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Article

How Art Places Climate Change at the Heart of Technological Innovation

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Abstract: How can we place climate change issues at the heart of technological innovation? From our point of view, artistic practice is a powerful tool to infuse sustainability dimensions into technological developments. By using a sensitive approach based on a dialogue with his/her inner self, the artist questions the nature and meaning of technological developments and therefore appeals to users' deep motivations. We explore first how the artist inner self engagement in the creation process relates to climate change mitigation. Then, through a qualitative survey-type experimentation derived from Jeanne Bloch's art-tech installation, we expose how the confrontation with a panel of users helps to understand the characteristics of the dialogue an artist engages in with an "immersed" audience, particularly on the issue of climate change.

Keywords: art-thinking; choreography; climate change; dance; food culture; innovation; light design; light pollution; phenomenology; sustainability; visual art

1. Introduction

Knowledge specialization has resulted in a divide between so-called "scientific" and "artistic" research. Often, there is a top-down authority relationship between the two research types, with hard sciences and engineering knowledge holding the upper hand [1] (p. 9). Innovation-based economy relies mainly on technological knowledge [2,3], sometimes with the help of human sciences to uphold the process in order to validate technological developments in design and systems compliance. Occasionally, the artistic approach can also be associated with technological developments, mainly as a communication tool [4].

Our working hypothesis considers the artist as a "transmitter of signifiers" beyond the designer and the technologist as s/he refers to the collective unconscious [5] through the creation of imaginary-based sensations and emotions. The artist talks about our "*not yet unfolded world*" as described by the philosopher Ernst Bloch in Hans Dieleman's paper [6] while incorporating his or her own subjectivity and vision [7]. As a result, says Dieleman, the artist helps us to imagine our future by connecting to our own subjectivity and imagination.

Neuroaesthetics, of which the "main objective is to characterize the neurobiological foundations and evolutionary history of the cognitive and affective processes involved in aesthetic experiences and artistic and other creative activities" [8] and other cognitive science fields have identified connections between the artist's gesture and embodied aesthetic experience whether we talk of visual art [9] or dance and performance [10]. All address the interaction with the art piece as a sensory experience. For the purpose of this article, we understand the "artist's gesture" as described by Hans Dieleman: A way for the artist to engage his/her inner self in the creation process, which is also considered as a condition in creating the required change of paradigm toward sustainable innovation and climate change mitigation (regardless of whether the artist's intention relates, or not, to sustainability itself).

We examine traces of the artist's gesture on developed technologies (Box 1) and with the audience of the studied art-tech installation—an interactive still life made of fruits and vegetables, which light up when touched by people (Figure 1). We question whether the artistic gesture would impact technological development of the art piece and how it would relate to sustainable innovation and climate change mitigation. We ask if artistic practice is a powerful tool to infuse ethical and sustainability elements within technological developments.

In our opinion, the materialization of the artist's vision and inner self engagement through works of art and furthermore, through interactive devices, helps in: (1) Taking into account non-mobilized features in mainstream innovation methodologies and (2) creating a qualitative dialogue with users and designers to generate subtle sustainable innovation indications.

Our research intentionally merges two very different approaches as an opportunity to examine intersections between art and innovation. Thus, each of the co-authors brings in some combination of skills: Céline Verchère is a sociologist, whose research focuses on new usages, and is also a dancer. Jeanne Bloch is both the creator of the artistic installation used for the survey, and the co-author of the research made from it. By writing this paper, she relates to a practice of self-reflection as used in research-creation methodology [11–15].

Box 1. Jeanne Bloch' s observations during work in dance studios: *(Centre National de la Danse, Dance-tech Berlin, 2014)*

- Dancers' body-space awareness and movement skills offer a wide array of manipulation options;
- Technological objects developed in the context of the dance performance with active performers participation help to: 1/Test different parts of the body as actuators or as light projectors, 2/Investigate body space in a deep and structured way and experiment unusual movements interaction;
- Dancers provide detailed reports on how they feel emotionally and physiologically while interacting with the technological objects;
- The choreographer-artist primary focus is to create an experience rather than an object;
- The choreographer seeks to maximize effects rather than technology when developing art-tech set elements (for example, she considers light as a scarce resource rather than the energy needed to produce the light);
- A mix of low and high tech components are used;
- Human based art-tech developments are possible thanks to simultaneous collaboration between dancer-artists and software developers, merging the dance studio with the fablab;
- As a result, human factors are integrated within tech developments and technologies and bodies are considered equally as matter and part of a same entity.

Figure 1. Interactive installation, Cité des Sciences, (2017). Photo: Anne Charignon ©.

2. What in the Artistic Practice Can Help to Mitigate Climate Change?

We can identify four elements within the artistic practice that can help climate change mitigation. First, the artistic gesture based on the artist's inner self dialogue; second, the value of subjectivity in the creation process; third, the importance of leaving the audience free to experience the work; and fourth, the development of empathy.

Hans Dieleman's article "*Transdisciplinary Hermeneutics; Working from the Inner Self, Creating Ecologies of Knowing*" explains what Jeanne Bloch intuitively experienced during the artistic process. The artist who connects sensory experience during creation including technological developments helps the audience connect to their sensory and emotional spheres while interacting with the artwork.

Hans Dieleman describes the concept of the artist inner self engagement and how it contributes to "what the German philosopher Ernst Bloch called anticipative consciousness (...). To realize a dream and create a new reality, we need to be in touch with our emotions, 'want' and motivation and thus with our inner self". Ernst Bloch, as quoted by Hans Dieleman in the same article, vividly links the intimate process and the impulse that lead to creative action: "Connecting to our intimate world mobilizes our creativity and our imagination. Free thoughts are floating inside us which get turned into actions and impulses are energy to convert into actions these thoughts that live inside us as a result of our experiences".

From Ernst Bloch's description, we can deduce the notion of subjectivity as our imagination relates to our intimate world, which is infused by our past experiences as individuals: One cannot engage one's inner self without engaging one's subjectivity. In addition, the philosopher highlights the value of myths, folk stories, and tales as a qualitative and symbolic forms of our historical conscience [16–19]. The artist refers to the above when creating new signifiers and opening up the possibility for new worlds.

The artist relates to Ernst Bloch's "Principle of Hope [20] as a theory of the Non-there yet (...) as for Bloch the human world is full of latent worlds that tend to the concretization of the Utopia intention" according to Michael Lowy [21]. The artist's setup includes conditions allowing a space for latency. By creating surprise or featuring unexpected experiences, s/he is able to open up an imaginary space literally and trigger the audience's imagination.

In addition, the stimulation of empathy is key to the artistic experience: "*viewers of works of art report bodily empathy*", according to art historian David Freedberg, who examined how relevant empathy is to aesthetic experience and what neural mechanisms are involved in the case of experiencing figurative as well as abstract art. Thus, could we consider the encounter with artwork as an opportunity to emphasize our empathetic nature? Would this contribute to building an intimate relationship with our "eco-surroundings"?

When, as Freedberg describes, the audience connects with the artist's gesture and when this gesture is based on the artist's dialogue with his or her inner self, could this specific gesture contribute to raising awareness about sustainability and climate change? Could it engage the audience?

In Jeanne Bloch's work, in the case of art and technologies, the artist's gesture and inner self engagement as well as the space for latency and empathy in her setup allow the emergence of new types of relations and connections between imagination and engineering, which is a relevant approach for engaging technological developments at the service of climate change mitigation.

3. Artistic Installation and Research Methodology

3.1. The Art Installation, "an Interactive Still life" Developed for the Choreographic Piece, "The Temple Windows Were Askew!"

In the specific case of the art piece that was examined for our research, the artist underlying considerations relate to:

- Intimacy and political action [22];
- Light pollution and low-emission lights as both metaphorical and technological proposition;
- The relationship between tech and organic matter.

The S*till Life* installation developed by Jeanne Bloch, is created as part of Jeanne Bloch's dance performance, *The Temple Windows were Askew!* and is presented, along with an interactive installation. It recalls chiaroscuro paintings and German expressionist film aesthetics. The installation features interactive fruits and vegetables that light up in different manners when you touch them. The performance developed from this installation includes additional objects such as several light projecting chairs installed on stage and three performers. A technological framework developed along the artistic creation runs the interactive lighting set. Jeanne's choice of using produce in her art piece is a step forward into her exploration of physical, organic, and technological frontiers. Her artistic approach apperceives technologies, human beings, and natural resources equally as matter and all as subjects. These operate according to the same universal physical principles that describe a single system of life and tech. In this sense, Jeanne relates to the *Metahumanist Manifesto* from Jaime del Val, artist–researcher, and Stefen Lorenz Sorgner, philosopher and specialist of ethics of emerging technologies [23]. In their work, del Val and Lorenz Sorgner lay the foundations for a world where new technological developments are human based. They propose, "*to deepen the understanding of reality as an unquantifiable field of relational bodies or metabodies, in changing and constitutive relation with one another. Herewith, we attempt to finally overcome the Cartesian split between body and mind, object and subject, by proposing a view of the mind as an embodied relational process, and of the body as relational movement, that operates from the molecular and bacterial, through the individual and psychic, to the social, planetary and cosmic levels, and in other dimensions of experience*".

At the time of our research, the light–produce installation included one Adafruit NeoPixel Jewel 7 × 5050 RGB LED and one Adafruit NeoPixel Stick 8 × 5050 RGB LED. Each group of LEDs is carved into a different fruit or vegetable after being protected from vegetable juice with a thermo-plastic envelope. For the presentation, we used cables to connect various produce to capacitive sensors and micro-controller. We are currently working on a wireless version of this project with different types of LEDs. In addition, Jonathan Perret, software performer (ut7.fr), developed a computer interface to control the lighting display (color variation and intensity). One part of the installation consists in manipulating "instrumented" produce displayed on a table placed in an obscure room. This particular context of manipulation (dark room, lighting effects) generates a series of reactions that are discussed with the audience. Then, we discuss the artist's intentions and research work and the participants' expectations and perceptions. Before stepping into the very dark room, one of the survey participants is invited to wear on a luminous t-shirt (Figure 2) helping the group to find its way to the installation in the completely dark room. The luminous t-shirts were developed during a previous dance and light artistic research [24] run by Jeanne Bloch. They include one or two 5 mm LEDs (blue or red or white) and some reflective and diffusing fabrics. A new version is in process in order for Jeanne Bloch to delve into her movement and light work.

Figure 2. Light and dance t-shirt. Photo: Jeanne Bloch ©.

3.2. Experiments

Jeanne Bloch, artist, and Celine Verchère, sociologist, set up two qualitative surveys "in situation" [25] in France in December 2017 and January 2018.

The two venues, Carrefour numérique—Cité des Sciences (Paris, France) and Le Shadok (Strasbourg, France), offered Jeanne Bloch to develop and present her artistic work and research. One of the venues, La Cité des Sciences' Carrefour Numérique, frequently invites researchers to test prototypes with visitors of the science museum (three billion per year) but rarely invites artists. Le Shadok, a public art and tech center in Strasbourg, invited Jeanne Bloch to do an artistic residency (April 2017) in preparation for "Strasbourg Laboratoire de Demain" as part of the major "inter-museum" exhibit, "Strasbourg Laboratoire d'Europe". (October 2017–February 2018). Interviews with visitors were set up while Jeanne's art installation was featured during a visual art exhibit in Le Shadok, Strasbourg (France). Both venues have a "maker" culture and are open to interdisciplinary approaches and therefore welcomed our proposal to add an art and research dimension to our installation at their museum. While the installation was quite similar in both places, the enhanced artistic context in the case of the Shadok's exhibit influenced some of the answers, and visitors were more inclined to express imaginary and creative ideas. The science museum (Cité des Sciences, Paris, France) seemed to be a more neutral place for our research, although interviewees were aware of the installation connection to a dance performance creation.

3.3. Methodology

The objective of both surveys aims to understand the type, as well as the modalities of the dialogue that could arise between the artist and the study participants. In that regard, our setup included an immersion in an art installation and a face-to-face qualitative interview (Appendix A). We favored a qualitative approach as our focus was to "*understand phenomena such as the values, representations and meanings that social actors give to human life*" as well as to "*pay attention to the meaning of phenomena rather than their frequency*" We also looked at the type of dialogue that would emerge from an art-tech installation and whether this dialogue would lead towards sustainable development issues.

Our survey protocol included:

Participants' visit and interaction with the art-installation without being previously informed about the survey purpose (5 min);

Participants' interview about the visit: What they just experienced, felt, and the meanings they might give to it (10 min).

Thirty-eight participants or groups of participants were recruited, randomly and on a voluntary basis among visitors to "La Villette" Science Museum in Paris (Figure 3) and "Le Shadok" Art and Tech

Center in Strasbourg, France. In the Science Museum, we chose specific days when various activities were proposed to visitors, such as "Saturday repair cafes", in order to reach a diverse audience in terms of socio-professional categories and ages. Recruitment has been adjusted and redesigned over time to increase the panel's diversification so as to boost the number of female participants in the survey. People were walking past the glass room where the facility was located, and voluntarily chose to step in. We stayed at the facility during large time slots (from 09:00 to 18:30) to include various participants' profiles in our research. Once engaged in the experiment, participants were asked to sign a use-of-data confidentiality protocol and an information and consent form for audio and video recordings. We filmed participants experiencing the immersive art installation to study their movements and verbal and non-verbal exchanges in the room. We then recorded the interviews by audio and video to facilitate their analysis and use.

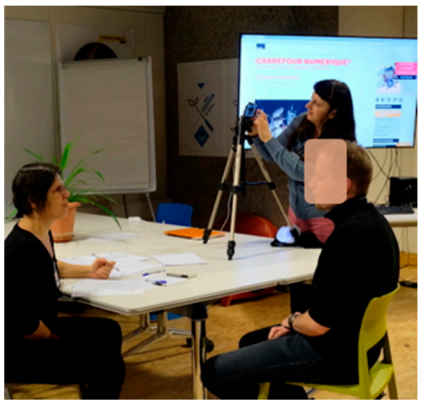

Figure 3. Visitors interviews, Cité des Sciences, (2017). Photo: Anne Charignon ©.

In the end, 38 interviews were conducted. We did not anticipate that several people would simultaneously participate in the survey. Indeed, a total of 18 interviews were run in groups, either as a couple, a group of friends, or a family, ranging from 2 to 4 people. We will see that this element, once analyzed, enhanced our conclusions. In total, we interviewed 62 people, almost as many women as men (25 women against 30 men) and 7 children. The ages ranged from 7 to 69 years old. Individuals had diverse professional backgrounds, from journalism to sociology and mathematics.

This number of participants is relevant for a qualitative survey. We stopped conducting interviews when we reached saturation point in data collection: When new interviews were not providing us with new information or different ways of understanding our subject.

4. Results and Analysis Returns

4.1. Analytical Method

Our analysis is based on the grounded theory method, developed by American sociologists Anselm L. Strauss and Barney G. Glaser, and adapted by researcher and specialist in educational science, Pierre Paillée [26]. Indeed, inductive qualitative studies [27,28] allow for an exhaustive and effective conceptualization and provide an in-depth understanding of the concepts emerging from the analysis.

Grounded theory analysis includes seven stages: Initial codification of the participants' comments; categorization of the codes identified in the comments; consolidation of the categorization; co-linkage of the categories; integration of the different concepts; modeling of the relationships between the concepts and the context of the experience; and theorization.

We applied this approach to our corpus in order to extract the relevant concepts. Based on the participants' discourse, but also on the objectives of the survey, we worked more particularly on the analysis of the following four dimensions: Sustainable development, energy, the function of art, and

the relationship to light. At a transversal level, we worked on the following categories: Imagination; place of emotion; subjective elements such as memories and how participants relate to their personal life; and emerging questionings (how participants get surprised).

4.2. Significant Results

The presented analysis focuses on the question of the dialogue established with the artist. We will therefore not detail all examined categories.

4.2.1. Analysis Elements

Survey results did not show a meaningful link between a logic of discourse and socio-professional categories, the number of annual visits to the Museum where our installation was set up, or even participants whose profession relates to the survey's subject (Appendix A.1). The only difference we identified in relation to participants' profiles is cultural and relates to their country of origin: Survey participants who lived in Brazil and Western African countries where power outages are more frequent expressed a relationship to light and energy that was slightly different to other participants. However, this finding was not significant enough to be the subject of an analysis of its own.

Then, as pointed out in Section 3.3., we note that when participants experienced the art installation collectively and were interviewed in groups of 2 to 4 people, interview content was enriched as they were encouraged to debate and reflect further than when interviewed individually; especially when they were asked to relate their experience to sustainability, as we will see later in the analysis.

4.2.2. Characteristics of the "Art Installation + Experience + Interview" Setup to Organize the Dialogue

Our analysis of the dialogue developed around the artists' intention highlights the benefit of the installation operating on three levels:

- A level of engagement, setting in motion that the participants have to make a gesture to light up the produce;
- An aspect of the art installation triggers an emotional and imaginary level because it refers visually to still life painting;
- A cognitive mode that occurs during an interview completed at the end of the experiment.

Light was the concept the participants referred to the most with regard to the level of engagement. In 25 of the 27 interviews, participants evoked the possibility of using produce as a nightlight or as an alternative to traditional lighting. Survey participants mentioned these ideas in the artistic and technological contexts when developing ideas for luminous produce as well as when addressing what they experienced at the art installation. In the installation, organic elements were associated with technology. When participants touched the installation, they lit up the produce, arousing their curiosity. People were fascinated by the luminous experience and this notion of experience is essential to our understanding. The term "*curiosity*" was used in 17 of the 38 interviews studied. For example, in the first question of the interview, "*if you had to describe what you just experienced, what would you tell? Emotions, adjectives?*", some people answered by naming the emotion "*curiosity!*", "*I felt, hhmm . . . I felt curious and confused*" and "*yes, intrigued, it is clear!*". Curiosity can be a leverage to facilitate open-mindedness and dialogue. Also, it worth noting that out of 17 interviews mentioning "*curiosity*", 13 included the notion of movement such as a willingness to touch and to discover.

On an emotional and imaginary level, the installation triggered memory recall. Several participants in the experiment mentioned that the experience was similar to experiences they had in school. Twelve of the 38 interviews related this type of memory. People would say, "*It reminds me of the power cables I used in school. You plug it in . . . the voltage . . . No, it's been a long time since I have done that . . . "*. In addition, the art installation evoked a collective imagination through the mention of paintings and masterpieces, notably the work of Italian artist Giuseppe Arcimboldo (1526–1593). During the interviews, 22 of the

38 interviews declared that the experience was reminiscent of a still life painting, when asked if it reflected memories or artistic works. Some of the participants talked about "*modern still life*", "*fruit basket*", and "*living still life*", integrating the luminous and interactive side of the experience with classic still life images found in paintings. In a few other interviews, individuals referred to the portraits made of fruits in the work of Giuseppe Arcimboldo but were unable to name these paintings precisely, for instance: "*I don't want to say the name, because I'm going to be wrong, but I am thinking of the portraits made of fruits . . . "* and "*There's this face with lots of fruits and vegetables, it really evokes that image . . . "*. This shared imaginary world brought up by the produce within the art installation as well as by participants' projection of paintings featuring human faces enhances their commitment to the experience. Another interesting point is the impact of memories activation: When participants referred to memories during the interview, they were more likely to talk longer and in detail than participants who did not evoke memories. It seems that using the word "memory" stimulates the discussion.

Finally, the cognitive mode completed the experiment. Interviews played an important, if not decisive, role in developing a dialogue and a reflective approach to participants experience with the interactive art installation. The importance of the interview is due, in particular, to Question 5 of the questionnaire: "*For you, is there a link between darkness, light, sustainable development: climate change and what you have just experienced?*" This question opened up a space for dialogue. Before this question, except for two interviews, people did not link sustainable development and climate change to the installation. This question allowed us to move from the emotional and experiential dimensions to a more verbal and expressive one. Thus, half of the respondents only talked about sustainable development when the question about this concept had been asked.

These three dimensions of the setup—engagement, imaginary, and cognitive—were key to linking participants' physical interaction with the art installation to the reflective mode: Movement stimulated by the interaction with the art installation provoked a great curiosity among participants; the artistic dimension, on the other hand, encouraged the emergence of memories and connected to a shared imaginary and the interview carried out afterwards allowed a "cognitive update" of the experience, encouraging verbal sharing and discussion. Moreover, participants who we interviewed in a group were more inclined to talk with us than individuals or couples. Lara Drew, an education specialist, when talking about embodied learning, explains that the body learns through specific contexts and then emotions are in charge to manage concepts [29]. We propose that this learning phenomenon occurred in our experiment. Indeed, our experiment was an important demonstration of the impact of movement and interaction on learning and of the value of verbal feedback after the experience.

4.2.3. Discussed Topics

- Sustainable Development and Climate Change:

Nineteen out of 38 interviews linked the experience of the art installation to sustainable development and climate change compared to 12 out of 38 who did not see any connection. Seven interviews did not address this question at all. The 19 interviews (individuals or groups) talked about sustainable development only when we asked the Question 4: "*Is there a link between darkness, light, sustainable development: climate change, and what you experienced in the cabin?*". Only two interviewees addressed the subject before the question was asked. The question triggered participants' reflection and brought it to a cognitive level, stimulating exchange when they finally recognized that the art installation could be linked up to sustainable development and climate change. Then, when going deeper into the conversation, the vast majority of interviewees associated sustainability with energy and light.

- Energy:

The term "*sustainable development*" is highly correlated with energy. Eighteen of the 38 interviews mentioned the term "*energy*" used in the sense of "*renewable energy*" and as alternative to polluting

energy sources such as oil and nuclear power. They also used this term in relation to lighting. Of these 18 interviews, 13 referred to sustainable development and climate change. Participants who did not connect energy to climate change mentioned energy sources in general. For example: "*perhaps if it was presented in another way, it could be an energy source, the fact that it is an energy source, indeed, but to say that I am going to buy an apple . . . "* or "*it is also extremely interesting to see, to discover, which food produces the most energy*".

- Technological treatment of organic matters:

Eight interviews out of 38 contain references to genetically modified organisms (GMOs). Question 7 "*would you be ready to eat an illuminated fruit or vegetable?*" initiated these considerations. This question was deliberate and in line with the artist's intention to express a form of continuity between organic and technical matters in order to question our relationship with technology. Participants then question the nature of light and think about GMO (genetically modified organism). Their reactions included: "*me, a priori, if someone tells me a fruit that enlightens, you eat it? Well, no! This is the big question of the demonization of GMOs!*", "*I know it's going to have to go through genetic mutations, but . . . why not, huh?*" and "*the whole fluorescent thing, I avoid, anyway . . . If they are genetically mutated and phosphorescent . . . "*. We note that their divide concerns, on the one hand, produce–nature and on the other hand, light–technology. For the majority, light did not modify their perception of fruits and vegetables, while eight interviewees raised the question of transformation of nature. For example, one participant felt that by watching the electrical wires on some of the fruits and vegetables, the experience was more technological than ecological: "*Each time you see electrical cables, I wouldn't necessarily associate it with organicity, I would automatically consider it to be technological*".

5. Conclusions

Our paper theoretically and practically demonstrates the contribution of artistic practice to technological developments, while assuming this practice brings about enough of a paradigm shift to lead to climate solutions. During our research, we have identified four characteristics of the artistic process that are likely to impact technological developments: The notion of inner self engagement, the value of subjectivity, the creation of a free space, and the opportunity of empathy. Then, we conducted a survey among the spectators of the artistic installation and examined the relevance to associate various channels of communication in order to establish a dialogue with the public:

- The experiential and interactive dimensions of the art installation promote learning through the body [30];
- The artistic setup, which includes touch, movement, and interactive technologies, stimulates participants' imaginaries and memories and activates the emotional and sensitive components of the experience;
- The interview and associated discussion conducted after the artistic experience brings in a cognitive and reflexive element. Although the interview was originally intended only for research and investigation purposes, we noted during the analysis that it also stimulated learnings based on self-reflection. In addition, it raised dialogue in relation to the artist's intention in regard of nature, technology, and sustainability issues. Furthermore, discussions were more intense and diverse when interviews were run with a group of participants instead of individuals.

Our research highlights the power of an art-based approach to increase the levels and possibilities of interaction with an audience by bringing together the sensory, imaginative, and cognitive dimensions.

Our approach opens, in a unique way, a new avenue between committed art [31], which immediately affirms a political and constant position, and augmented art [32], which uses technology in order to increase its own artistic vocabulary within its artistic media. In our case, the body is the main actuator of a space that articulates intimacy and social and political domains throughout

imagination, whether we talk about the body of the spectator at the time of the experiment or the artist's one during the creation process.

We do embody our trajectories and our relationships to the world, as described by Sylvia Faure and Anne-Sophie Gosselin: "the social speaks directly to the body by transmitting values, ways of being and doing that are reproduced by each other, without any objectification" [33]. In that sense, engaging bodies in artistic experiences opens possibilities to question contemporary values and ethics [34]. For Ernst Bloch, social differences are transmitted as well but throughout imaginations. For the purpose of this research, we have experienced, in an original way, the idea of the body and of the imaginary as transmitters of values in relation to the issue of climate change.

At the time of the artistic creation, the project of a research survey was not in the artist mind. On one hand, this situation had the advantage of leaving the artist free of working with her imagination regardless of its impact outside the piece of art. On the other hand, knowing about the research and analysis part at the time of the creation would have helped the artist to set up an adapted reflective framework that could have been used during the survey phase. Although our analysis of the artistic experience was detailed, we did not use dance movement analysis to deepen our understanding of the audience interaction with the art piece. In addition, in the case of a future research, we will think of improving the cross section of our sample. This was satisfactory for our present work, albeit we noted some influence based on the two different places where we hired research participants as well as variation in interviews conducted in group or individually.

Design and context in relation to the artist's own sensory experience allow us to experience often hidden or unspoken issues and to question the meaning of innovations. It opens up a space for dialogue and advances user's environmental consciousness as well as contributing to implementing innovation that transcends the idea of market need and seeks to connect to global needs that integrate human and nature.

This research is a tentative to understand the value of imagination and freedom as practical and rational tools adapted to climate change mitigation, which could relate, by its magnitude, to Ernst Bloch's idea of concrete utopia.

Author Contributions: J.B. is the author of the studied art installation. C.V. wrote the questionnaire with input from J.B. Interviews were conducted by C.V. and J.B. together during three days in Paris and J.B. conducted, by herself, the last day of interviews at Cité des Sciences as well as interviews run in Strasbourg (Le Shadok). Corpus analysis has been led by C.V,. J.B. and C.V. wrote the paper.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A.

Appendix A.1. Observation Form

The Different Objects and People in Place: Cabin, Curtains, Fruit Basket, Light, 2 Participants, Jeanne, Celine

a. Participants relation to the dark cabin:

When Getting into the Cabin:	Inside the Cabin (General):	When Getting off the Cabin:
Curtains etc	Body posture Eyes Movements	Eyes Face

b. Observation of the dark/light ratio:

How participants move, how they touch . . .
Postural changes
Dialogues between participants, reports to the interviewers.

c. Description of how people interact with objects, what exactly does she/he do?

Movements performed
Observations of manipulation of fruit and vegetables
Observations of manipulation of luminous produce, which part of the body is being used?

d. How participants address (or not) these "inanimate" objects:

What exactly is said in the cabin
How do participants relate to the objects?

e. Interaction between the two participants in the cabin:

Frequency of interactions
Words exchanged

f. Learning and interaction dynamics:

Dynamics of participants interaction with objects
Dynamics of the interaction among participations

g. Acknowledge if the installation happens to dysfunction:

On what occasion?
What are the participants', gestures?

Appendix A.2. Questions

(1) If you had to describe what you have just experienced, what would you say?
(2) Does the dark cabin inspire something in you? Does it echo something?
(3) Does the overall scene echo artistic works (drawing, painting, etc.)?
(4) For you, what is the "subject" of what you have just experienced? Is there a link between darkness, light, sustainable development (climate change) and what you experienced in the cabin?
(5) For the person manipulating the produce: how do you feel about a luminous fruit or vegetable?
(6) With regard to your gesture: have you changed anything because of the light setting and the darkness within the cabin?
(7) In a different environment, would it have the same effect? For example, imagine yourself in your kitchen: would you see this lighting technology being used in your kitchen? In other contexts? Is it transposable for everyday use?
(8) For the observer: does this change the way of looking at produce? Did you need time to understand what was going on?
(9) With regard to this T-shirt: do you have anything to say? Do you think it is of interest in this context? For what?
(10) Finally, do you think this facility is a technological facility?

Appendix A.3. Additional Questions for the Shadok Audience

What You Have just Seen/Experienced is Part of a Performance that will be Presented soon (Scenic Object Which is Part of the Plot of a Show). A Video Related to the Dramaturgy of the Show is Projected on the Dark Cabin:

(11) In relation to what you have just seen, do you have anything to say?
(12) In your opinion, what is the artist's intention?
(13) Does this affect you?
(14) If you can imagine, play with what you have just seen and experienced, what would you feel like doing? Any gestures? Movements?
(15) Would you like to ask the artist one or more questions?

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