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## **From CliFi to fiction for change : the contribution of fiction and design to media and communication research on digital sobriety**

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**Key-words** : digital sobriety, fiction, design, low-tech, digital everyday life, visual methodologies.

**Abstract** : In the context of the current clash of the transition's narratives in the field of digital technologies, how to mobilize fiction and design to support research on digital sobriety? Drawing inspiration from innovation through withdrawal, the paper presents a comparative analysis of two workshops on topics related to digital sobriety: music sharing without streaming, and the use of a smartphone without networks. These experiments have in common to rethink digital everyday life, relying on fiction and visual, creative and narrative methods. Cross-cutting questions focus on how to get students to develop a critical perspective on technologies, to project themselves into possible and desirable alternatives through « fiction for change ».

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The current ecological crisis raises social, environmental and ethical issues in relation to the design of digital technologies to project ourselves into a future with limited resources. Awareness of ecological limits is still emerging, as shown by recent works on digital ecology (Bonnet, Landivar, Monnin, 2021, Allard, 2022, Halloy, 2022), and by the circulation of fictions, mostly dystopia about climate change, embedded in several media from literature to digital networks. Those topical issues trigger new challenges for researchers and teachers in communication and media research, in relationship with environment, sciences and risks, whether they can be technological or natural risks. We propose to reflect on the theme of communication and environment, through the analysis of two pedagogical experimentations aimed at making students from different backgrounds aware of the eco-criticism of technologies. The objective was to offer them the opportunity to make alternative uses of everyday digital objects possible, during a workshop. The main question we will answer in this paper is the following : How to mobilize fiction and design to support research on digital sobriety (Bordage, 2018)? What mediation device can be imagined to support students towards a critical analysis while supporting their ability to act?

To answer, the paper presents a comparative analysis of the two workshops on topics related to digital sobriety: music sharing without streaming, and the use of a smartphone without networks. These experiments have in common to rethink digital every day life by drawing inspiration from innovation by withdrawal (Vinck, Gourlet, 2022) and relying on fiction and visual, creative and narrative methods (Mannay, 2016). Cross-cutting questions focus on how to get students to develop a critical perspective on technologies, to project themselves into possible and desirable alternatives.

Our methodology is rooted in media studies (Mitchell and Hansen, 2010) to study the role of fiction and intermediate objects (Vinck, 2009) produced by students. These mediation objects support communication between actors, and are relevant to analyze to contribute to communication research on digital sobriety. Our analysis is rooted in semiotics and the anthropology of communication to

study the factivity of the media materiality of the intermediate objects that circulate in each team (Catoir-Brisson, 2022).

The article is developed in three parts. The first part defines the issues on digital sobriety and explains the current clash of the transition's narratives in the field of digital technologies, from literature review. The second part presents the methodology of the two workshops made with students in different contexts, within the same framework of participatory design, fiction and creative methods. The context and organization of the workshops are specified in order to present in the third part the results of the comparative analysis, to foster the role of the intermediary objects in the dialog between the participants of the workshops. The article proposes a theoretical contribution on the concepts of digital sobriety and low-tech design in particular, and a methodological one, from the reflexive analysis of the mediation system in the two workshops to open up alternative trajectories in the design of technologies.

## **1. Literature review : the clash of the transition's narratives in the field of digital tech**

### **1.1 From the techno-critics to the eco-critics of technologies**

From digital interfaces to wearable tech, new media and digital communication technologies have developed by being part of imaginaries of the design of technologies based on a vision of the planet as an infinite resource. However, some pioneers have warned of these wicked problems since the 1990s and before, such as Victor Papanek, who already called for consideration of ecology and ethics in design by declaring: « There can be little doubt that the environment and the ecological balance of the planet are no longer sustainable. » (Papanek, 1995, 1). Awareness of ecological limits is still emerging, as shown by recent work on smartphone ecology (Allard, 2015, 2022. Nova, 2020. Bonnet, Landivar, Monnin, 2021), a research that reconnects with the materiality of digital and mobile culture and offers a "perspective of decolonized digital ecology", often based on experimental approaches (Allard, 2022). Yet, despite the denunciation of the impacts of the technosphere on the biosphere by researchers, these « zombie technologies" (Halloy, 2022) - so called to qualify the technologies that some continue to keep alive as much as possible because they are profitable - are part of an unsustainable production system which is already obsolete.

For example, the number of raw materials is constantly increasing in the manufacture of a smartphone, which complicates its production, especially in the era of its miniaturization. The environmental issues concern in particular the manufacture of the screen and the electronic components. The smartphone can thus be studied from the periodic table in physics<sup>1</sup>, to visualize the quantity of elements it contains, implying an increasing extraction of rare metals, such as lithium or cobalt. Beyond the extraction of materials and rare earth resources, it is also the exploitation of humans that is at stake in the production of the smartphone, which concerns in particular the children of cobalt in the Congo (Allard, 2022). This is why it is relevant to grasp together the environmental and social issues of the smartphone, to highlight the need for a decolonial perspective on this everyday object. Thus, we move from a techno-critical perspective (Jarrige, 2016) on the smartphone, which questions the dominant technological trajectories, towards an eco-critical perspective, which restores this tendency to extractivism and productivism in a global context of neocolonialism. This is useful to observe this shift from one slavery to another, and to highlight the way in which digital technology makes the eco-political issues of its production invisible (Couldry and Meijas, 2020). This decolonial approach to the digital, which borrows as much from eco-criticism (Glotfelty & Fromm, 1996) as from cyberfeminism (Haraway, 1985) is relevant to "give visibility to experiments

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<sup>1</sup> More than 60 materials, out of the 103 elements of Mendeleev's periodic table, go into the composition of a smartphone. See this infographic from the Atomic Energy Commission (CEA, 2021, 27-29): [https://www.cea.fr/multimedia/Documents/publications/les-defis-du-cea/CEA\\_DEFIS\\_244.pdf](https://www.cea.fr/multimedia/Documents/publications/les-defis-du-cea/CEA_DEFIS_244.pdf)

which by 'doing' deploy a logic of sobriety, both in design and in (re)use" (Allard, 2022, 56). It offers the possibility of a critical analysis of multiple forms of hegemony to shake our certainties about binary oppositions (human/machine, human/animal, nature/culture). This critical perspective can be considered as a preparation to act through hacking hegemonic imaginaries of technology. Moreover, the difference between zombie and living technologies (Halloy, 2022) is also helpful to go from a production paradigm based on finite resources, maximum running durability and minimum waste life (zombie techs) to another one, based on renewable resources, minimum running durability and maximum waste life (living tech). It can be inspiring to develop new imaginaries and relationships between humans, technology and nature. Wild tech (Grimaud et al. 2017) as an alternative to the opposition between high and low tech is a relevant concept to take into account the continuum of technologies and the hybridization between them, as a territory of exploration through fiction.

### 1.2 CliFi and eco-fiction to trigger reflexive analysis on our daily life with technology

Other imaginaries from science fiction circulate in the form of utopian or dystopian fictions on technology, in literature, cinema, or via digital networks. To express our fears linked to the ecological issues of technologies, many CliFi (climate fictions) circulate online as in traditional media, and echo the tradition of eco-fiction in literature and the performing arts (Kressner and al. 2019). For instance, we can remember the pictures used by journalists in September 2020 to tell the story of the fires in the United States which have multiplied with climate change. The orange color often used in the pictures accompanying the articles echo to the same orange color used in post-apocalyptic movies such as *Blade Runner*, a common reference in the Western world. Eco-fiction offers the opportunity, through the plasticity of the language of literature, cinema and arts, to make visible and to document the tension and violence between human and nature, in particular in relation to technologies and the digital world. This is also what the reader can feel after reading the book « Dans les imaginaires du futur » (Kyrrou, 2020) that explores the ways in which science fiction and the imaginary as a whole have thought about the social, political, economic or ecological apocalypses but also the aftermath. We can identify a strong opposition between the Gaia's imaginary, a world of preservation of nature, and the Gafa's imaginaries, full of technological creatures who can be scary. We can thus identify another role of imaginaries, to sustain a critical perspective and raise social, environmental and ethical issues. Moreover, « 'stories' used to communicate climate change knowledge shape opinions and preferences » (Fløttum and Gjerstad, 2016). As a narrative construction, they have the ability to play a role on our individual and collective representations of what is to come and how we can react. But beyond the opposition between utopian and dystopian possible futures, it seems relevant to consider fiction as a creative exercise to open new pathways and to prepare to act, including with the students we work with every day as teacher and researcher.

We can rely on two inspirations in eco-fiction literature and media, close to innovation through withdrawal. They both propose to explore the topic of a life without any car through fiction. The first one is extracted from the book *Ecotopia* (Callenbah, 1975). It is a chapter presenting the possibility of living without a car in the new towns of Ecotopia. It can be considered as a good example of what the imaginary and imagination process through art and individual expression can offer, with an author writing a science-fiction novel. The second one is a collective fiction written by citizens participating in the Bright Mirror project<sup>2</sup>, and it was on the specific topic of cities of the future. A group of citizen wrote a collective story on a city without any car, untitled « Alvéoles ». And the

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<sup>2</sup> Bright Mirror is a collective initiative initiated in 2018 by the studio BlueNove to make citizens participate in the transition management through workshops of collective writing. URL : <https://www.blunenove.com/blog/bright-mirror-prototypez-votre-futur-desirable/>

story was embedded in one of the podcast produced by Bright Mirror's community<sup>3</sup>. Close to the city of Ecotopia, this example is interesting as the collective voice of citizens' fiction to open up other possibilities. These examples open to diversity, can make us think of the concept of heterotopias (Foucault, 1966) defined as other spaces, open to challenge the space where we live in.

### **1.3 Cross-cutting issues on communication for change, digital sobriety and the topics of environment, science and risk**

Social and environmental issues on our daily life technologies underline the role of communities (users, citizens, students etc.) to retake their ability to participate in the design of technologies. Communities are also at the heart of the field of communication for social change (Gumucio-Dragon, Tufte, 2015), in which the role of communication is to solve collective social problems by considering it as a praxis. In this perspective, the communication aims at "stimulating processes of transformation, in which, from the articulation between citizenship and social networks, communication strategies based on more horizontal and participatory models and styles are carried out to anticipate other ways of living and lead to the transformation of dominant economic and political structures" (Tufte, 2015, p.10). Then, communities can have a power of action in the co-creation of counter-hegemonic imaginaries through media that give them visibility and legitimacy. Communication for social change and participatory design approaches have in common this role attributed to communities to transform their environment, by stimulating action at both local and global levels. Emerging approaches in design are raising the issue of sustainability, such as transition design (Irwin, 2015) and « it is very important to deal both at the same time with sustainability and social issues, instead of opposing them. » (Watkin, Catoir-Brisson, 2021).

To go deeper, we can explore the emerging work on alternatives to all-digital in our daily lives. They invite us to situate digital objects and services in their territories and they are linked to older works on digital sobriety, deployed in many projects based on eco-design or the reuse of waste electrical and electronic equipment (WEEE). These projects rely on an imaginary of technology that questions the acceptability of less comfortable objects (Catoir-Brisson, Chauveau, 2021). Digital sobriety aims at sustaining the design of more sober digital services and to moderate uses (Bordage, 2018). Digital sobriety concerns both the components, the necessary energy consumption, the carbon impact or even that of the data centers in the environment in which they are located. It also applies to uses, by aiming to make the digital system resilient and to create a framework that generates compatible uses with planetary limits. This implies a paradigm shift in digital design, involving taking into account the necessary and available resources as well as the durability of the systems from the start of the design, as a creative constraint. This can be inspiring in a participatory design approach, whose sobriety is not suffered but desired by those who make the project.

Ecological and social issues for the design and uses of daily digital tech, and the need for more sober uses or reasoned uses of technology, echo to former works on the conviviality of tools (Illitch, 1973) or the green imperative in the design of objects and services (Papanek, 1995). Indeed, Illitch proposed a criticism of productivism and he invited to think of a convivial society through re-tooling society. In opposition to the alienating tool, a convivial tool is based on the values of individual autonomy and community relationship. Papanek also played the role of a whistleblower for design: « Ecology and the environmental equilibrium are the basic underpinnings of all human life on earth; there can be neither life nor human culture without it; (...) Design must be the bridge between human needs, culture and ecology. » (Papanek, 1995, 14). Techno-discernment, considered by Illitch as the act of using precious resources only in the specific places where they are really useful, can be

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<sup>3</sup> the podcast « Alvéoles » is the first episode available online since July 2020 : <https://www.youtube.com/watch?v=N7HP9K3m0pQ>

relevant for our research on digital sobriety as an intention of taking into account the cost-benefit ratio in the design process.

Moreover, our approach is part of innovation through withdrawal (Gourlet, Vinck, 2012) to help students rethink the uses of the smartphone in a context with limited resources. This approach is based on the withdrawal of an element or an artefact and relies on various detachment mechanisms aimed at making the absence less strong by making it bearable or even desirable.

The connection between digital culture and ecology raises some paradoxes for research in environmental communication and risks whether they are natural (risks related to the planet resources) or technological (risks related to the relationship between human, nature and technology). The ecological crisis questions the recent orientations of the design of technologies to project ourselves into a future with limited resources. This involves many challenges for the design of technologies, which take into account social, environmental and ethical issues. We can then ask the following question: How to mobilize fiction and design to support research on digital sobriety? What mediation system can be imagined to support students towards a critical analysis while supporting their ability to act? We propose to reflect on the theme of communication and environment, by analyzing two fields of pedagogical experimentation aimed at making students from different backgrounds aware of the eco-criticism of technologies, to help them contribute to this emerging field. The objective was to offer them the opportunity to make alternative uses of everyday digital objects possible, during some workshops. These current issues for researchers in media and communication also raise some challenges for teaching and need new skills for teachers and students, in a more collaborative and participative way of learning together.

## **2. Methodology of the workshops on innovation through withdrawal : design fiction on the use of a digital technologies in a world with limited resources**

### **2.1 Participative research with students by design : an approach to sustain engagement**

To present our participative research by design, we first explain our methodology of participatory design with students and the way we consider the workshop as a mediation system.

Participatory design was relevant for our two workshops on digital technologies with students. It is an approach to computer systems whose particularity is to involve the people for whom they are intended to play a critical role in their design (Schuler & Namioka 1993). This approach was useful in the two workshops as we wanted to make the students be part of the design of alternative solutions and to sustain their engagement in the workshops through eco-critics of technologies and the use of intermediary objects to develop their ideas in a collective mode.

We consider the workshop as a communication and mediation system, by building an environment that promotes collaborative design between students, and by creating conditions favorable to creativity by producing knowledge in an exploratory form. This process of knowledge production based on error tolerance, serendipity and experimentation, constitutes a common approach that we have developed in a comparable way in the two workshops.

We propose a comparative analysis of two workshops on topics related to digital sobriety: music sharing without streaming, and the use of a smartphone without networks. They have in common to rethink digital every day life by drawing inspiration from innovation by withdrawal (Vinck, Gourlet, 2022) and relying on fiction and visual, creative and narrative methods (Mannay, 2016).

### **2.2 Design, fiction and visual methods as a way to sustain creativity and alternative perspectives through an iterative process of learning by doing**

Our pedagogical approach had the particularity of relying on fiction to immerse students in a near future with limited resources: a world without telecommunications networks or without streaming.

We consider fiction to be a social practice that plays an important role in the knowledge process because it constitutes “a playful pretense which is also an endlessly replayed negotiation of our relationship to the world” (Schaeffer, 1999). This definition of fiction underlines the role of fiction to sustain change in everyday life. It can open up new pathways for pedagogy through the use of fiction to rethink our daily life with technologies through an eco-critics perspective. Our approach aimed to raise their awareness through reflective practice and the use of fiction, with a view to "bringing possibilities to life through thought experiments" (Murzilli, 2023, 13).

Our workshops' methodology is also close to design fiction, which is based on the deliberate use of diegetic prototypes in order to suspend non-belief in change (Sterling, 2013). Video was a central media used by researchers and students in both projects to create some moments of fiction with the materiality of the audiovisual language to embody possible situations, as we see in the tables below.

Visual methodologies encourage an empathetic posture by helping people to share their experiences (Hine, 2015; Pink, 2015). Visual, creative and narrative methods (Mannay, 2015) have the potential to evoke an understanding of how people experience their own world. Those methods are used in qualitative research to highlight embodied experiences and can be relevant for a workshop with students in order to sustain the development of a reflexive analysis on their own digital daily uses. During a workshop, visual materials can help participants to shape insights through diagrams, drawings, photomontage, and storyboards. Thus visual methodologies can also be used to foster the participation of all stakeholders in a collaborative project. In addition, the design methods make it possible to develop the ideas of the students by materializing them via rapid prototyping methods. The various media mobilized have made it possible to embody alternative uses of technologies, in the form of exhibitions, tangible models, drawings or even videos. Design makes it possible to solve design problems related to collective action, by implementing sensitive and creative methods (Dorst and Cross, 2001). When design appropriates the methods of qualitative research, it makes it possible to develop tactics, a know-how to equip the conversation, by the creation of mediation and communication support, in order to set up a dialogical cooperation.

In the two workshops, we led the students to experiment with critical thinking in order to rethink the uses of everyday digital technologies, from a posture rooted in reflective practice (Schön, 1983) which situates the reflection in the action of the project carried out. This approach constitutes a “means of creating links and meaning between the various elements of training” based on different disciplines. It leads students to practice a form of DIY that “is not only an epistemology, an action and a product (but) also a constructed approach to political resistance” (Allard, 2022).

The iterative process of learning by doing through design methodology is based on three values in the workshops : we consider design as a process, and iterations as a way to accompany the students to improve their ideas. Moreover, the materiality of intermediary objects plays a central role to deepen the design process and to embody uses in concrete situations.

### **2.3 Two experimentations of innovation through withdrawal in the field of digital tech : music sharing without streaming and the use of a smartphone without networks**

We first present the contexts and the organization of the two workshops before we sum up the data collected and the intermediary objects produced by the students.

The first workshop was proposed in 2020 to students in Bachelor of interaction design by a team of a researcher in design from the university of Nîmes and professional designers in collaboration with a local fablab<sup>4</sup>. The second workshop was proposed to students in Bachelor of sciences and techno-

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<sup>4</sup> a complete analysis of this experimentation is available in French : Catoir-Brisson, M-J. Chauveau, N. (2021). Vers des usages dégradés désirables : nouveaux imaginaires du design d'interaction, *Design Arts Medias*, 12/2021.

logy in 2021 by a team of a researcher in communication and design at Audencia Nantes, a researcher in physics and a designer, in collaboration with Villebon-Georges Charpak Institute and La Physique autrement laboratory at the university of Paris Saclay<sup>5</sup>. The main differences between the two workshops are the background of the participants (from design & humanities or sciences & technology) and the duration of the workshops, which extended over 3 months for the first one and a complete immersion of one week for the second one.

Despite those differences, both workshops address some social and environmental issues related to digital sobriety and aimed to engage students in research, through fiction, reflective analysis of their own practices, and critical making. They also focus on daily digital practices such as listening to music or using our smartphone. These two situations of use of technologies in mobility are questioned in the context of a near future in which material resources and access to the connected world are limited.

We present below the sequence and the various intermediate objects produced by the students in order to show how the materiality of these objects makes it possible to embody alternative trajectories of technologies in situations of daily use.

### **First experimentation : music sharing without streaming**

This first workshop was part of a research on low-tech design assumed as a creative approach based on reused materials. It was a question of leading the 34 students in design to question themselves on the acceptability of "less comfortable" objects, and to develop a critical reflection on the hegemonic vision based on the idea of infinite progress. The limitations imposed (design without screens, reduced technological means, and based on the already-there) constituted a challenge for the students. The exercise was introduced to the students on the first day as follows: "In 2030, the mining of rare metals has been limited, and manufacturing new electronic components has become too expensive. High-tech and fragile screens, manufactured in the years 2010-2020, are out of use. Despite these constraints, you will design a device to listen to and share music in digital format."<sup>6</sup>

Over the three months of the project, the students were accompanied by the team of teachers and researchers in order to develop their own project, in both individual and collaborative mode. They produced the intermediary objects below, all along the workshops including user scenarios, wireframes, models of a new system device made of reused materials to listen and share music. They also produced a video<sup>7</sup> introducing their new service and/or object.

Workshop step	Data collected	Mediation tools and knowledge offered by teachers/researchers	Intermediary objects produced by students
From the 1st day	Litterature review and benchmark on digital sobriety	Classes on low-tech design and digital sobriety as a creative constraint / auto-ethnography through visual methods	Mind-maps Moodboards
First month	Design intentions First sketches and wireframes	Classes on prototyping and ethnography by design	Storyboard Concept sketch First wireframes

<sup>5</sup> a complete analysis of this experimentation is available in French : Catoir-Brisson, M-J. Bobroff, J. (2023). De la sobriété numérique à l'innovation par retrait : repenser les usages du smartphone à la croisée des SIC et du design, 23ème Congrès de la SFSIC : La numérisation de la société.

<sup>6</sup> Extract from the subject of the project offered to students as part of the "interaction design" course.

<sup>7</sup> the video produced by each teams can be watched online : <https://vimeo.com/user128769102>



Second month	Creation of the new object/ service and development of uses scenarios	Accompanying the iterations of the design process through visual methods	Wireframes improved Prototype of the final object storyboard of the final video
Third month	Improvement of the final concept and design of a video	Accompanying the development of argumentation for final presentation	Final object improved Video Uses scenarios

The six projects presented by the students are based on the reuse of elements from waste, but different positions emerge. Some aim to claim the “non-noble” origin of their components, by making them visible, repairable. For others, the reuse of components from waste is not explicitly highlighted, it does not constitute a singular aspect of the history of the object. For example, the project proposed by the team Maker Pod takes up the principles of DIY, by imagining a system of open source objects for a world where music sharing would be freed from the mobile network - exchanges based on USB keys, SD cards, flash memory, and locally reused LCD screens.

### **Second experimentation : the use of a smartphone without network**

The second workshop aimed at 23 students in science and technology who discovered the methods of human and social sciences and design to envision a world without internet in order to rethink their current uses of the smartphone.

On the first day, the students were immersed in the fictional universe of the workshop through the two videos projected at the launch of the project. The syncretic materiality of the videos, made up of edited extracts from TV newspapers and specifically created content (such as the voice-over) promoted verisimilitude and launched the creative constraints of the project on the smartphone without network. These micro-fictions communicate about a possible future by using today's media forms to make people want to participate in the challenge. We can sum up the collected data and the intermediary objects produced by the students in the table below.

Workshop step	Data collected	Mediation tools offered by teachers/researchers	Intermediary objects produced by students
Day 1 to 5	Individual data on smartphone daily use	Classes and example of tools for ethnography	A3 template to visualise a day with the phone
Day 2	Collective data on uses problems with smartphone	Classes on visual methods for auto-ethnography	Photos
Day 2 to 5	First ideas and sketches of their own project	Classes on quick prototyping with design	Iterations on sketches, storyboards, uses scenario and prototype
Day 4 to 5	Final ideas and solutions to imagine alternative uses of a smartphone without network	Classes on making video and building a story	Storyboard of the video FinalVideo Final Model/mock-up

The workshop was based on a mix of sharing knowledge on design, communication and physics and exercises to sustain the students' creativity in the development of their ideas of solutions, improving them through an iterative process. They were encouraged to rely on visual and tangible methods as a tool for making collective choice in each team. Throughout the week, they produced different deliverables, that we consider as intermediate objects (Vinck, 2009) as they circulate between them in each team, to co-design alternative solutions to the existing one. Each of these objects allowed them to embody situations and uses of the smartphone.

### **3. Results of the comparative analysis. Simulating through fiction to stimulate the ability to act : new skills for students, teachers and researchers**

#### **Results and limits : the importance of the intermediary objects in the co-design process**

Our compared analysis is rooted in media studies (Mitchell and Hansen, 2010) to study the role of fiction and intermediate objects produced by students. These objects support communication between actors, and are relevant to analyze to contribute to communication research on digital sobriety. We sum up the analysis of the two workshops through the three topics following.

First of all, we can underline the role of intermediary objects in the co-design process. The different media materials offered to students gradually aimed to promote their reflective analysis of their uses and representations of digital technologies, but also to stimulate their creativity to prototype their ideas. Secondly, we can foster the contribution of fiction to pedagogy: in dialog with design and communication knowledge, it opens the way to "an anthropology of possibilities, of the imagination, which involves not only understanding what people say about the future but also what people perceive about the future" (Pink, Ibanez-Bueno, Marin, 2021). The use of fiction made it possible to open up reflection on new imaginaries of the relationship to everyday technologies. Some students have rightly appreciated being pushed out of their comfort zone to raise social issues around a daily digital object. Thirdly, design methods have made it possible to embody possibilities by materializing them and fiction has helped students to project themselves and get involved in the search for alternative solutions. These workshops highlight the contributions of mediation through participatory design to promote interdisciplinarity on a complex object such as digital tech.

These collaborative experiences were framed by a mediation system to engage the participants on a cognitive, affective and motivational level. The simulation of a diegetic universe co-constructed with the students made it possible to stimulate their ability to act through creativity, playful and eco-critical projection in a fiction, that is based on the students' reflexive analysis of their own uses of digital technologies. The various media mobilized by the students all along the project framed the evolution of their ideas in an iterative way. The accessibility of rapid prototype materials and the stimulation created by the creation of video embody these alternative uses of technology in various formats with a view to producing real effects (Barthes, 1968), whether in the form of tangible models, drawings or videos. The videos made by the students to represent their project, constitute a particularly interesting intermediate object to understand their intentions to propose degraded uses or new uses of the technologies. Produced in different tones, some videos are close to advertising speeches, others present a scenario of the user or even a scenario in first person reminiscent of that of video games (in FPS mode). The solutions are marked by current counter-cultural references to digital (anti-uber / anti-social networks) and show an openness to technologies whose uses are collective (and not individual). Even when it comes to rethinking the sharing of messages or music, it is done in the social link with a community that guarantees confidentiality and informational ecology. While different trade-offs have been made between maintaining and renouncing certain uses, the student projects have a common desire to maintain some uses, such as communication and playful ones, considered essential (especially during the Covid-19 pandemic). Each project, with the exception of one, gives a central place to face-to-face communication, the creation of social ties, solidarity, and direct interpersonal encounters.

We can also sum up the limits of the comparison of the two workshops in this article. Firstly, we consider the limit of the different scales of time for each project (from one week to three months) but the participatory design and the use of fiction were mobilized in a comparable way to engage the students. Another limit can be the disciplinary backgrounds of the two groups of students (one

in design and humanities and the other one in sciences and technology) but the comparison of the two groups put the stress on the contribution on the visual, creative and narratives methods as well as design skills to favor the expression of each one in the co-design process. We can also underline the necessary skills for the team of teachers, researchers and professional designers such as a strong engagement to be able to dedicate some time for preparation of all the medias and mediation tools for the design fiction, and agility at the service of the participation approach to sustain the students' contribution to the collective research, during and after the workshops.

To conclude, we can highlight the different contributions to teaching and research in communication and media on the topic of digital sobriety.

The contribution to pedagogy was effective to sustain the student's ability to act in a world with limited resources relying on an eco-critical perspective. Our approach is framed in learning by doing (Polman, 1999), to move beyond traditional textbook approaches and interact with the students in ways that encourage them to become active science learners. It was important to make them learn through critical making and to renew teaching and research formats as a common way of exploring solutions with students. Finally participatory design as a pedagogical experimentation is close to Participatory learning Approach (PLA) in which the students are engaged as active participants in the full life cycle of homework, including in examinations (Shen and al. 2004). Indeed, in both experimentations, the students were included in the final evaluation in order to listen and share with the other students in a more engaging way but also to give them a voice in the selection of the best projects in terms of social and environmental impacts. Our contribution through the use of fiction is to help students prepare to act (to simulate risks situations in order to stimulate agency) on daily life tech in order to deal with these social, environmental and ethical issues. Beyond the binary opposition between utopias and dystopias, this approach is relevant to develop new imaginaries of the future of tech through uses scenarios, to sustain collective decision making processes and to manage situations of uncertainty. Innovation through withdrawal can be considered as stimulation of creativity to rethink uses by considering constraints as challenges for participatory design.

The contributions to research in communication and media are twofold : first of all, fiction and what we call « fiction for change » - to define our approach based on collective fiction to sustain changes and to enable people to act in world of uncertainties - was helpful to favor the emergence of alternative « cultural trajectories » for the design of technologies (Gras, 2013) including techno-discernment (Illitch, 1973), using precious resources only in the specific situations in which they are useful. Fiction can be considered as a playful feint (Schaeffer, 1999) and design fiction as a simulation/stimulation to prepare to act through the use of tangible objects or prototypes used as a way to trigger reactions and actions. This approach can enrich communication and media research to embody the trajectories of more sober technologies and explore the multiple voices/pathways of techno-discernment. Moreover, creative ethics of technologies (Catoir-Brisson, 2018) can contribute to open up new imaginaries of tech, if we define ethics as a process in tension throughout the project. Indeed, all technology carries specific values and standards built by those who designed it (Fabris, 2018). At the level of organizations, the relationship to ethics is made in a dynamic of tensions, between the values of the project and those of the organizations in which it fits throughout the design process, and especially according to the different actors who gravitate around the project. To deal with that complexity, creative ethics of technologies can be experienced at three levels in the project. At an individual level, the first one is related to the experience offered to the user and concerns the ethics of interaction design. At the level of the organization of a project, the second level is dedicated to the analysis of the design process of the collaborative project itself. It deals with the ethics of participation in the co-design process. The third one is related to the environmental level of the service ecosystem (as a soft, hard and human network). This approach answers to the necessi-

ty to pay attention to the quality of the experience offered, throughout the project and the decision-making process from the design of technologies to uses in situation.

To develop the perspectives of this research, we wish to reflect on the conditions of reproducibility of these experimentations with other students, in order to compare the solutions proposed but also the use of diversified media materials, adapted to the specificity of each group to support them in expressing their vision of the project. The in-depth exploration of the links between fiction, participatory design and imaginaries of technologies can also be a fruitful research perspective.

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