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# The Pleasure of doing the Right Thing: Designing Pro-Environmental Experiences with Industrial Design Engineering students.

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**Abstract:** Pro-Environmental Behaviour (PEB) is gaining relevance in society, since climate change is an ever-growing problem for everyone. Even though many people are willing to be more sustainable in their daily lives, engaging in Pro-Environmental practices is often considered difficult. Drivers like convenience, economy or lack of time, often end up ruining their willingness to save the planet. Using the Positive Practice Canvas as a basis, we led the students to discovering what the joy of Pro-Environmental Practices is for people that are already practising them. Then, they analysed the positive practices they gathered in order to find common patterns. Finally, based on those patterns they proposed new Pro-Environmental practices through design. This paper shows the definition and refinement of a proposed procedure, the creation of new materials to help students coping with the difficulties of incorporating psychological concepts into their design process and discusses the relevance of the resulting solutions for PEB.

**Keywords:** Pro-Environmental Behaviour, Experience Design, Design Education, Research tools, Psychology in Design

## 1. Introduction

Sustainability is a key issue for society nowadays. Although there are climate change deniers, the effects of climate change are increasingly evident and the consensus on the need to do something about it is widespread. A survey made in 2023 with over 30000 participants shows that the concern about climate change has grown up to 65% of people considering it “very serious” from 48% in a similar study in 2003 (Miller, 2023). The same study states that 71% of participants expect companies to actively support government action on climate change (Miller, 2023). Furthermore, especially population with children at home show a strong desire to live sustainably (66%) and are much more likely to do major changes in order to become more sustainable (42%). However, although half (50%)

say they would like to change their lifestyle “a great deal” to be more environmentally friendly, only 26 percent claim to have made “major changes” in the past year to reduce their impact.

The willingness to change habits towards a more Environmentally-friendly lifestyle is related to the concept of Pro-Environmental behaviour. This concept has been studied from many angles and disciplines and their findings are implemented in many public policies but also in the design of spaces, commodities, products and services. Most efforts have worked on externally influencing people’s choices into more environmentally friendly decisions, and few other attempts have tried to tackle the challenge from the viewpoint of people feeling satisfied about their behaviour or enjoying Pro-Environmental activities intrinsically.

In this paper we explore a specific design approach (related to the Positive Practice Canvas tool) being used not by senior or PhD level researchers but by bachelor students of Industrial Design Engineering. To do so, we adapt the proposed design process and create templates and examples to help students get through the thinking that is needed to understand terms from disciplines like psychology and apply them successfully to tackle major design challenges such as Pro-Environmental Behaviour.

How can design enable more people to engage on Pro-Environmental activities?

## 2. Background & context

### 2.1 Pro-Environmental Behaviour

Pro-Environmental Behaviour (PEB) can be defined from the actor’s standpoint and covers all behaviours undertaken by a single individual to reduce one’s negative environmental impact with a clear intention to change the environment (Blankenberg and Alhusen, 2019; Stern, 2000; Kollmuss and Agyeman, 2002). The topic has been researched from different perspectives and multiple disciplines, from psychology to economics and policy making.

According to Blankenberg and Alhusen (2019), the determinants of PEB can be classified in four major types: socio-demographic factors (personal capabilities), attitudinal factors, habits and contextual factors (such as individual, social and institutional factors). Research on psychology has worked on the creation of different theories and frameworks to help understand how Behaviour works (Ajzen & Fishbein, 1980) as well as the barriers and difficulties that arise when engaging people on active and continued PEB in their daily lives (Kollmuss and Agyeman, 2002). In that sense, the Model of Pro-Environmental Behaviour (Kollmuss and Agyeman, 2002) depicts a complex interplay between internal and external factors that influence PEB, as well as a series of barriers that difficult people to engage in a more successful way in environmentally-friendly actions in their daily lives.

Human beings are complex and even though knowledge about the emergency of climate change and the urgency to act responsibly is commonplace, there are many barriers for people with Environmental Concern to behave Pro-Environmentally. Blake (1999) depicts three barriers: individuality, responsibility and practicality, especially for people without a strong environmental concern. In those cases, environmental concern is not considered as important as individuality (e.g., laziness, lack of interest), responsibility (e.g., lack of trust on its usefulness) or practicality (e.g. lack of money or time) and therefore the PEB is not achieved. Although this model is limited and other authors have questioned its completeness, it sets a starting point for Design to break in:

Can Design provide solutions to help individuals overcome the barriers that prevent them from engaging in pro-environmental behaviour?

## 2.2 Current strategies for promoting Pro-Environmental Behaviour

According to research (Grilli & Curtis, 2021), five main strategies can be found when approaching Pro-Environmental Behaviour change:

- Education and awareness (EAA). This group strategy refers to approaches that provide pro-environmental information through advertising campaigns, newsletters, fliers and many other means. While this type of interventions are effective with highly motivated individuals, motivation alone does not always lead to Pro-Environmental Behaviours (Poortinga, Steg & Vlek, 2004).
- Outreach and relationship building (ORB). This group refers to activities that aim to enhance pro-environmental attitudes and behaviours, with a particular emphasis on fostering relationships among individuals in order to create an environmentally conscious community.
- Social Influence (SI). These strategies depend on the influence of individuals within close-knit communities, such as family members, friends, and neighbours. As humans, we place a great deal of importance on our relationships with others, and their opinions about our behaviour can have a significant impact on some people.
- Nudges and Behavioural Insights (NBI). This strategy focuses on making a desired green decision the most desirable one in a particular context. An example of NBI would be pre-setting the most environmentally-friendly option of a list as the default choice.
- Incentives. Lastly, an additional strategy for promoting PEB change involves rewarding individuals with either monetary or non-monetary incentives for engaging in the desired behaviours.

Most of these strategies rely on external triggers to modify people's behaviour. While EAA and ORB are effective with motivated users (Daut et al., 2014), they do not work well with profiles that are not motivated. Social influence (SI) places the responsibility for good behaviour on friends and family rather than on individuals themselves. Incentives may affect people's behaviour positively but they do not contribute to changing attitudes in favour of the environment.

In this paper, we consider that Pro-Environmental Behaviour should be targeted by focusing on intrinsic motivations instead of relying solely on extrinsic factors. We consider intrinsic motivation can lead to higher levels of commitment to PEB in the long run. We believe that enjoying pro-environmental activities can be as effective as relying on external motivations.

## 2.3 Gathering Positive Practices to Design richer experiences

Like we concluded in the previous section, making a specific pro-environmental activity more convenient or easier to perform does not necessarily guarantee that people will be more likely to engage in it. On the contrary, we consider that by identifying what makes a particular experience enjoyable and memorable, designers have the opportunity to incorporate those qualities into new experiences that people may be more likely to enjoy.

In order to do so, this paper explores Experience Design (Hassenzahl, 2010) as the basis to explore possibilities for human flourishing, in this case, through engaging in Pro-Environmental Experiences.

Hassenzahl (2010) defined Experience as the relationship between a person and “their world” mediated by action. In his book, Hassenzahl (2010) defines “a multi-level model to understand technology-mediated experiences as activities (the “What”) that are driven by the need of fulfilling psychological needs (The “Why”) through the interaction with technologies of any kind (the “How”)”

(Klapperich et al., 2018). From a design perspective, he claims that design usually focuses on the “What” and “How” levels of experience leaving the “Why” level behind when we focus on designing products. Thus, by designing experiences we are opening the conversation towards motivational issues rather than focusing solely on the product and its interaction.

Based on Hassenzahl’s model of levels of the Experience, Retegi (2016) proposed the Experience Canvas Model (ECM). This model (figure 1) establishes a set of five interconnected key elements that can be used to analyse, describe and define experiences. The central element is Action and the rest of elements revolve around it. When analysis design briefs or problems, the ECM allows the designers to have a more systematic viewpoint on the Experience.

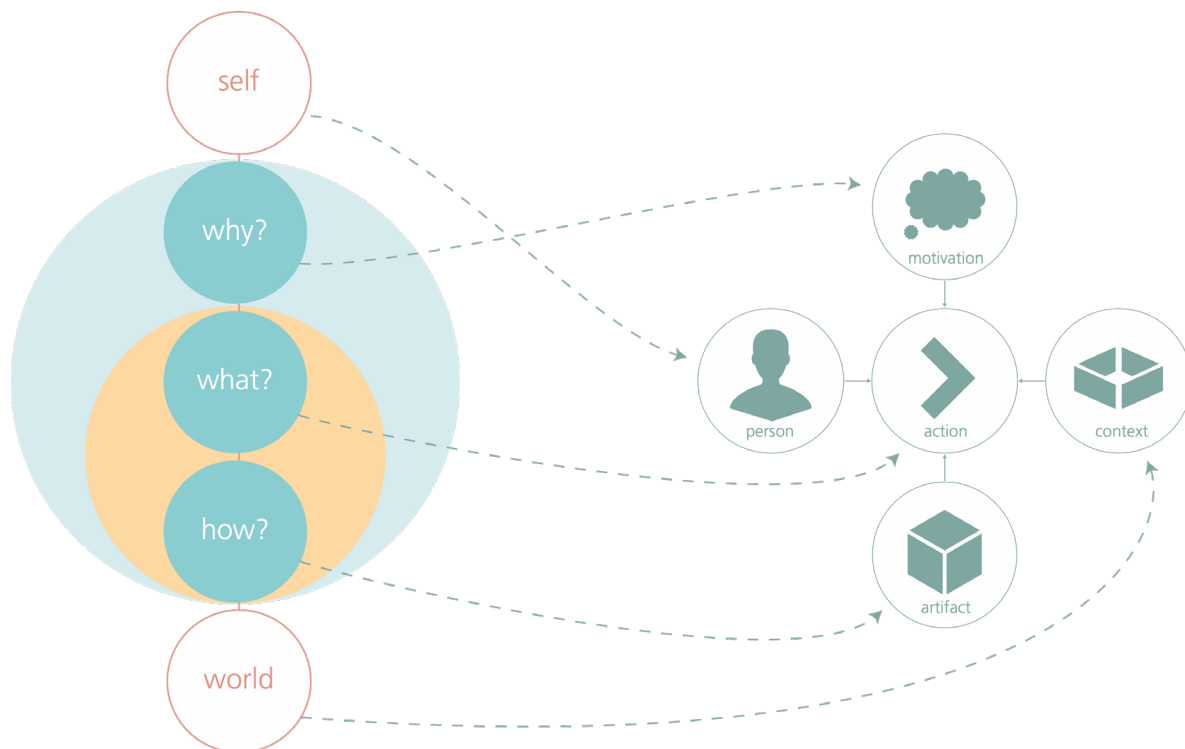


Figure 1. Transformation from Hassenzahl’s model of Experience(2010) into the Experience Canvas Model (Retegi, 2016).

Focusing on Experiences, specifically on the “Why” level of the Experience means that designers have to adapt their process to find motivation-related insights. Hassenzahl (2010) proposes using the Universal Psychological Needs defined by Sheldon et al. (1999) to understand human motivation. Specifically, Hassenzahl suggests that by analysing and understanding Positive Practices designers can identify which qualities make those practices pleasurable. By translating those qualities to new contexts, designers are able to create new meaningful experiences.

## 2.4 The Positive Practice Canvas

The Positive Practice Canvas (PPC) is a tool proposed by Klapperich and colleagues (2018) to guide design researchers in identifying, clustering and analysing Positive Practices. This tool is based on Shove et al.’s (2012) model of social practices and Hassenzahl’s notion of psychological needs (2010). To be able to analyse the “Why” level of experience, Klapperich et al. (2018) focus on the concept of Practices. In their view, Practices are “theoretical entities which help to better understand the interrelation between the levels of Experience” (Klapperich et al., 2018). Exploring Positive Practices related to any given topic can provide highly relevant insights and help us identify desirable qualities for new meaningful Experiences.

The PPC is a visual interview guideline to help designers spotting insightful practices while performing interviews. The guideline is designed as a template that, after performing an interview, will serve as a notepad where Positive Practices and their qualities will be collected.

In this study, we test this tool to help us identify and gather Positive Practices related to Pro-Environmental Behaviour with bachelor Industrial Design Engineering students.

## 3. Development of the study

### 3.1 Overview

The main objective of the project was to test if the Positive Practice Canvas method could be used successfully by bachelor level third year students of Industrial Design Engineering to respond to challenging problems like engaging user on Pro-Environmental Behaviour.

In order to do so, the design process suggested in the Positive Practice Canvas was analysed and adapted to fit the design brief and academic objectives of the course “Experience and Service Design” where the project is integrated. Additional material was created in order to ensure the students could have as much support as possible in understanding and using the PPC. Finally, after the students carried out the project, an analytic evaluation of the outcome was made.

### 3.2 The Positive Practice Canvas procedure

This is the underlying design process that is proposed to use the Positive Practice Canvas (Klapperich et al., 2018):

1. Define the topic to be addressed.
2. Select and reach participants which can provide positive practices related to that topic.
3. Perform semi-structured interviews using the PPC. The Positive Practice Canvas is a guide for the interview materialised in a template that is folded in a particular way. The researcher can unfold it along the interview so that it can be helpful to guide the interviewing process; some parts are highlighted when discussing specific issues so that information can be gathered in a smooth way. The PPC template has six sections:
  - Profile. Relevant information about the participant.
  - Practice. Put a label or meaningful name to it and describe the practice shortly.
  - Meaning. Why is this practice important for the participant?
  - Needs. Link the meaning described by the participant to specific Universal Needs. Although this analysis will be made after the interviews, it is suggested that the link can be discussed with the participant using questions from Sheldon’s questionnaire for clarification.
  - Skills. What skills are needed to perform the practice? Shared reflective discussion.
  - Materials. What kind of materials do you use to perform the practice? Details might be insightful when describing practices

After performing multiple interviews, cluster the social practices that have been collected and identify patterns among them.

4. Design based on the outcome of the PPC. After the Positive Practice Canvas is used, the designer will have a collection of interconnected positive practices that can be

used to inform the design process. The authors of the canvas suggest a number of strategies that could be used to design based on that information:

- a. “Anecdotal design”. An exceptionally good practice could inspire a design proposal. Thus, the outcome could be used to inspire new experiences.
- b. “Making it more likely for people to engage in a practice”. Remove barriers that keep people from engaging in positive practices. The PPC can highlight those barriers.
- c. “Combining individual positive practices into an ideal practice”. Create an ideal, more complex practice or experience that builds upon practices from different people.
- d. “Transfer insights from positive practices to new areas”. Understand the underlying structure of a positive practice and implement it in a completely different context.
- e. “Justify ideas during the design process”. Use positive practices to help understand experiences within a design process.

The Positive Practice Canvas, as described in literature (Klapperich et al., 2018) is a helpful guide that is created in an academic research context. However, the process requires to be used a little differently in order to be used by bachelor students such as the ones this study is aiming at. Therefore, we developed a specific procedure for the project as well as specific tools and examples.

### 3.3 Proposed design process

To facilitate the project's development with the students, a step-by-step process was established, which consisted of three parts: Data collection, Analysis and Design. To provide a detailed explanation of each of these parts, the following section will outline the step-by-step process established for the project's development with the students.

#### Part 1: Data collection

1. Define the topic to be addressed.

The topic was determined for each student in the design brief. We gave them a list of five relevant topics regarding Pro-Environmental Behaviour: Energy Efficiency, Zero Waste, Sustainable Mobility, Conscious Consumption and Repairing the Earth. A set of examples of Positive Practices linked to each of them was provided (table 1). Students could focus just on one of them, analyse different specific practices or come up with other related practices as a starting point.

*Table 1. Topics and examples of pro-environmental behaviours provided to the students*

ENERGY EFFICIENCY	ZERO WASTE	SUSTAINABLE MOBILITY	CONSCIOUS CONSUMPTION	REPAIRING THE EARTH
Use of stairs instead of the elevator	Eat food leftovers	Use public transportation	Grow your own food	Plant trees
Switch off devices on standby (tv, monitor, laptop...)	Eat/cook unusual parts of food	Walk, bike or use other alternatives to commute	Buy ecological and/or fair-trade food	Help animals and plants
Switch off lights when leaving a room	Do not buy single-use packaging	Car-sharing	Reduce shopping	Support pro-environmental organisations

Take shorter and colder showers	Fix devices instead of buying new ones	...	Rethink a purchase before making it	Collect garbage from nature: ocean, beaches...
Lower room heater temperature	...		Buy longer lasting products	...

2. Select and reach participants which can provide positive practices related to that topic.

The selection of participants, their profile and number of interviews that were required was up to each student, as well as the preparation of the interviews and the materials they might require to make them. Transcriptions of the interviews were required.

3. Perform semi-structured interviews using the-Positive Practice Canvas

In this project, the Positive Practice Canvas was replaced with the Positive Practice Template (PPT, figure 2), which is a simplified version of the PPC. Each Positive Practice had to be presented in one template and a minimum of six of them were required.

Even though in the original approach, each Positive Practice should be linked to one or more Universal Need on the spot, we did not ask the students to make those connections when making the interviews. We consider reflecting on Needs while making interviews meant adding unnecessary complexity to the task. Instead, we proposed to do that later in the Analysis part of the project.

Name:  
Age:  
Short bio:

Figure 2. Positive Practice Template (adapted from Klapperich et al., 2018)

## Part 2: Analysis

After the interviews were performed, we proposed the students to analyse the information they gathered with the Positive Practice Templates in a specific way. In order to give them further guidance, we provided visual schematic examples of how the analysis could be done.

The analysis stage was divided in four steps:

1. First, we asked them to link the motivation of each Positive Practice to one or more Universal Needs (Sheldon et al., 1999). We provided them with Need Cards (Hassenzahl et al., 2010) that explain them in a way that it can be useful for designer to understand them and associate them to the motivations underlying each Positive Practice.
2. Secondly, we instructed the students to cluster the positive practices according to universal needs. If a practice was associated with multiple needs, it would be included in both clusters. While we encouraged the students to make creative connections, we also provided a visual example of a pattern and insight analysis map (Figure 3) to guide them.

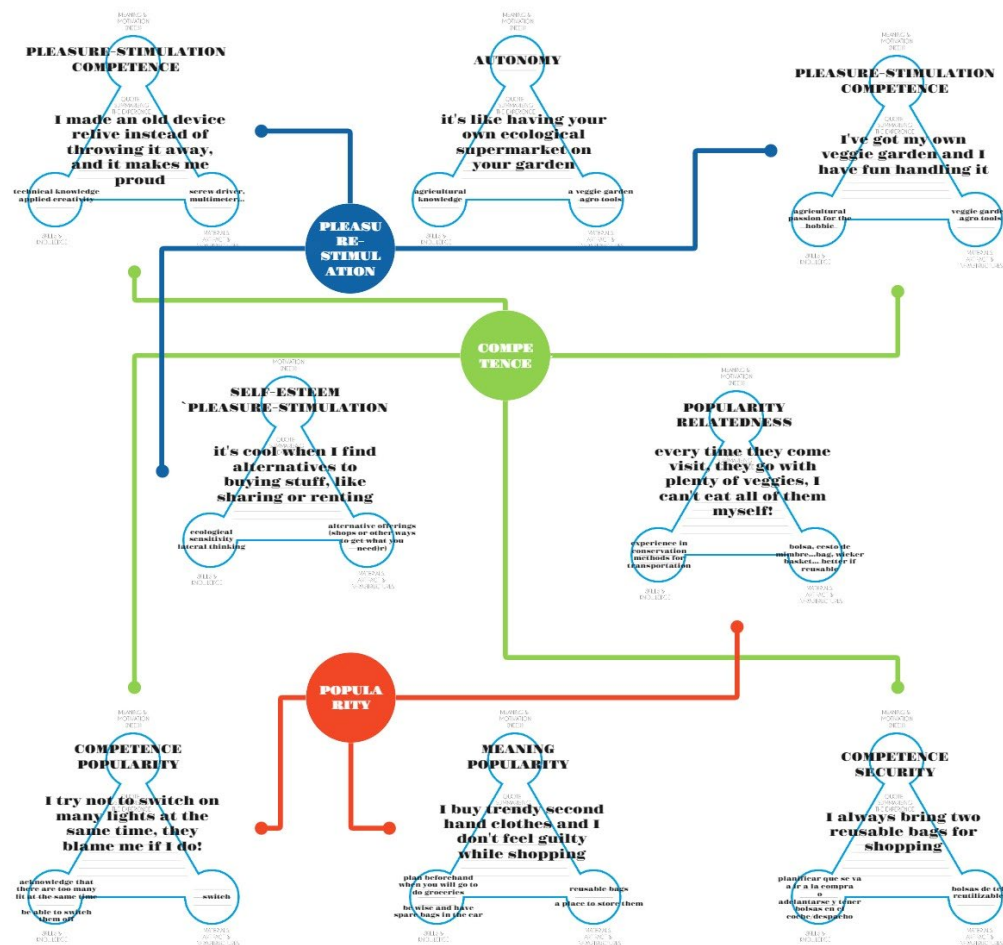


Figure 3. Example of an alternative pattern analysis map that was provided to the students (Retegi).

3. To better understand the connections they made, we recommended that they group the main quotes from the positive practices by needs, as shown in the example in Figure 4.



## PATTERNS-INSIGHTS DETECTED USING UNIVERSAL NEEDS



Figure 4. Summary page of examples of Positive practices clustered by Needs.

- Then, we prompted the students to identify potential design opportunities and patterns among the positive practices. We asked them whether it was feasible to create new experiences based on these practices, to encourage individuals who don't typically engage in pro-environmental behaviours to adopt more sustainable actions. To assist them in this task, we provided a visual example of different patterns and design opportunities (as seen in figure 5), with each pattern described as a quote and positioned near the corresponding practices that inspired it. We expected the students to create similar visual representations in their own projects, and we also included some product examples that fit these patterns to serve as inspiration.

## PATTERNS-INSIGHTS DETECTED USING UNIVERSAL NEEDS

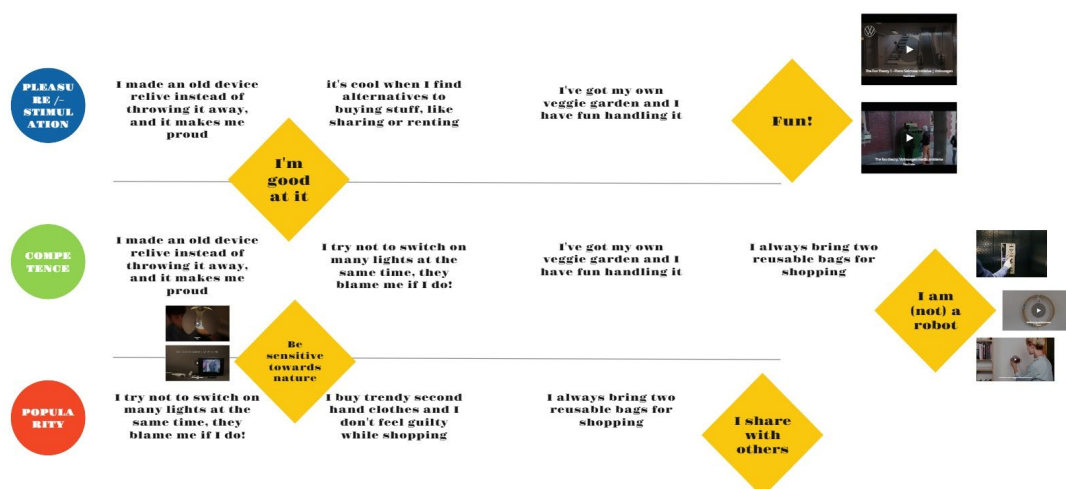


Figure 5. An example of patterns and insights detected around clustered positive practices.

### Part 3. Design a solution

In the last stage of the process the students were asked to design a new experience. Based on their findings, we encouraged them to brainstorm ideas that could potentially respond to the challenge at hand. After selecting the final idea, they were asked to shape the experience through a written description, a simple storyboard and a conceptual sketch. On the contrary to the structured approach followed in the previous steps, this last phase was intentionally kept open-ended, allowing the students to have the freedom to define and shape their projects their way.

## 4. Results

The project was carried out as part of the course “Experience and Service Design Lab” by 48 design students with the supervision of the authors of this paper. The project was developed along three weeks. Students combined individual home working time and guided work time in class. The final deliverable was a written report including the whole process. Altogether, in their projects, students gathered 296 Positive Practices related to Pro-Environmental Behaviour and clustered them to Universal Psychological Needs (Sheldon et al., 1999) to end up proposing a design concept per student. In this section we will analyse the Practices and the Needs that were attributed to them and introduce five project examples (one per topic).

### 4.1 Examples of resulting experiences

We selected one project from each topic out of the 48, to showcase the design outcome that can be achieved through this approach (Figure 6).

#### Energy efficiency

The device is a mobile phone charger with a mechanical auto-unplugging system that must be programmed by the user based on their individual needs. The user is responsible of programming it when they need it. It fulfils the Needs of Competence (*“I am able to minimize electric consumption to fit my needs”*), Autonomy (*“I can use it whenever and wherever I need”*), Security (*“it is my daily routine to charge the phone like that”*) and Meaning (*“I am saving money and saving the planet”*).

#### Zero waste

The proposed solution is a global competition of producing the least waste possible. Through an app, the waste disposal every user does is monitored. By the end of the year, everyone can see your yearly waste as well as their position in different ranking (global, local, group of friends, family...). Top ranked “waste managers” get highlighted and are encouraged to share strategies and tricks to avoid creating waste. The design fulfils the Need for Popularity (people do not want to be down in public rankings), Stimulation (keeping track of how your position can be addictive) and Competence (you master your waste reduction skills while trying to keep it low).

#### Sustainable Mobility

The design proposal is a carpooling service which is focused on daily commutes, immediacy and the ability to choose who you travel with advanced search filters. The concept fulfils the Needs for Autonomy (*“I can travel the way I want when I need it”*), Security (*“I build a new habit of sharing a car to go to the university”*) and Luxury (*“it is a luxury to use a car to commute”*).

#### Conscious consumption

This proposal is an internet browser extension that allows the users to rethink about online shopping on the spot. The app or extension pops up whenever you are about to make an online purchase. The service analyses your shopping cart and asks you if you really need to buy that item. It also offers an

overview of your last online purchases along time and offers alternative solutions to buying the product you are aiming for. *"It is too easy to buy online"*. The Service fulfils the need for Competence (being able to avoid compulsively buying things you probably don't need).

## Repairing the Earth

Finally, the last design proposal is PixelPlant, a smart composting container that encourages urban compost making. The system monitors the compost that an urban user makes when the compost is put in the containers. When the use of it is optimum, the user watches a virtual flower grow, while they know that the waste they generate is being used by rural members of the community. The design fulfils the Needs for Competence (*"the flower grows if you are making the compost right"*), Relatedness (*"you are contributing to the community with your compost"*) and Meaning (*"your waste is somebody else's gain"*).

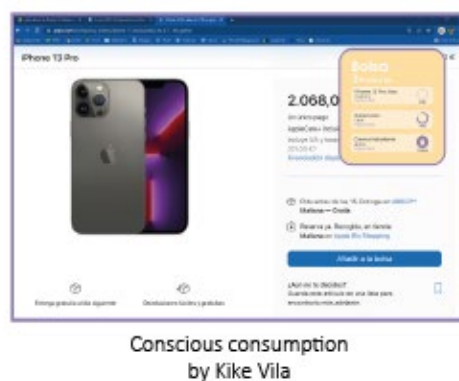
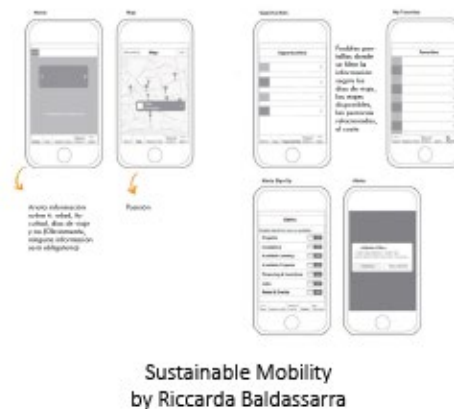
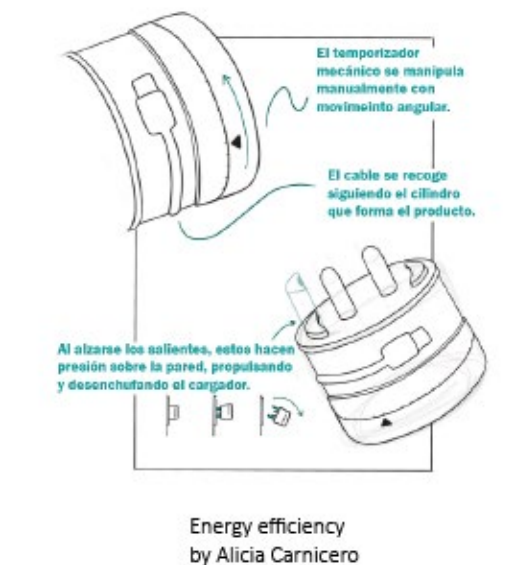


Figure 6. Visual representation of student proposals for the five topics.

## 4.2 Understanding the significance of Universal Needs in Pro-Environmental Practices

In this section we will quantitatively evaluate the way the Positive Practices collected by the students have been linked to the Universal Psychological Needs by comparing the recurrence of each of them. The results presented here cannot be considered scientifically rigorous due to the way data collection and analysis has been done by the students. Nevertheless, the findings can provide valuable insights into how design students interpret the data as well as providing insights about the motivations behind Pro-Environmental Behaviour.

On one hand, table 2 presents a ranking of the ten Universal Needs that correspond to the Positive Practices collected in the project. In order to have a comparable scale among different needs and the number of practices associated to each of them, we set the Need with the highest number of Practices linked to it as 100%. Then, the rest of Needs were compared to it.

*Table 2. Overall Need ranking for Pro-Environmental Practices.*

Overall Ranking	Universal Need	Relative recurrence %
1	Self-realisation - Meaning	100
2	Pleasure-stimulation	89
3	Autonomy	87
4	Self-esteem	67
5	Competence	52
6	Relatedness	48
7	Physicalness	46
8	Security	40
9	Money-luxury	40
10	Popularity-influence	19

According to Table 2, the most relevant motivations for people that engage in Pro-Environmental activities are Self-realisation - Meaning, Pleasure - Stimulation and Autonomy. It's not surprising that Meaning is the most relevant Need among them all, as personal growth is one of the primary motivators for pro-environmental behaviour. Contrary to what one might expect, Pleasure-stimulation and Autonomy ranked much higher than Money-Luxury or Popularity-Influence. This might mean that people who engage on PEB do so because they enjoy the pleasure and the stimulation that performing such actions brings them rather than the economic benefit that it might result on. Similarly, the numbers suggest that the interviewed people value the internal satisfaction of doing the right thing more than the external impression that one might generate on other people (i.e. Popularity). If that is right, social influence and economic motivations might not be as important as we initially expected and therefore the use of Incentives and Social Influence might not be the most effective strategies for Pro-Environmental Behaviour.

On the other hand, in table 3 we can see the relative recurrence of Needs for each of the topics covered by students.

Table 3. Need ranking for Pro-Environmental Practices by topics.

Universal Need	Energy efficiency	Zero Waste	Sustainable Mobility	Conscious consumption	Repairing the Earth
Self-realisation - Meaning	<b>100</b>	<b>100</b>	<b>100</b>	23	<b>100</b>
Pleasure-stimulation	73	<b>65</b>	35	<b>100</b>	<b>81</b>
Autonomy	<b>84</b>	<b>82</b>	<b>100</b>	<b>84</b>	52
Self-esteem	<b>79</b>	39	17	<b>94</b>	47
Competence	36	48	17	68	42
Relatedness	15	39	41	26	<b>67</b>
Physicalness	26	4	<b>94</b>	52	24
Security	73	26	53	5	9
Money-luxury	68	13	58	26	0
Popularity-influence	16	13	6	5	33

For clarity, the most and least relevant needs for each topic are shown in descending order in table 4, which will be used as the basis to this part of the analysis.

Table 4. The most and least relevant needs for each topic.

	#1	#2	#3	#8	#9	#10
Energy efficiency	Self-realisation - Meaning	Autonomy	Pleasure – stimulation	Physicalness	Popularity – influence	Relatedness
Zero Waste	Self-realisation – Meaning	Autonomy	Pleasure – stimulation	Popularity – influence	Money – luxury	Physicalness
Sustainable Mobility	Self-realisation – Meaning	Autonomy	Physicalness	Self – esteem	Competence	Popularity - influence
Conscious consumption	Pleasure – stimulation	Self-esteem	Autonomy	Self-realisation-Meaning	Security	Popularity
Repairing the Earth	Self-realisation – Meaning	Pleasure – stimulation	Relatedness	Physicalness	Security	Money - luxury

If we look the topics separately and focus on the top 3, we can find significant differences among them. Conscious consumption is the only topic where Meaning is not the most important need and it ranks #8. Autonomy on the other hand, while it ranks lower in average than Pleasure-stimulation, it is the only Need that never scored below 50%. Relatedness ranks relatively low, while it makes the top three in Repairing the Earth. The reason for this may be that these activities are often carried out by volunteer groups and communities. Finally, Physicalness is relevant just for Sustainable Mobility, suggesting that people enjoy the physical dimension of biking or walking in their daily lives.

## 5. Challenges and limitations of the process

The implementation of the Positive Practice Canvas by students has been successful. Despite being a relatively complex tool that requires reflective skills and intellectual effort to fully grasp, most students found the use of the Positive Practice Canvas beneficial for their projects, and specifically for Pro-Environmental Behaviour related projects. In the following section, we will present a critical evaluation of the process and the most relevant obstacles encountered during the project.

### **Setting up the starting point and finding participants**

Some practices were fairly easy to find people who engage on them (energy efficiency, zero waste or sustainable mobility) while others were more difficult. For this reason, some of the sub-topics were selected by many people working on them (for example, use of single-use plastics, conscious shopping or food waste) while others were avoided. The ones linked to energy efficiency and repairing the Earth were found to be less likely to find suitable participants.

### **Preparing the interviews and making them**

Since it was the first time the students were working this way, the interviewing part was problematic. Some students were unable to foresee what kind of questions could help them advance. However, the fact that the topics are familiar to everyone in general helped students focusing on basic questions and adapt their next interviews based on what they learnt from them.

### **Understanding and linking needs to practices**

Needs sometimes were misunderstood or wrongly identified. Self-esteem and self-realisation were selected instead of the more accurate Popularity or Competence in some cases. In other cases, the name of the need confused some students, since they understood them differently to how they are described in the Need cards. “Security” is often confused with “Safety” (in Spanish they are the same word) while “Physicalness” was often linked to healthy habits. Finally, “Relatedness” was mistakenly understood as “closeness” in the context of mobility, due to the Spanish word used to describe it (“cercanía”). Apart from language related confusion, some students also got some needs messed up.

All in all, the description of the Needs is accurate and valid, but it would be interesting to deepen into them to avoid confusion.

### **Finding patterns and creating design proposals linked to the findings**

After following the whole process, the most decisive step is the connection between the findings and the final design idea. While most students could come up with relevant ideas, some others ended up with disconnected concepts. This can be due to the difficulty of the topic of Pro-Environmental Behaviour, but also due to the fact that getting familiar to any new knowledge. Some students came up with design concepts that were very similar to examples that we provided in class, more specifically in the examples shown in figure 5.

Overall, the process followed by the students has facilitated a shift in their thinking patterns, leading to novel user research strategies and approaches to design. Although not all of the patterns and insights have been translated into successful design solutions, the process has proven to be valuable for design students to develop their analytic skills, critical thinking and creativity from a different angle.

Further work is needed in order to make the process smoother, easier to understand and apply for students. Furthermore, it would be very interesting to test the tool in a non-academic environment

where more skilled and experienced designers could try out the tool and show their point of view on it as well.

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