to many dancers, dance researchers but also, for example, to researchers of embodiment such as philosopher and cognitive scientist Alva Noë (Noë 2007, 2015).



Figure 3. From class diary (student 5)

It was interesting to see how he [the partner] changed his approach between the two stages while he was in the active role. To feel my arm, he went much further into the corners of my hand and used almost all the space available. On my part, I appreciated trying to feel the invisible matter: the phalanges, the wrist bones, the forearm bones; also, I was interested in the different roughness of the surfaces. When I was active, I acted only for my own pleasure, as if Albert was an unconscious body, with a very low tone. (student 1)<sup>3</sup>

As the following student's quote shows, this exploration also allowed the participants to encounter a vast number of social and emotional negotiations:

It is through the exercise with two hands that I have "sensed" the most. Doing it with Victor<sup>4</sup> was almost embarrassing and made me a little un-

3 All students' quotes are translations from French (except that from student 4, which was originally in English).

4 Names of participants appearing in the quotes are changed for anonymity.

comfortable at first. There was something very sensual in this exercise. In fact, he made a remark about it to me. He felt that I was tense at first. (student 2)

Later, the students explored their own spines, as well as the spine of their partners. They traced their partner's vertebrae, first still, then moving, with their fingers. Finally, they offered their hands to remind the moving, travelling, dancing partners that the spine is in connection with the whole body, taking part in all motion (see "Touching spine" in the video). This was done through firmly directed brushes from the spine towards the hands and feet. Or, in the words of one student:

We understand that the other's column is similar to ours. Due to my hands, the other person can feel his or her spine and explore its different parts. It's a discovery to be shared between the two of us. [...] My hands remain in contact with Arnold's spine, animate his body, which becomes almost articulated like a puppet. The hands start from the column to animate the other parts of the body. From the spine to the arm, from the spine to the leg. The bodies come to life, again they respond to each other and influence each other. (student 3)

These two exercises exemplify how I offered the students the possibility of a range of different experiences, which interwove several aspects of learning through and about the body. Obviously, they learned experientially and experimentally about anatomy and physiology. In addition, the practice allowed them to recognize both sameness and difference within the group, to support each other without determining the imagination or actions of the partner, and to be supported without becoming disempowered.

## **5.2 Response-Ability**

With the term 'response-ability', I refer to the ability to respond. If by cultivating sense-ability, improvisation practitioners provide themselves with a vast source of empirical information and sensation-based questions to work with, then cultivating response-ability is about practicing to generate a potentially very large number of possible answers or responses to such questions or situations.<sup>5</sup> These questions or situations can be sensation-

5 In a discussion about one of my sensing/responding exercises in May 2019, the German movement artist Bettina Mainz emphasized the term response-ability as a

based, as described above, but they can also emanate from memories, abstract ideas, or problems and tasks arising from external factors. Similarly, to the relationship between sense-ability and sensibility, the concept of response-ability can be regarded as preceding responsibility, which is defined as the quality or state of being responsible, such as a moral, legal, or mental accountability, or reliability and trustworthiness (Merriam Webster 2019). Dance improvisation practitioners (and improvisers in general) immerse themselves in potentially open-ended chains of artistic responses rather than aiming at determining the most reliable or most trustworthy answer to a question. Conceptualizing improvisation as attending to one's response-ability also relates to literary theorist Edgar Landgraf's definition of improvisation as: "rather than being the expression of unbridled freedom, improvisation must be seen as a mode of engaging existing structures and constraints" (2011: 11). In line with dance improvisation scholars such as Vida Midgelow (2012) and Danielle Goldman (2010), Landgraf argues that without understanding the subject as completely autonomous and equipped with an inherent and presupposed freedom, the improvising self has agency, but "as the result, not as source of a continued, improvised practice" (Landgraf 2011: 18). It is important here not only to conceptually replace freedom with structure and constraints, but also to replace expression with engagement. Expression, in this context, comprises the idea that once you have freedom, you can simply choose or allow yourself to express it. "Engaging existing structures and constraints", in contrast, comprises an effort, a practice, a process of learning – a sort of empowerment during which the structures and constraints may be altered.

This is especially important for the educational context. My pedagogical practice as well as the developing argument of this article build on the idea that improvisation is a practice that facilitates creativity. This means that it is not an activity of and for inventive people, or an expression of an essentially pre-existing exceptional creative talent or even freedom. Instead, it is

descriptor of this work. She took the term from Javanese artist Suprpto Suryodarmo (Amerta Movement). It was through this discussion in the frame of our regular artistic research laboratory meetings (AREAL) that I finally defined my focus within the ASCOPET research as sense-ability, response-ability, and play. For an interesting use of the term response-ability in critical posthumanist and material feminist discourse, which goes beyond human-to-human relationships, see Barad 2012 and Haraway 2008.



something to be practiced. It is a specific learning process that can be supported by teachers. It is an indeterminate work, or an “infinite game” (Carse 2013) of furthering the ability to respond to what comes to one’s attention in more ways than the habitual; in more differentiated, congruent or infelicitous, far-fetched or literal, affirmative or dissenting ways. In this sense, I argue that improvisation, as a form of training for response-ability, also holds the potential to develop a deeper and more critical understanding of one’s responsibilities and possibilities as a learner.

Within the class *Dancing with Real Bodies*, the pedagogical focus on developing individual or shared idiosyncratic responses to an assignment or to the dynamics of an ongoing social situation was implicit from the very first moment, and remained so throughout. What is not visible in the edited video is that the class began for the students with a thirty-minute-long presentation on the Arsenic spring program by the artistic director Patrick de Rham. When I took over after such a long period of sitting and listening, I strongly perceived the need for a major shift of mode and mood in the room and spontaneously decided to facilitate a time of transition, or what contact improviser Nancy Stark Smith defines as “arriving energetically” (Koteen and Stark Smith 2007: 91) before introducing myself and the class content.

I put on an up-beat baroque tune and kept advising the students to “transition” and to “breathe”, and after a while to also make sounds while breathing (see “Transitioning into class” in the video). I moved and travelled between them and through the room, but did not tell them how to move. Rather, I created a certain atmosphere through my actions and the music, which gave them hints about what I might have meant and what was possible. According to the students’ diaries, both the music and myself were perceived as unconventional and funny. In my notes, I describe the function of this moment as: “making wind, changing the atmosphere, activating the body, creating some energy, increasing bodily, spatial, social awareness, increasing blood flow after this veeery loooong sitting and listening state”. Through the vagueness and openness of my instructions, I right away challenged the participants’ response-ability and demanded a high degree of individual interpretation and decision-making in terms of how to respond to my deliberately vague assignment to “transition” into the class.

In contrast, a later partner exercise was an example of provoking response-ability by setting a seemingly tight and clear framework. Partner A,

in the role of “assistant” or supporting “coach”, named body parts for partner B to move from or to treat as a “protagonist” (see “Moving from different body parts” in the video). In this way, A decided for B which part of her/his body to foreground and for how long. Guiding the dancing partner by calling out an unforeseeable range of large or tiny parts of the body to move with or move from is an efficient way to increase partner B’s repertoire of movement choice without too much pressure on B to come up with the choices her/himself. After both partners had the chance to dance and to assist, in a second round, they took turns dancing a solo for the other, using the tools they had discovered in the previous round. As before, the watcher followed the dancer through the space to stay attuned to every detail of what she/he was doing. Regarding the activity of the watcher, such an active, physical following of the dancer precludes any attitude of distanced or detached observation. For the dancer, it counteracts any sense of being judged or of having to please the watcher and instead affords a relationship in which the dancer takes the watcher on a journey. I decided, for this exercise, to give the students a very basic tool for generating movement material; in other words, to strengthen their basic ability to respond to the general objective of the class, which was “to dance”. This was important because most of the students were not familiar with dance at all, and I was aware that they might have found the prospect of having to deal with bodies, with dance, and with touch (as announced in my class description) to be threatening. The reflexive diaries show that this projection was correct.

One of the most embarrassing and interesting Wednesdays so far! It isn’t easy to discover our own body, so when it is about someone else’s body... it is another story! (student 4)

Once the first contact was made we all relaxed and this second dance was all the more enjoyable. I let my body improvise according to the themes that my partner imposed on it. (student 5)

With the help of music, we dance with a specific part of our body, let it express itself and rediscover the full potential of a hand, an arm, a head, legs. (student 3)

It is significant that the students experienced “embarrassment” in combination with interest; they experienced the imposition by their partner (assigning body-parts) as something to make use of productively; they

experienced tensions, but also how those tensions dissolved with time; and their bodily “potential” was rediscovered. For me, this means that the partners succeeded in responding to each other as empathetic and encouraging collaborators. The fast back-and-forth pace of responding to each other established an attitude of mutual support. None of them had to carry the full responsibility to create, to improvise, to dance, on their own. It was a shared responsibility. At the end of this exercise, each student therefore seemed to feel able to perform an open solo dance for a one-person-audience. Even if short and only for one person, this is a very advanced task for any participant, whether or not they have a dance background.

### 5.3 Play

Along with daring to become more aware and positively attentive to the senses, and with continuously broadening the range of responses through communal discovery, it is the idea of play and playfulness that feeds the embodied creative process of improvising. While it is possible to be assigned and required to participate in a game, the experience of playfulness itself can only be facilitated. The players eventually find themselves in ‘play mode’. Creating entrances and then supporting continuity in playing together is one of the major principles in the work of theatre improviser Keith Johnstone, one of the most influential figures in the world of improvisation since the 1970s. The theatre games he invented serve as pedagogical tools and as performance formats currently used by professional and amateur performers all over the world. He helpfully stresses the importance of lightness and benevolence as characteristics of playing:

Well, if you don't play games with good nature, you're working. And the point about a game is that it doesn't matter if you screw up. If you're a carpenter and you screw up the table-leg, you've lost good wood. I'm not against work, I think work is great, I work a lot; but if you want to play, the consequences must not be important. (Johnstone in Colman 2013, unpaginated)

Such light-heartedness and benevolence towards both others and the self paves the way for spirited experimentation, bold exploration, and unpredicted imagination that are less and less subdued by fear or avoidance of failure. This idea of play connects to joy as a resource or an engine. In the



Figure 4. From class diary (student 5)

art of improvisation, it is less the joy of competing and winning a finite game, but the joy of co-creating and continuously building on each other's ideas and actions to invent potentially infinite games together. Joy and laughter as part of the pedagogy of improvisation is neither frivolous nor a break from learning or serious enquiry; it is one of its most powerful principles. Accordingly, the internationally acclaimed improvisation performer and teacher Andrew Morrish, for example, usually ends his workshop descriptions with the sentence: "Participants should come expecting to enjoy themselves" (Morrish 2019). Or, as philosopher and religious scholar James P. Carse would have it:

Infinite play resounds throughout with a kind of laughter. [...] It is laughter *with* others with whom we have discovered that the end we thought we were coming to has unexpectedly opened. We laugh not at what has surprisingly come to be impossible for others, but over what has surprisingly come to be possible with others. (Carse 1986: 25)

Fulfilling the objective of bringing the participants of *Dancing with Real Bodies* into play mode cannot be identified through any specific exercise we engaged in. Play, even more than attending to sense-ability and response-ability, is an attitude promoted and embodied throughout the teaching of improvisation. Determining that the class successfully facilitated play is confirmed by the fact that all of the reflexive diaries reported fun and joy, even though all also pointed to the challenges of dealing with the intimacy of touch. For example:

I really enjoyed this extraordinary workshop. It immersed me in a totally unusual relationship with the bodies of others. This explained a short hesitation at the beginning of the exercise, a slight uneasiness before daring to enter the game and once caught up in the game, the experience was comical, funny and pleasant. (student 6)

This week's workshop was a magical experience. Susanne Martin communicated her good mood to us throughout, and she managed to build our confidence from the beginning of the course. I think we all felt as if we were transformed... (student 7)

Sometimes students interpret this pedagogical situation as me being especially funny or as them taking a break from studying. This does not lessen the fact that they are in fact actively learning to perceive and accept both themselves and each other as complex, diverse, bodily beings. They support each other, listen and build upon each other's ideas and actions. They perceive themselves and each other as a group and as individuals with sometimes similar and sometimes different vulnerabilities and potentials.

## 6 Discussion

Dance improvisation is a practice that puts the lived body into focus (foregrounding the body). It builds upon and furthers practitioners' awareness and differentiated use of the senses (sense-ability). It increases their capacities for recognizing and daring to answer to situations in many more ways than the habitual (response-ability). It introduces practitioners to non-competitive games and activates joy as a resource for learning (play). As such, it is a way of supporting students to increase their courage and appetite for experimentation and for collaborative inquiry. My own experience

with this group of students, the reflections found in their diaries, and the other encounters I had during my practical research at EPFL led me to argue that dance improvisation for students of science, engineering, and architecture indeed broadens their perspective and knowledge, just as intended by the *POLY-perspective* agenda of the EPFL, quoted above. They gained insights into a creative practice that is very different from their usual activities. They learned about a field that concentrates on artistic modes of inquiry and of building knowledge. This confrontation with a different discipline was even movement-inclusive and allowed them to have fun with their peers. As such it leads to a sense of community and social cohesion that is crucial for working in teams.

However, my research suggests that dance improvisation could bring even more to the students: As shown above, dance improvisation, and especially contact improvisation, requires the practitioners to confront the limits of their perceptual and imaginative potentials, as well as their physical and emotional boundaries. This is something conventionally excluded from science and engineering curricula, and neither students nor lecturers usually expect (or are expected to deal with) these matters. It is therefore no wonder that most of the students' diaries report embarrassment and shyness when asked to move in non-conventional ways, to interact physically, and to engage in touch as a mode of enquiry and communication. The most interesting point is that these diaries all report a wish – sometimes with perceived success – to overcome this shyness and to reduce the social distance between one another. I interpret that as recognizing or maybe re-discovering the body and bodily relationships as a desirable basic human resource or enabler. Most diaries also report the weekly effect of overcoming tiredness and leaving the *Improgineering* course with refreshed energy.

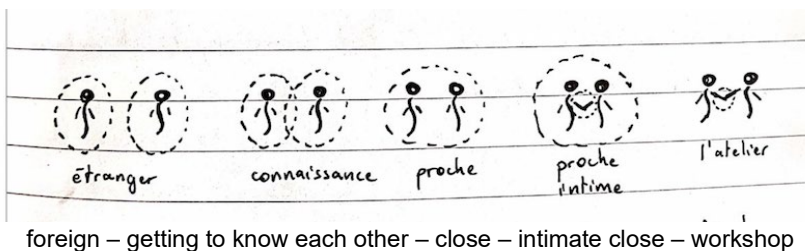


Figure 5. From class diary (student 9)

From my perspective, as a teacher of dance improvisation, there is a clear correlation between the effort of overcoming this shyness, which is related to the traditional academic mind–body divide (Tau et al. 2020), and the experience of being energized. Exposing more sides of oneself without negative consequences, and being part of intelligent and sensuous movement activity and interactions, can surely be energizing, “invigorating” (student 1), or even “a kind of catharsis” (student 8).

Furthermore, in an educational context, the artistic practice of foregrounding the body, attending to sense-ability, response-ability, and play should always incorporate time for individual and communal reflection. In the *Dancing with Real Bodies* class, there were short exchanges between the partners after an exercise and a shared reflection with the whole group at the end (see: “Reflection with partner” and “Reflection with group” in the video). Additionally, the reflexive diaries provided an important individual reflective space after each session, and also allowed students to trace, review, and evaluate their process over time, according to their own values and criteria. This combination of intense shared and individual experiences and verbalizing moments can also enable critical thinking.<sup>6</sup> I argue that dance improvisation offers a space for individual and critical meaning-making precisely because it does not operate with tightly fixed learning objectives or outcomes. Critical thinking can develop because neither facilitator nor participant fix beforehand which problems or questions should emerge in the process and how they should be answered.

I interpret the following quote from a student as a critical reflection on mental and physical norms and habits:

And in fact, doing this exercise allows us to rediscover what surrounds us, we see and feel them in a different, new way. It is in fact extremely liberating to put oneself in this situation. It is like conditioning oneself to no longer be conditioned by our current perception and interpretation of the things around us. (student 8)

One month after the *Dancing with Real Bodies* class, another student critically related the overall *Improengineering* course to the theory of micro-

6 I understand the term “critical thinking” in the tradition of critical and feminist theory as an emancipatory effort of revealing and critiquing the constructedness of, and the power relations within, our reality or status quo.

violences by Simone Lemoine (2017). The student experienced the course as an emancipatory learning experience that can help to “maneuver” around the institutional micro-violences of spatial and speech conventions of the university:

Through the different exercises set up in the course, dance, theatre, attentive listening, music with the voice, improvisation with objects, body, mixing these different techniques, I learned to become aware of the micro-relationships between humans and how as an individual I fit into a whole. This course resonated with my reading [Lemoine S. (2017)] and seems to have made me more sensitive to the different micro-violences to which I am exposed. For example, we can note the micro-violences of “*aménagements*” [facilities, arrangements, or accommodations]: the standard classroom stages the teacher-student [hierarchy] difference and filters the speech, or the “thinking”: which forces people to think by category and pushes them to being assigned to roles from which they could hardly escape, or their actions combined. [...] These perceptions of space are more striking than I would have thought [...] My activities within [the *Improgineering* course] therefore push me to become more aware of my space for maneuvering, to enjoy it, and to work on it in order to align my conduct with those imposed violently or not by an apparatus [orig.: *dispositif*] that I have no other choice but to use. (student 6)

These exemplary quotes show to what extent the critical transfer of concepts and experiences discovered during improvisation informs the participants’ interests and personal questions. The practice triggers both body and mind, but leaves space to be filled in just the way that is pertinent to each individual and for each group of learners.

## 7 Conclusion, Limits, and Outlook

As the scope of this text does not allow a detailed exegesis either of the concrete class contents or of the students’ diaries, I hope that the fragments of practice and reflection chosen here suffice to support the claim that dance improvisation offers a transformative learning experience that can be considered to inform and foster the “holistic engineer of the 21st century”



(EPFL 2019a) within an increasingly algorithmic learning and research environment.

The exemplary class contents and excerpts from students' reflexive diaries serve to illuminate how, in dance improvisation, important basic human issues are exposed and confronted, which invites students to obtain a more profound, complex, and critically contextual understanding of their roles and tasks as learners within higher education. Questions of sociality and singularity, of care and vulnerability, of dealing with difference and taking responsibility, and of power relations and normativity are explored in this bodily creative practice. As such, the practice supports students' ability and interest in collaborative enquiry and bold experimentation, without being a straightforward toolbox with compartments for each skill or competence, and without leading exclusively to predictable and pre-defined outcomes. In other words, dance improvisation does not directly address specific transversal competencies through class content and learning objectives. Rather, it enables students to connect critically more aspects of their lifeworlds (*Lebenswelten*) (Husserl 1996) to their experiences of studying. This obviously limits the possibilities for standardized quantitative evaluation of pedagogical effects. However, the existing and thorough documentation of one complete year-long *Improgineering* course provides data rich enough for several qualitative analyses, the first of which is now being conducted by the ASCOPET team in parallel to this artistic research (Tau et al. 2020). Additionally, a future qualitative longitudinal cohort study would be desirable to gain an understanding of the long-term effects of such practice. Consequent questions regarding the financial and structural support needed to make such a pedagogical offer available to more than only twenty-five out of several thousand students within an institution like EPFL need to be discussed elsewhere. The scope of this article, furthermore, does not allow room to discuss the danger that the benefits of reflective practice – such as increased self-competencies – could be co-opted by the neoliberal economic system to increase student competition, output and efficiency, at the expense of the people.

From the perspective of an improvisation practitioner who delved into the field of science and technology education to understand and articulate what dance improvisation can bring to this context, I have become convinced of its value as a transversal, cross-disciplinary, transformative learning practice that helps to build basic learning and research competencies.

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