Article

Place-Sensing through Haptic Interfaces: Proposing an Alternative to Modern Sustainability Education

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Abstract: In this article we address the issue of how an instrumental approach to sustainability education has dominated the scientific debate of the last 20 years. By conducting interviews and focus group interviews, we have investigated a community arts initiative in the Flemish city of Antwerp in which artists together with local inhabitants engaged in activities around two art installations and address the sustainability of a particular living environment. Our empirical study of this place-based initiative that we call a 'critical zone observatory' has been enriched by the work of Bruno Latour, Richard Sennett and Hans Schildermans. We conclude that a temporal and spatial shift in sustainability education (research) is needed from (1) development (a steady movement towards a planned future) and (2) human stewardship (the capability of people to shape their passive living environments) to (1) what we call co-sperity (a collective hope in the present) and (2) inhabitation (an attached and undetermined engagement with the dynamic of one's habitat). By proposing a collective study pedagogy as an alternative to individual training, we suggest a need for future research on critical zone observatories.

Keywords: sustainability education; community arts; study practices; place-based education; critical zone observatory

1. Introduction

Today, we are globally confronted with sustainability issues that influence our quality of life in an intrusive way, e.g., toxic air pollution affecting the physical health of many citizens, climate change forcing thousands of people to flee their homes in the Global South and an increasing amount of public spaces that are being privatized for commercial ends. In response to the global call for tackling the challenge of sustainable development, international organizations such as UNESCO [1] have started to advocate the deployment of educational programs in which people "acquire the knowledge and skills needed to promote sustainable development". This increased emphasis is also visible in the international field of educational research, e.g., [2–5]. Despite these pressing concerns, many people still fail to become responsive to the urgency of our current predicament and subsequently lack the ability to formulate an appropriate answer to the deteriorating condition of their living environments [6]. In this paper we argue, in line with a growing number of educational scholars [7–9], that one of the main reasons for this deadlock is the fact that sustainability education is more often than not approached in an instrumental way. More precisely, it is mainly conceived of as an instrument for the imparting of predefined sustainability competences, i.e., passing on a particular set of knowledge, skills, and attitudes that are formulated by scientific and educational experts, e.g., [3–5]. In this approach, education is expected to enable people to think and behave in a (predefined) sustainable way or even to formulate answers to future sustainability issues. It can thus be argued that education is conceived of as individual training, i.e., as a vehicle for supplying a stock of competences

into would-be sustainable citizens [10]. Consequently, educational programs are considered successful when key sustainability facts and skills are retained after training activities have been brought to fruition. The assumption is that in order to become a responsive and responsible citizen, a person has to be enlightened through acquiring the right facts and attitudes that enable him or her to shape the world for the better. Such an instrumental approach to sustainability education is embedded in a modern framing of time and space (1) in which the present is understood as a mere instrument for humans to further develop in moving towards an imagined future and (2) in which our daily dwelling places are considered to be the mere passive settings for human agency. More precisely, in modernity humankind is expected to modify its living environment according to its purposes [11]. Because the main purpose of modern humans is to achieve a cosmopolitan way of life with universal richness and enlightenment [12], every person on earth is expected to be able to profit from the benefits of science, technology and the resources that the earth has to offer. However, it becomes increasingly clear that this modern dream is a castle in the air because the earth cannot bear the goal of infinite progress anymore [6].

Concerning the temporal dimension of this dominant educational approach, an increasing number of scholars emphasize how the future is mainly conceived of as calculable and predictable: experts know how people should be prepared in order to realize a sustainable world. Differently put, a sustainable future is defined as a delineated end-goal that can be planned and accordingly needs to be brought into being through anticipatory measures in the present [13]. This comes down to defining a static temporal horizon to which the present is merely instrumental [9]. Educational practices in the present are subsequently disciplined, i.e., that what can and should be learned now is already a priori constrained by a fixed idea of what a sustainable future consists of [10]. Based on Latour's recent analyses [6,12], it can be argued that this understanding of time, present in many educational policies as well as in much ESD research, is strongly influenced by a modern way of thinking. In modernity, time is defined as linear, sequential development, viz. a steady movement from the archaic past towards a bright future that does not take into account the possibility of radical and unforeseen disruptions [13]. The result of this modern timeframe is that education is reduced to a technological endeavor in which the present is merely functional in the direction of a hypothetical future [14]. Put differently, the educational goal is set by experts and people should only focus on this future image [15]. Therefore, it can be argued that a modern understanding of temporality in sustainability education gets us caught up in a planned future [12], i.e., due to a mere focus on the goals set for the future, we become out of sync with the unprecedented possibilities in the present. Furthermore, a crucial feature of this modern timeframe is the fact that time is mainly conceived of as a human-controlled process in which only humans as opposed to all other entities have the capacity to decide about the course of time. Non-humans, e.g., animals, rivers, engineering applications, are consequently considered to be merely passive and instrumental in strengthening this control.

We can also make such an analysis concerning spatiality (viz. the relation between humans and their habitat). More precisely, this relation is understood as one between active human subjects as the sole originators of meaning on the one hand, and places that are the neutral, mute and passive backdrop against which education takes place on the other hand [8]. More precisely, the idea of a sustainability stewardship frames pedagogy as an endeavor in which humans as (future) stewards of their surroundings separate themselves from a setting (as object) and learn about it (as subject). To such an approach, the main focus is on how people can learn to transform unsustainable places, which are thus considered to be the mere object of human intervention [16]. Latour [6] offers a profound analysis of how this modern relation to the spatial dimension of the world became dominant in the seventeenth century. More precisely, he explains how the emergence of the modern sciences led to a separation of reality into Nature on the one hand and the Human Realm on the other hand: 'the bifurcation of reality'. Rather than a whole, Nature—with a capital 'N'— started to be defined as a separate mechanism controlled by iron laws that can be conceived

of as regulating objective facts. By contrast, the Human Realm started to be defined as mere thoughts and feelings that are always subjective and that cannot be considered as real facts. Because of this bifurcation, Humans have started to place themselves at a distance from Nature—a view from nowhere [17]. This resulted in a loss of sensitivity to the fact that there is always a reciprocal, performative and (re)shaping interaction between humans and their surroundings. Hence, we want to suggest that the instrumental [7] and human-centered [8] characteristics of this dominant approach in both sustainability education research [9] and policy, e.g., [1], increase the risk of immunizing people against the unforeseen encounters with the 'here' during educational activities. The reason for this is that the only relationship towards these places is conceived of as 'taking over control'. Cameron [16] and Taylor [8] explain how modern stewardship approaches hence fail to recognize the efficacy of the interactional relations between humans and their 'habitat', which in line with Latour [12] can be defined as a place in which a variety of human and non-human entities try to thrive and where there is no 'a priori' peaceful mode of living together. Hence, to inhabit a place means that we are receptive to our attachment to and dependence on other (human and non-human) entities for our survival. Any attempt to detach ourselves therefore results in a loss of sense of really inhabiting a place, because humans consider themselves able to shape their dwelling places without being reciprocally shaped by these attachments. A modern spatial understanding of sustainability education therefore leads us astray and makes us take a position of detachment vis-a-vis the habitats we aim to control.

In this article, we aim at broadening the possible role of sustainability education in tackling contemporary and future ecological challenges. Epistemologically, this research project has to be situated in line with recent post-human scholarly work in the social sciences in which the relation between the social and the material is being reconceptualized [18–23] and in which both time [7,10,14,24,25] and space/place [8,26–31] are increasingly being investigated from this post-human perspective.

We present our analysis of a community arts project in 'Ten Dam', a multicultural district in the northern part of Antwerp. At this place, a collective of artists, together with local inhabitants, designed and created two art installations. The objective of this research project can be described as the formulation of an alternative spatiotemporal framework for sustainability education (research) by conducting empirical research and enriching our findings with the theoretical work of Bruno Latour, Richard Sennett and Hans Schildermans. Before going into more detail about this alternative approach, we will first describe the rationality behind the case selection as well as the methodology we deployed.

2. Methods: Case Selection, Data Collection and Data Analysis

2.1. Investigating a Critical Zone Observatory

In this study we start from Latour's lecture at Cornell University [32], where he promotes the deployment and investigation of critical zone observatories: initiatives where a small group of citizens collectively investigate a 'critical zone'. The notion 'zone' refers to the locality of the place that is studied, i.e., a habitat in which they have an interest. The notion 'critical' points towards two things [33]: first, it denotes the possibility that a particular place, such as an abandoned airport or a water basin in the rainforest, might start to matter to people; second, it points towards the fact that the existing dynamic of a place could change quickly and drastically, e.g., the bee population of a city park that is on the brink of extinction due to particular insecticides used by the local government, influencing the flora and subsequently the air purification capacity of the park. In the same lecture, Latour [32] defines the efficacy of scientific tools in such critical zone laboratories (e.g., air quality monitors) as 'haptic' because they provide people with the means to become sensitive to the influence that they have on their living environments (e.g., the toxic pollution of a factory in an urban district) and vice versa, the response of these biospheres (e.g., the deteriorating quality of groundwater that threatens animals, plants and people in different ways). By gathering data with the help of such haptic tools, people can get in touch (again) with the earth's response on their way of living, hence, the condition of

their habitat might start to matter to them. When Latour defines the efficacy of scientific instruments in critical zone observatories as haptic, he thus does this in line with the meaning of the Greek word 'haptikos', i.e., to get in touch with something. Hence, haptic tools can enable people to engage with and take part in the shaping process that takes places between their selves and their habitat.

Based on Latour's suggestion we selected a community arts initiative in which the sustainable development of a particular place is at stake and that can be termed a citizens' critical zone observatory. By focusing on this initiative, we furthermore aim at broadening the idea of these observatories from mere scientific installations to community arts projects. The reason for this is twofold: (1) critical zone observatories are still mainly understood as mere scientific endeavors [34] and (2) community arts initiatives have the potential to perform sustainability issues in such a way that a wide public can start to relate to them [35].

2.2. A Community Arts Project in an Inhospitable Place

The case study in this inquiry involves a suburban wasteland in the Belgian city of Antwerp, which was purposefully selected after an open call was made to citizen initiatives that are committed to the sustainable development of a concrete living environment in Flanders. After several explorative talks had been organized with a diverse set of people involved in organizing activities on the site, two projects from one and the same citizen collective were selected. The selected place concerns a former slaughterhouse complex (de Slachthuissite) in the Flemish port city of Antwerp, which has been out of commercial use for more than two decades. Before the decay of the infrastructure and the mass dumping of all kinds of debris, it was a well-known commercial site that provided many people with a stable income. However, until recently, many neighbors from the surrounding district 'Ten Dam' recalled the place as one that did not have any significant meaning for them. At best it was a shortcut to a nearby shop. Following many years of decay, the city council decided, in accordance with the policy of other local governments in Flemish post-industrial regions, to plan a new future for the place in which high quality and state-of-the-art apartments are to substitute for the current infrastructure. However, some local residents hesitate to support these gentrification plans because they fear a rise in rents in the surrounding areas, chasing away many of the current residents. Despite the crumbling of the current infrastructure and the plans of the Antwerp city council, an ethnically diverse group of young artists—who call themselves 'Rooftoptiger'—started to occupy some of the buildings as well as the vast open space on the site. One of the artists remembers the place on arrival as "inhospitable and even a little apocalyptic". Nevertheless, they decided to create what they call a mobile laboratory (Figure 1) in which inhabitants of the neighborhood were asked to draw their invisible city (Figure 2), viz., the parts of their living environment that cannot be seen directly but that can be felt, heard, smelled, remembered and desired.

Figure 1. Mobile laboratory © Rooftoptiger.

Figure 2. Mapping local inhabitants' invisible cities © Rooftoptiger.

This laboratory enabled both artists and inhabitants to gain a sensorial knowledge about the place and discussing this knowledge stimulated a first step in collectively designing a new way of living together for the Slaughterhouse area. By performing the memories and desires of the inhabitants in a creative way, people for the first time started to get interested in each other as well as in the past, current and future condition of their neighborhood. Following this stage of the project, the artists decided, after consulting the local inhabitants and community workers, to collectively erect a tower made out of bamboo in front of one of the abandoned buildings (Figure 3).

Figure 3. Tower of Babel © Sofie Gheysens.

The purpose of this artistic intervention was not predefined by the artists, opening up the possibility of giving shape to the project collectively and in an undetermined way. The project was eventually named after a well-known biblical story: 'the Tower of Babel'. This choice did not subscribe to the idea that a collective project only can be successful if people involved in it share the same language. On the contrary, it quickly became clear that people with different linguistic, as well as social, ethnic, economic, cultural and religious backgrounds are actually able to work together and to revitalize a place that used to have no significant meaning for them. For a period of four months, this diverse group of people came together to design and build a tower. During this process a variety of activities took place, ranging from constructing the basic structure of the tower, to weaving textiles for decorating its interior parts (Figure 4). Furthermore, moments of discussion were organized during which the local inhabitants were invited to collectively reflect on the building process and the ways of living together that emerged on this piece of land due to their common endeavors. When the tower was finally built, it started to become a place

where people from all over the city of Antwerp came to meet each other and in which a collective sensitivity for the place was fostered. People from all over the neighborhood and other parts of the city, for instance, wrote poems in their own language and recited these artworks to each other in the tower, hence creating an attention to the rich variety of languages—and cultures—in this place.

Figure 4. Fabricating tapestries to decorate the tower interior © Siege Dehing.

2.3. Data Collection and Analysis

In order to be able to study this initiative thoroughly, we used a composite of methods for data collection. More precisely, semi-structured interviews were organized, as well as semi-structured focus group interviews. Respondents were purposefully selected if they were involved in the activities of the two projects. They include both organizers and participants who live near the former slaughterhouse and who were involved in the project for a long period of time. With the aim of the research project in mind, i.e., the formulation of an empirically based alternative to the instrumental approach to sustainability education, we deployed a triangulation of methods to gain a clear view of how the respondents experienced their engagement with this place. It is important to mention that, in our data collection and analysis, we turned our attention from away both the agency of people (as can be found in much contemporary sustainability education research) and the agency of things. Instead, the focus is on the relationality between people and things. Hence, we deploy the term 'interface' in order to bring relationality to the core of our analysis. Based on the work of Fedorova [36], we define an interface as a boundary in which a particular constellation of people and materials constitutes a touching of something beyond the self, i.e., a mediating time-space in which a relational sensitivity and potentiality is fostered. Consequently, 'to interface' means to enter a dynamic framework of relations.

Both the semi-structured interviews and the semi-structured focus group interviews were structured around two themes. The first theme revolves around temporality, gauges the respondents' perspectives on the past and the future of this particular place and aims at grasping how these perspectives were (re)shaped through their engagement in the mobile laboratory and the tower of Babel. The second theme revolves around spatiality and gauges how the respondents and their socio-material situatedness on this site (re)shaped their experience of living (together) in the neighborhood of Ten Dam. All data were collected through four individual face-to-face interviews and three focus group interviews, each time with a different group of respondents. The collected data were analyzed with the help of the qualitative data analysis software Nvivo in which all fragments on temporality and spatiality were first openly coded, after which we upscaled and sharpened these codes into themes with the help of the concepts offered by the work of Latour [6,12,32], Sennett [37] and Schildermans [38]. In this way, and as described in Major & Savin-Baden [39], theory emerged through the interaction between empirical data and pre-existing concepts.

3. Results

3.1. From Development to Co-Sperity: Formulating an Alternative to the Modern Temporal Framework

During our interviews, we noticed how for many local neighbors prior to their engagement in the community arts initiative, the future of the slaughterhouse complex was already perceived as determined. More concretely, the city council already had concrete development plans for the site and regularly communicated these plans via information sessions and community workers. These plans consisted of the mass construction and sale of high quality apartments without much public space for organizing social, cultural or ecological activities. It was these prospects that installed a fear among people who rented a house or apartment in the surrounding neighborhood. In this regard, one of the community workers mentioned the following:

> I also regularly explained these big plans to the citizens. Some people have lived here for a long time and are now convinced that they will be chased away due to rising rents. It is true that the politicians don't want to build more social housing in this district, so it all will be houses or flats that you need to buy.

However, the same community worker noticed how the intertwinement of local neighbors, artists and art installations on the former slaughterhouse site has slowly re-opened the perceived closed future of this place. More concretely, new futures started to emerge through performing and discussing the local residents' invisible cities. Furthermore, by gathering a dynamic group of people around the common project of building a tower and discussing the social, cultural and ecological processes that emerged during related activities (such as writing and reading poems together on the different floors of the tower), new thoughts about living together (with the place and the surrounding residents) started to become tangible. However, one of the participating artists emphasizes how this particular opening of new futures did not happen without any hesitation:

> I really think that these ideas about the future came about 'au fur et à mesure' (little by little) through the project we did here. The Tower of Babel project has shown that this place has a lot of possibilities, that it can mean a lot to people and that people come to it... that it can be something... in another way... in what way... that we still have to investigate... So . . . hm... I can't get it right yet, it's kind of like experimenting and exploring right now . . . because of the many contacts that there have been taken place, maybe there is a hope for an opening of the future of this site, a better or sustainable one that is more social and cultural.

What becomes clear is that the activities around the art installations have installed an interface in which the relation between the local inhabitants and their living environment is being mediated. It is this mediation that fosters an exploration of new possibilities for the future within a still undecided present. This stands in sharp contrast with the temporal efficacy that prevailed in the information sessions organized by the project developers and the local government in which the notion of development was central: experts decide what people should do in the present in order to go forwards towards a more sustainable future, viz. a future that is expected to become more probable by informing not-yet sustainable citizens in the right way. Earlier in this paper, we argued with Facer [13] that this impedes an openness to real novelty in the present and hinders a temporal dynamic like that which has started to occur at the slaughterhouse site. When asking the local inhabitants to explain in three words what their engagement in the mobile laboratory and the tower had meant for their relationship with the slaughterhouse complex, they emphasized, in accordance with the artist above, that a collective feeling of 'hope' has been created. We argue that it is this feeling that distinguishes the community arts project from a modern, individual training program. Whereas following the most probable way to a hypothetical sustainable future is just a calculated anticipation, hope in the strong sense of the word stands for creating possibility against such probability [40]. More precisely, it points towards the haptic capacity of particular assemblages of people and materials in which those involved

are touched by something to the extent that what is given by others (cf. experts) can be questioned and eventually transcended [41]. A good illustration of this is the collective problematization of the local government's plan to gentrify the area by building many new luxurious apartments. During the course of the project the participants started to question the project developers' pedantic stance in which they claim to be the experts in designing livable places. More precisely, the mediation of the mobile laboratory and the tower enabled a haptic interface in which the local inhabitants became attentive to the current condition of this place, which has become a 'public meeting and cultural space' for everyone living in the neighborhood. In other words: people became sensitive to the differences that occurred at the site—in view of the new hybrid mix of different people, languages and infrastructures. In this regard, a participating neighbor let us record the following:

> *By doing things with people in a concrete way, the possibilities for the future are already being actively explored. So actually, the possible is already becoming tangible. Because of that tangibility, I think that the local people gain more power. One will no longer be able to take this place away from us, just like that... so by doing activities on the Slachthuissite, one is developing other processes than the ones that used to be in place there.*

Hence, we suggest that the slaughterhouse complex has become critical because (1) it starts to matter to many local inhabitants and (2) the appearance of and interaction between human entities, e.g., artists, community workers, local inhabitants, and non-human entities, e.g., building materials, music installations, started to dramatically change the unsustainable condition of the place. A community worker that we interviewed in the course of our case study mentioned how the current situation contrasts with that of the last decade: many local inhabitants, like himself, became 'out of touch' with their habitat, i.e., they had become unresponsive and unreceptive to what happened in this place, which itself resulted in a lack of attention to the deteriorating condition of the complex:

> *The site was in the past a kind of an empty space to me. Actually, an unfamiliar place to which I didn't have to go. Now, I have started to look more at this place, and also differently . . . the place did actually come a little closer to the center of the neighbourhood. I think it was for many people a remote place and because people went there to help building, it has now come closer to them. There also came to exist, I have heard, a feeling of care for this place. So it's no longer unknown, it has made people become attentive to it, the place has started to exist. Whereas it used to be unknown, it exists now.*

We suggest that this slow and experimental (i.e., with much hesitation) opening up of a new, more socially, culturally and ecologically sustainable future is pivotal in making this place critical again. To better understand this temporality and in what way it differs from a modern timeframe, we turn to Sennett's [37] contrast between two teaching methods useful for learning to play the cello. On the one hand, there is the well-known 'Suzuki method' in which, based on expert instruction, parents plaster little bands of tape across the fingerboard of the cello of their child. The pupil then exactly knows where to put his or her fingers. This leaves no space for exploration because the child's fingers are disciplined by a predefined future touch. Sennett contrasts this method with a more experimental method in which the placement of the pupil's fingers is more ambiguous, viz. the pupil herself searches where the fingers can go on the black, blank fingerboard. The acquired skill thus results from 'induction': an increasingly larger number of possible ways of relating to the instrument becomes possible [37].

Such a process of induction, as opposed to deduction—a process in which an expert-formulated hypothesis about the future is forced upon the present—was enabled by performing and discussing the locals' sensorial knowledge of the place as well as by collectively designing and building the tower, after which participating neighbors and artists started to reflect on new ways of living together that emerged around the tower. In line with Latour [32] and Sennett [37], we therefore argue that the dynamic interweavement of different entities on this site constituted a haptic interface in which new relational potentialities between the local residents and their living environment started to flourish. Moreover,

this condition incited the project's participants to start to hesitate, regarding the probable future of their habitat. It is thus important to note that this haptic interface should be opposed to sustainability training programs in which, for instance, online courses are deployed to impart predefined sustainability knowledge and attitudes into individuals with the aim of shaping a predefined future world, e.g., [42]. Over and against this, the haptic interface that has been constituted in the course of this community project makes it possible to transcend such instrumentalization. More precisely, a precarious searching in the now and a hesitant exploring of the future has taken place.

Based on our case study and in line with an increasing number of scholars in the postmodern tradition, we consequently propose to do away with the concept of 'development' because it tends to generate a linear idea about time in which humans—and mainly experts—are the main protagonists. Moreover, the conversations we held with the project's participants provide us with conceptual clues for introducing a new way of thinking about temporality in sustainability education (research). When we asked the participating artists, local inhabitants and community workers to describe what this project meant for their district, they all strongly pointed towards a collective feeling of hope for a different future than the gentrified one. More precisely, and in line with Vlieghe & Zamojski [43], they indicated a hope that is based in a present in which things might potentially take a turn against all probability. Hence, in order to reconfigure the current modern approach to time, we suggest, inspired by our observations, and building further on Latour's proposal [12], the introduction of the French term 'prosperité' in contemporary ecological discourse. Latour proposes this concept in the sense of 'to flourish'. He contrasts it with the modern idea of development in which the focus is on how humans can develop towards a better future, whereas he considers plants, animals and humans equally to be able to flourish. We take his suggestion in a different way by going back to the original meaning of the word prosperité, which is derived from the Latin word 'spes', meaning hope. Taking a step further, we tentatively suggest the term 'co-sperity' to define the temporal efficacy of haptic interfacing more accurately in critical zone observatories. More concretely, the notion points towards the collective (co-)exploration of an increasingly larger number of possible ways of relating to the future of one's habitat, hence, fostering a collective hope (spes) in the present. Next to reconfiguring the temporal dimension of sustainability education, it also becomes clear that the community arts project also fosters a rethinking of the modern approach to space.

3.2. From Human Stewardship to Inhabitation: Formulating an Alternative to the Modern Spatial Framework

In what follows we will detail how a particular relationship came to exist between the project's participants and the slaughterhouse site. As explained above, parallel to the community arts project, the inhabitants of Ten Dam (the district surrounding the slaughterhouse complex) were regularly informed about the future gentrification plans of the city council. Some of the inhabitants who attended these information sessions also engaged later in the activities around the two art installations. One of the local inhabitants who participated in both the information sessions and the community arts project, noticed how several of his neighbors only started to become sensitive to the lack of public space for organizing social and cultural activities in the city councils' plans when engaging in the activities initiated by the artists' collective. More precisely, their involvement in the latter resulted in being affected by the indeterminacy of the complex, i.e., other, more public destinations started to become tangible through their bodily presence on the site. In this regard, one of the project's participants mentioned the following:

> *What is especially important is uhm... an undetermined space, what this place actually is. The structure of the tower is actually an open space as well, it is not a closed tower . . . it is something completely different from a residential tower with all its blocks, flats, everyone between four walls. The Tower of Babel is and remains simply a big metaphor for the importance of open spaces that can be filled in over and over again, and in which*

one can meet one other ... the place is unfinished, and I mean this in a positive way: it has not yet been fully designed, it has not yet been determined ... and that is quite exceptional in a city that is so densely populated ... this space is still very much vacant, open and therefore everything is still possible, there is a feeling of potentiality.

It is interesting that all participants considered it crucial to keep at bay any attempt to undertake political activities, like other citizens and politicians were doing. A local action committee, for instance, organized participatory meetings in which the local inhabitants were asked to express how they envisioned the future of the slaughterhouse complex. These ideas were then represented through a variety of protest activities. To our surprise, both the community workers and the local inhabitants we had interviewed emphasized how in these gatherings a rapid flight into preferred futures was being constituted. As a result, several of the local inhabitants who had engaged in the participatory meetings felt detached towards the actual condition of their habitat. One of the inhabitants of Ten Dam for instance recalled how:

The unfortunate thing is that sometimes, or actually many times, only very empowered people go to these events or gain something from it. Not everyone is equally able or willing to formulate his or her ideas about the future in these kind of activities. There are some of the things that are missed in such moments of political participation.

We suggest that this hasty leap into the future and the paired feelings of detachment should be contrasted with the haptic dynamic that was constituted between the participants of the community arts project and the former slaughterhouse. More precisely, a sensitivity to what the place itself was, is and could become, was being fostered by suspending any attempt to impose a new, determined future on the place. More exactly, the new condition of this zone (as a public meeting area) had become tangible while playing music together, reading poems collectively and cooking a variety of meals for the inhabitants of the neighborhood. In other words, the new condition started to matter and had begun to affect the people who were taking part in these activities. Moreover, by collectively discussing this condition (during several sessions in the tower) and by performing how this area was sensed in the past and in the present (during the gathering in the mobile laboratory), it became possible to think beyond (1) the perceived 'unavoidable' gentrified future. Doing this, any strong adherence to (2) a priori imagined futures was kept at bay. Because the interface that was constituted nurtured a haptic relation between the participants and their daily environment, these people started to develop the ability to sense the condition of their habitat, and at the same time started to make sense of this condition collectively. One of the local residents, for instance, underlines how:

The place is actually literally drafted on some kind of mental map of the people in the neighborhood, so they now know this place. It gained a specific value which makes it more difficult for the local government to do anything with this place. The stronger there is an attention to certain conditions of a place, such as the open space of the slaughterhouse site, the more difficult it will become to just do anything with it. So you lift the banality of it. Through these activities, you ensure that people become more engaged with the place.

Again, if we understand the gathering together of the art installations, people and activities as an act of interfacing, viz. a mediated engagement with a place in which relational potentiality is being fostered, it is important to fully grasp the kind of haptic process that has taken place between the project's participants and this concrete zone. In this regard, our observations show that both the place and the project's participants were being shaped simultaneously. In order to better understand the kind of touch that enabled this mutual shaping process, we will turn again to Richard Sennett's [37] analysis of learning how to play the cello. In this regard, Sennett makes a useful contrast between what he calls a faulty touch on the one hand and the application of a minimum force on the other hand. He makes this distinction with regard to the mastering of the vibrato movement in the learning process of playing the cello. The vibrato is a rocking tone that is always a delicate, temporary coming together of the pressure applied by the artist and the

resistance of the cello's strings. A faulty touch occurs when one puts too much pressure on the strings of the cello, disrupting the vibrations and ending the vibrato. The cause is the fact that one tries to discipline the resistance that originates from the strings. In contrast, constituting a minimum force implies 'holding back and reflecting rather than forcing ourselves forward' [37] (p. 8). By lessening the application of power in dealing with the resistance of the strings, one might start to engage with the instrument and test and explore what the resistance might do with the sound. Sennett emphasizes how a curiosity for novelty can come into play by such an engagement and how one might enter a state of what can be called a vibrational touch with the instrument. By vibrational, we point towards the fact that, in a moment of living, the player and the cello are in the process of co-constituting a still unpredictable future sound. This moment can be characterized by a reciprocal and delicate touching that always can be disrupted due to the imposition of too much pressure.

Likewise, in this citizens' critical zone observatory, the potential of the site has also started to vibrate with the inhabitants because of the initiated small and open-ended interventions. More specifically, what we have observed is that these artistic interventions (as a collective of people, concrete materials and activities) constituted a haptic interface in which a minimum force on the dynamic of the site was being applied. This has been a delicate process in which the imposing of a priori imagined futures was suspended. Hence, as one of the participants illustrates, the resistance coming from the current, public characteristics of the slaughterhouse complex started to affect those involved, creating a vibrational contact:

> *Through the activities on the Slaughterhouse site, one again questions the standards of what is most likely to happen in the future... by making something concrete you are actually going to be confronted with something that is not right, that something that often exists unconsciously can be questioned.*

In line with Latour we therefore suggest that engaging in this art installations enabled these people to sense and make sense of their living environment again. In other words, it provides them with the means to really inhabit a place once more. This strongly contrasts with a modern spatial framework in which citizens are expected to become the stewards of their living environment and shape these perceived passive and staged settings of active human intervention. In this modern framework, the assumption prevails that people are able to take a sterile distance from their habitat and shape it unilaterally.

4. Discussion: Going Beyond Individual Training Programs

Based on our empirical research, we have formulated conceptual starting points for both a temporal and a spatial shift in sustainability education (research). In this discussion we want to come back to the objective of this study and to sum up our contribution to the ongoing work of recent post-human studies in sustainability education research [8,9,15,16,44,45] that aims to formulate an alternative to the instrumental pedagogical approach in much of the current research and practice. As discussed in the introduction, education nowadays is mainly understood as an individual training process in which experts aim at imparting knowledge and skills to learners who are subsequently expected to become the future sustainability stewards of their daily environment. We suggest that this contrasts with the processes that we have identified in the investigated critical zone observatory in which the local inhabitants were not approached as not yet sustainable citizens who had to be taught the 'right' way of acting upon their living environment. In accordance with our observations, we argue that the particular spatiotemporal processes that have been constituted by the haptic interfacing on this site went along with an educational dynamic that distinguishes itself from modern, individual training programs. More precisely, the emerging educational dynamic can be in line with Schildermans' [38] work, defined as collective studying. Schildermans describes this as a three-staged process: the first stage consists of the bringing together of people and study materials, e.g., maps, photographs,

documentaries, reports. In our case study this concerns the bringing together of local inhabitants, artists, drawings of invisible cities and poems around the two art structures.

The second step is the problematization of a shared issue with the help of particular artifices, viz. study materials like maps or images that transform the mere articulation of opinions into collective study. Such a transformation is grounded in the capacity of artefacts to contest what we think and say, hence constituting fruitful moments of hesitation. This second step defines very well how, in the community arts project, political and expert visions about the future of the former slaughterhouse were being questioned: the drawings of the local inhabitants' invisible cities made it possible, for instance, that the here-and-now was not exceeded for a hasty leap into an expert-calculated future. We suggested that this problematization resulted from the application of a minimum force that makes it possible to resist the local government's gentrification plans: fostering a collective process of fruitful hesitation. The third and final step consists of the emergence of an attention to new possibilities in the future. In our analysis, we defined this gained sensitivity as a process of 'induction' and explained how this became apparent during the experimental performing of more social and cultural destinations for the former slaughterhouse. We added that this resulted from a vibrational relation between the project's participants and the slaughterhouse complex in which these people started to become response-able [30], viz. the participants' thoughts were made creative in new ways of living together other than those that were being proposed as unavoidable or obvious by experts and political actors. More precisely, engaging in this project allowed for a leeway in which a local, and experimental answer could be formulated to the sustainability challenges in Ten Dam. In line with the observations of this local resident and the theory of Schildermans [38], we conclude that it is essential for sustainability education to not exceed the here-and-now. Moreover, an educational dynamic of collective studying harbors a haptic relationality in which a sense of spatial and temporal situatedness is being stimulated and in which unexpected movements towards the future are cultivated. In the wake of the ecological catastrophe and the discussed limitations of the instrumental approach to sustainability education, we consequently suggest moving beyond the modern educational time-space that hinders us in becoming responsive to unforeseen possibilities in the present. In this article we addressed the possibility of designing an alternative approach to sustainability education by affirming the value of interventions that establish a haptic dynamic between people and their environment. We suggest that when people become part of a haptic interface, a transformation of an unsustainable place into a critical zone is fostered. Starting from Latour's suggestion and studying a concrete community arts project, we have tried to develop an appropriate language to describe the undertheorized haptic dimension of sustainability practices.

In line with recent studies in the field of sustainability education [7–9,16,44] we propose to investigate, in future research, places that are, just like the slaughterhouse complex, fertile grounds for designing and performing new ways of inhabiting our common world. Moreover, we believe that investigating these kinds of sustainability projects can foster the ongoing scientific work of developing alternative educational frameworks. Therefore, in view of this, we suggest further investigation into the relationship between collective studying and processes of haptic interfacing in critical zones. With regard to future research it would also be fruitful to structurally observe the interaction between people and concrete materials besides conducting interviews and focus group interviews. The initiative that we investigated was already in its last phase, which offered the possibility of talking about experiences, but made it at the same time impossible to conduct extensive observations. Observing the educational dynamic of concrete sustainability activities could offer the necessary data to further develop this alternative approach.

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