

Designing for *Behavior change*

Identifying design components that encourage and empower
individuals to act in environmentally responsible ways

THESIS DOCUMENT

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Designing for Behavior Change

Identifying design components that encourage and empower individuals to act in environmentally responsible ways

A thesis submitted to the School of Design,
Carnegie Mellon University, for the degree of Master of Design
in Communication Planning and Information Design

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“Only one side of learning is made up of facts; the other consists of stories—that is, ideas and images.”

—Richard Saul Wurman 2001, 79

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*“...design as activism is optimistic and
action-based. When design is activism,
design is a verb.”*

—Emily Pilloton 2009, 22

Abstract

Many designers today are creating communication materials that encourage individuals to change their behavior related to environmental issues. The problem is that people are often unaware of existing research on effective methods for these communications. For example, environmental psychologists have studied best practices for creating persuasive communications for several decades.

During this yearlong master's thesis project, I conducted my own research studies, exploring how the emotional tone and medium of a communication piece affect a person's decision to change his or her behavior. My second goal was to connect designers to existing research in the fields of psychology, decision sciences, and persuasive technology.

In the end, I created a roadmap to behavior change: a compilation of research from my own studies and existing literature. The roadmap includes observations and practical tips people can use when designing for environmental issues, as well as a set of ethical principles that should be followed when designing for behavior change.

I believe that my work will help designers use communication to empower individuals with knowledge, encouraging them to begin and sustain a journey toward positive behavior change.

Thank you

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Introduction

CONTEXT

Designing for behavior change is a hot topic today. Those of us who want to inspire behavior change use communication methods, such as posters, websites, and videos, to increase awareness and encourage action on issues as varied as obesity, breast cancer, and water conservation. When addressing environmental issues, we often use an educational approach, hoping that increasing awareness of the negative environmental effects of a particular behavior will cause audiences to change their behavior.

In practice, however, studies from the field of psychology have shown that educational approaches are limited in what they can achieve. In fact, environmental psychologists have studied best practices for creating persuasive communications for several decades, building a substantial body of literature with specific guidelines for designing campaigns (Bator and Cialdini 2000; National Research Council 2002; Gardner and Stern 1996). The problem is that many people who are designing such campaigns remain unaware of these guidelines, or use methods that have already been shown to be ineffective.



An exhibit on climate change at the Academy of Sciences in San Francisco encourages visitors to take action



In "The Story of Stuff," author Annie Leonard urges viewers to consume less (www.storyofstuff.org)

PROJECT GOALS

In this document, I will share the process and results of my yearlong Master's thesis project. I had two main goals during this project. My first goal was to explore answers to the following questions:

How does the medium and delivery of information affect viewers' understanding of the effects of their behavior on the environment?

Within the preferred medium, how does the emotional tone of the sound, images, and verbal language enhance the persuasive effect of the design?

My second goal was to point designers toward resources that I hope will enable them to design more effective campaigns for behavior change. Although I was especially interested in bridging the knowledge gap between design and environmental psychology, I also looked at insights from the fields of cognitive psychology, decision sciences, and persuasive technology. I felt strongly that if designers could be connected with this wide variety of resources, they would be better equipped when designing campaigns aimed at behavior change. This goal eventually inspired me to write and design a resource to assist people who create communication pieces for environmental issues.

PROJECT SCOPE AND CONSTRAINTS

During this project, I focused on using an educational approach to encourage individuals to change their habits. I did this with a full awareness that individual behavior change must often be accompanied by change at the social, cultural, or political level. Focusing on individuals helped me to maintain a reasonable scope for this one-year project.

I also chose to focus on designing for communication, for three reasons.

First, I am familiar with communication design and use it in my own practice often, but I had not yet explored in-depth how specific components (such as medium and emotional tone) affect individuals.

Second, although communication materials are widely used by non-profits and governmental agencies, I believe communication design has been largely overlooked by the recent design for behavior change movement. There is currently a lack of recommendations for the people who design educational campaigns, especially campaigns for environmental issues.

My third reason was that I believe informing audiences about an issue can help circumvent potential ethical issues with persuasion. I will return to this argument again in this document.

Over the past year, some people have asked me why I did not focus on literature from the disciplines of advertising and marketing. Although I did research theories of attitudes and attitude change, which are often used in advertising, I soon found that the type of persuasion I was interested in differed from the type of persuasion used in advertising. Instead of trying to sell a product or brand, my research was focused on educating audiences about an issue and helping them to make decisions about their personal habits. While advertising often focuses on tangible, short-term desires, environmentally responsible behavior change aims toward less tangible, long-term results.

LITERATURE REVIEWED: SELECTED WORKS

McCoy, Katherine. 2000. "Information and Persuasion: Rivals or Partners?" *Design Issues* 16 (3).

Norman, Donald A. 1993. *Things That Make Us Smart: Defending Human Attributes in the Age of The Machine*. Cambridge, Ma: Perseus Books.

Norman, Donald A. 2004. *Emotional Design: Why We Love (or Hate) Everyday Things*. New York: Basic Books.

Lockton, Dan, with David Harrison and Neville A. Stanton. 2010. *Design with Intent: 101 Patterns for Influencing Behaviour Through Design*. Windsor, Berkshire, UK: Equifine. http://www.danlockton.com/dwi/Main_Page.

Relevant work

When I first began to define my thesis project, I was particularly influenced by Katherine McCoy's article, "Information and Persuasion: Rivals or Partners?" In this piece, McCoy argues that communication designers' view of persuasion as "manipulative" or "distasteful" is unjustified, because information and persuasion are "modes of communication that overlap and interact" (80). McCoy points out that all information designers use rhetorical devices, which can be as simple as boldface text highlighting someone's name (83). This article, though only a few pages long, helped spark my thesis project by leading me to consider exploring the complex interaction between information and persuasion.

During my literature review, I looked at the work of several renowned information designers, including Edward Tufte and Richard Saul Wurman. The designer whose work I found most relevant, however, was Donald Norman, whose approach beautifully connects human-centered design and cognitive psychology. From *Things That Make Us Smart*, I learned about the difference between what Norman terms "experiential cognition" and "reflective cognition." Because reflective cognition is a state of "comparison and contrast, of thought, of decision-making" (16), I decided early on that I wanted to aim toward fostering and encouraging reflection through my work. I was also influenced by *Emotional Design*, as it related to how emotions affect our learning process. Norman states that positive emotions facilitate curiosity, creativity, and learning (26), an idea that I referred back to many times throughout the year.

I also looked at the work of Dan Lockton, a product designer whose PhD research focuses on design for behavior change related to social and environmental issues. This is documented on Lockton's blog (<http://designwithintent.co.uk/>). One of Lockton's most influential works, which is recommended as a resource by the AIGA Living Principle website, is his *Design with Intent* toolkit (Lockton 2010). This toolkit features 101 patterns used by designers to influence behavior, and is meant both as a reference and as a way to provoke discussion and "inspire brainstorming or idea generation." After reading through the toolkit, however, I was troubled to find that it also includes

unethical patterns such as “Degrading Performance,” “Slow Response,” and even “Threat of Injury.” Lockton points out in his introduction that some of the techniques he included are considered unethical, and I understand that he is not endorsing these methods, but rather is attempting to bring attention to them. However, I wonder whether, instead of taking a neutral approach, Lockton might have included some commentary along with the more blatantly manipulative methods. By showcasing them in the same way as the more benign design methods, I believe he is implicitly giving equal value to the less ethical ways of designing.

I also looked at research from the emerging field of persuasive technology. This movement has generated a great deal of attention, particularly through the work of the Stanford Persuasive Tech Lab and its director, BJ Fogg (<http://captology.stanford.edu/>). Many designers have embraced persuasive technology because of its focus on creating products and influencing users through design, and I was interested in whether the research developed by Fogg would be relevant to my thesis project. Although I read Fogg’s book *Persuasive Technology*, I found his online resources more useful.

Fogg, BJ. 2003. Persuasive Technology: Using Computers to Change What We Think and Do. San Francisco, CA: Morgan Kaufmann Publishers.

Fogg’s Behavior Grid.
www.behaviorgrid.org/.

Fogg’s Behavior Model.
www.behaviormodel.org/.

Fogg’s Behavior Grid helped me to realize I was interested in encouraging participants to change their behavior for a particular duration of time. This is called a “Span” behavior, and helps to ease the transition into long-term, or “Path,” behavior change. Fogg’s Behavior Model shows the relationship between motivation and ability, and this spurred me to think about my audience’s ability to change. Interestingly, I later found during my research that someone’s perception of his or her ability to perform a behavior is actually quite subjective, a point that I do not think Fogg addresses in his model.

While examining Lockton and Fogg’s work, I was somewhat disappointed that neither author had, in my opinion, satisfactorily addressed the ethical issues that I felt surrounded the areas of persuasion and design for behavior change. I was therefore relieved to come across Bernardine Atkinson’s article,

Atkinson, Bernardine M.C. 2006. "Captology: A Critical Review." In *Persuasive Technology: First International Conference on Persuasive Technology for Human Well-Being, PERSUASIVE 2006, Proceedings*, edited by Wijnand IJsselstein, et al., 171–182. Berlin, Germany: Springer.

Maio, Gregory R., and Geoffrey Haddock. 2009. *The Psychology of Attitudes and Attitude Change*. London: SAGE Publications Ltd.

Kahneman, Daniel, Jack L. Knetsch, and Richard H. Thaler. 1991. "Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias." *Journal of Economic Perspectives* 5(1): 193–206.

Janis, Irving L., and Leon Mann. 1976. "Coping with Decisional Conflict." *American Scientist* 64 (December): 657–667.

Gardner, Gerald T., and Paul C. Stern. 1996. *Environmental Problems and Human Behavior*. Boston: Allyn and Bacon.

in which she argues that it is only ethical to attempt to change someone's attitude, belief, or behavior if the user is "aware of the intention from the outset of their participation with the program" (179). Atkinson makes a convincing case for the ethical benefits of using advocacy and education as ways of communicating. Although I personally do not believe that persuasion is inherently wrong, I welcomed Atkinson's viewpoint because it helped me to decide that I would focus on education in my thesis project. Her article, along with Emily Pilloton's introduction to *Design Revolution*, provided me with the impetus to develop my own ethical principles for designing for behavior change.

I felt I could not conduct research on behavior change without gaining a basic understanding of psychology and decision-making. For this reason, I read *The Psychology of Attitudes and Attitude Change* by Maio and Haddock, from which I gained a non-threatening introduction into theories of attitudes and behavior. I also took a class at Carnegie Mellon, "Intro to Behavioral Decision Making," during which I encountered an article by Kahneman, Knetsch, and Thaler on heuristics and biases. Through this article, I learned about the theory of loss aversion and the status quo bias. Reflecting on these theories allowed me to consider how I could frame behavior change as a gain, not a loss, and how to help individuals overcome the hurdle of leaving the status quo. Another article I read during this class, "Coping with Decisional Conflict," looked at how stress affects decision-making. The authors argue that both an absence of stress and a very high amount of stress lead to unhealthy ways of coping with decision-making, but that a moderate amount of stress helps us to carefully consider our options and make responsible decisions. I came back to this theory later on during my research studies with participants.

Finally, I looked at a great deal of research from psychologists interested in environmental issues in particular. Reading this literature was exciting, because I felt I had found a treasure trove of ideas and tips for creating campaigns for environmental issues. Many of these were quite relevant to my work. For example, I learned that education and information alone are

often not enough to change behavior, but rather, should be considered as one part of a more robust campaign (Gardner and Stern 1996, McKenzie-Mohr 2000, Schultz 2002, Stern 2002). Gardner and Stern's *Environmental Problems and Human Behavior* was particularly helpful in pointing out specific situations in which educational approaches can be successful at changing behavior, and outlining ways to effectively frame and deliver messages.

I was also influenced by Stephen Kaplan's viewpoint that an altruistic approach to environmental issues can lead to unintended and negative consequences, causing people to feel helpless (491) and guilty (500). Kaplan's writing inspired me to focus on ways of encouraging change without focusing on altruism or guilt.

Through these readings, I gained practical tips to put into practice, and I also began to question why more designers were not taking advantage of this existing research. I was particularly inspired by a quote from one author, who told his fellow researchers:

"We have created a psychological literature that is largely invisible to those who can most benefit from it. [...] In short, until we reach out to the individuals who design and deliver environmental programs, our efforts will remain invisible to those who can most benefit from them."

—McKenzie-Mohr 2000, 544

It was while reading these works that I solidified my second thesis project goal of connecting those who design communications for environmental issues to existing research and resources.

McKenzie-Mohr, Doug. 2000. "Promoting Sustainable Behavior: An Introduction to Community-Based Social Marketing." *Journal of Social Issues* 56(3): 543-554.

Schultz, P. Wesley. 2002. "Knowledge, Information, and Household Recycling: Examining the Knowledge-Deficit Model of Behavior Change." In *New Tools for Environmental Protection, by the National Research Council*, 67-82. Washington DC: National Academy Press.

Stern, Paul C. 2002. "Changing Behavior in Households and Communities: What Have We Learned?" In *New Tools for Environmental Protection, by the National Research Council*, 201-211. Washington DC: National Academy Press.

Kaplan, Stephen. 2000. "Human Nature and Environmentally Responsible Behavior." *Journal of Social Issues* 56(3): 491-508.



Case study

During my own research studies, I chose to encourage people to drink less bottled water, due to its effects on the environment. I chose this topic because it is a common everyday habit. In the U.S., for example, we consume an average of 1,500 disposable bottles of water per second, and producing, shipping, and disposing of these bottles uses up extraordinary amounts of natural resources (Leonard, “The Story of Bottled Water”). Although many people are unaware of bottled water’s effects on the environment, the barriers to behavior change are relatively low, since most U.S. residents have access to clean tap water. Because of the widespread unawareness of this issue, and the low barriers to change, an educational approach to behavior change made sense.

I also focused on adults between the ages of 25 and 40 years old, who were not full-time students and did not consider themselves environmental activists. People in this generation interested me because they generally have a desire to help others, but did not grow up with the ubiquitous emphasis on being “green” that many children experience today. Because of these characteristics, I felt that this demographic presented an opportunity for behavior change through learning and exposure to the issue.

Artifact review

Before beginning my research with participants, I conducted a review of campaigns and information design dealing with the specific issues of water conservation and plastic consumption. While reviewing 19 artifacts, I looked for commonalities, benchmarks, and places for improvement (see Diagram 1).

Using statistics was a common trend. Some works in particular, such as MSLK's "Watershed" exhibit, and Chris Jordan's "Plastic Bottles," use visualizations to show how many plastic bottles we consume daily. Since the numbers are so high, these types of visualizations can leave a powerful impression on viewers; on the other hand, they can also backfire by showing audiences that the behavior is acceptable, or leading people to believe that any individual change on their part will be ineffective. Because of this, I decided that in my own work during the year I would focus more on the *desired* behavior and less on the widespread nature of the problem.

USES STATISTICS



"Plastic Bottles" by Chris Jordan, a digital rendering of 2 million plastic bottles, the number used in the U.S. every 5 minutes.



"Watershed" by MSLK, an exhibit made from 1,500 plastic water bottles, the amount consumed every second in the U.S.

DIAGRAM 1: ARTIFACTS I REVIEWED

TO NE	ARTIFACT	MEDIUM	USES STATISTICS	EXPLICITLY ENCOURAGES ACTION	EMPHASIZES SOCIAL NORMS	USES A FUN OR HUMOROUS APPROACH
VERY POSITIVE	“Bottle Bank Arcade” by The Fun Theory. www.thefuntheory.com/bottle-bank-arcade-machine .	Physical product				✓
	“A Skwirl’s Eye View—Bottle VS Tap” by Derek Forgie. http://vimeo.com/9785294 .	Video	✓	✓	✓	✓
	“Rethink Your Green” by students from CalArts. www.aspendesignchallenge.org/	Print		✓	✓	
POSITIVE	StepGreen by the HCI Institute at Carnegie Mellon University. http://cmu.stepgreen.org/	Website		✓	✓	
	Heal the Bay Website. http://trashed.healthebay.org/	Multimedia	✓	✓	✓	✓
	“The Story of Bottled Water” by Annie Leonard. www.storyofstuff.org/bottledwater .	Video	✓	✓	✓	
NEUTRAL	“Watershed” exhibition by MSLK. http://mslk.com/reactions/watershed-a-new-mslk-eco-installation .	Physical product	✓	✓		
	“The Virtual Water Project” by Timm Kekeritz. http://virtualwater.eu/ .	Print	✓			
	The Plastiki Expedition by Adventure Ecology. www.theplastiki.com .	Physical product				
NEGATIVE	“Plastic Bottles” by Chris Jordan. www.chrisjordan.com/gallery/rtn/#plastic-bottles .	Multimedia	✓			
	“Save the River Jadro” by Igor Carli. www.aspendesignchallenge.org	Physical product	✓			
	“Use Less Plastic” by GOOD Magazine. www.youtube.com	Video	✓	✓		
VERY NEGATIVE	“Plastic Issues” infographics by The Plastiki Expedition. www.theplastiki.com/plasticsissues/ .	Print	✓	✓		
	“Tapped,” directed by Stephanie Soechtig and Jason Lindsey, 2009.	Video	✓	✓		
	Diagrams from <i>An Inconvenient Truth: the Crisis of Global Warming</i> by Albert Gore, 2007.	Print	✓			
VERY NEGATIVE	TED Talk: Capt. Charles Moore. http://www.ted.com	Video	✓			
	“Change the Way You Think About Everything” by WWF. www.youtube.com	Video	✓			
	“FLOW: For the Love of Water” directed by Irena Salina, 2008.	Video	✓	✓		
	5 Gyres Website. http://5gyres.org/	Website	✓	✓		

During my literature review, I had learned how important it is to give people concrete ways to take action after learning about an environmental issue (Gardner and Stern 1996, 248; Stern 2002, 206). I was therefore surprised to find that only 11 of the 19 artifacts I reviewed explicitly encouraged the audience to take a specific action. I felt that this was a potentially important opportunity to encourage behavior change that was often missed.

EXPLICITLY ENCOURAGES
SPECIFIC ACTION

I had also read articles during my literature review that examined how social norms can be a powerful influence on environmentally responsible behaviors (Cialdini, Reno, and Kallgreen 1990; Schultz 2002). Only five of the artifacts I examined used social norms, suggesting that this could also be an area for further exploration.

EMPHASIZES SOCIAL NORMS

A few artifacts took a light-hearted or humorous approach, and I found this made the pieces more appealing and accessible, particularly for people in my target audience's age range. I felt that humor as a rhetorical approach was underutilized in environmental campaigns, and I later used a humorous approach in one of my own research studies.

USES A HUMOROUS APPROACH



"Heal the Bay" website takes a light-hearted approach by letting you cover your friends' screens with virtual trash



"Bottle Bank Arcade" makes recycling seem like a game

OVERALL EMOTIONAL TONE

Finally, I looked at the emotional tone of all the artifacts, placing each artifact along a scale, from those with a mostly positive tone to those with a mostly negative tone. This directly related to my thesis question on how the emotional tone of a communication piece affects its persuasive quality. The resulting emotional scale showed that nearly half of the artifacts were negative or very negative; less than one-third were positive or very positive.

From my literature review, I had learned that positive feeling could enhance creativity, problem-solving, and learning (Norman 2004). For this reason, I believed that a greater emphasis on positive messages would encourage audiences to take action, not out of guilt but out of a belief in their own ability to create positive change. I later put this hypothesis into practice in my own research studies.



"The Story of Bottled Water" is told with a positive tone



"A Skwirl's Eye View" is an entertaining video by a Canadian comedian

Exploratory research with participants

During the fall semester, I conducted four research sessions. Although each focused on the issue of bottled water, I designed my studies so that the resulting findings would be beneficial to a range of cases. For example, many of my questions focused on participants' attitudes toward environmental issues in general or their reactions to ways that information is presented. The knowledge that I gained in answer to these questions should help designers working on many different kinds of environmental issues.

See Appendix A for information about the demographics for each research study.

I conducted the following exploratory research studies:

- October: Large-scale survey
- October: Week-long journal study
- November: Contextual interviews in participants' homes and responses to images and texts about bottled water (combined)

The questions that drove each particular study can be grouped into three distinct areas of inquiry and exploration:

1. *Participants' existing knowledge and beliefs about bottled water and reasons for drinking it*
2. *Participants' behaviors and attitudes toward eco-friendly habits*
3. *Participants' preferences for receiving information about environmental issues*

Many of the findings from this exploratory research directly influenced my studies during the spring semester, during which I created specific communication pieces to test with participants.

FIRST AREA OF INQUIRY:
KNOWLEDGE AND BELIEFS ABOUT BOTTLED WATER

Questions I asked:

- What do people know or believe about bottled and tap water? What are their misconceptions?
- Why do people drink bottled water?
- How does drinking bottled water integrate into someone's everyday life? Is it a daily or occasional habit? Is it a habit people think about?

One of my first findings was that drinking water, whether bottled or tap, is a habit that most of my participants did not consciously consider. In my survey, journal study, and contextual interviews, I asked people why they drank bottled water. After considering the question, respondents gave very similar reasons: bottled water is easily available; it tastes better than tap; drinking it is a habit; they didn't trust their tap water. The issue of not trusting tap water was the strongest barrier that kept people from drinking tap water, and this issue came up in my final research studies.



An image of one person's reusable bottle, from my contextual interviews

From the survey responses and journals, I had an indication that people were largely unaware of the negative effects of bottled water on the environment. To confirm this, I showed participants texts with facts about the issue of bottled water during my November study. My hunch was confirmed; many participants expressed surprise at the amount of energy or plastic used to produce the bottles, and also the low rates of recycling. This was an important finding, because it meant that I could effectively address this lack of knowledge with an educational approach aimed at individuals (Gardner and Stern 1996, 92).

I also found from the survey and journals that people drink bottled water or tap water depending on what they perceive as most convenient. During the survey, for example, respondents cited ease and convenience among their top reasons for drinking both types of water, indicating that a person's idea of what is convenient is quite subjective. I hypothesized that trying out a new behavior for a short period of time might help people to change their perceptions of what is convenient.



One of my contextual interview participants showing me where the bottled water is kept

SECOND AREA OF INQUIRY: BEHAVIORS AND ATTITUDES TOWARD ECO-FRIENDLY HABITS

Questions I asked:

- What do people consider “doing something good for the environment”? When and why do they act on these beliefs?
- Do people have strong emotions toward eco-friendly habits?
- What are peoples’ attitudes toward helping the environment? Does their behavior match their attitudes?
- How do people integrate eco-friendly habits (such as recycling) into their everyday lives?

Because I was interested in encouraging audiences to engage in a potentially unfamiliar environmentally responsible habit, I wanted to learn about their attitudes toward familiar eco-friendly activities, and why they reported engaging in these habits. I found that recycling was a good behavior to use as a benchmark, because it is such a common individual habit. During my survey, I found that people viewed recycling as something that is easy to do. Comments such as “I recycle because it’s easy and convenient” lead me to wonder whether drinking out of a reusable bottle could also become a habit that people would eventually view as “easy.”

In addition, I found that people’s sense of control over a situation greatly affected their behavior. During my journal studies, for example, one participant reported being “on board with environmental awareness and recycling,” but nonetheless throwing plastic bottles into the trash every day, explaining “I need better access to recycling.” In these types of situations where people lacked control, or at least the perception of control, they were very unlikely to engage in environmentally responsible behavior.

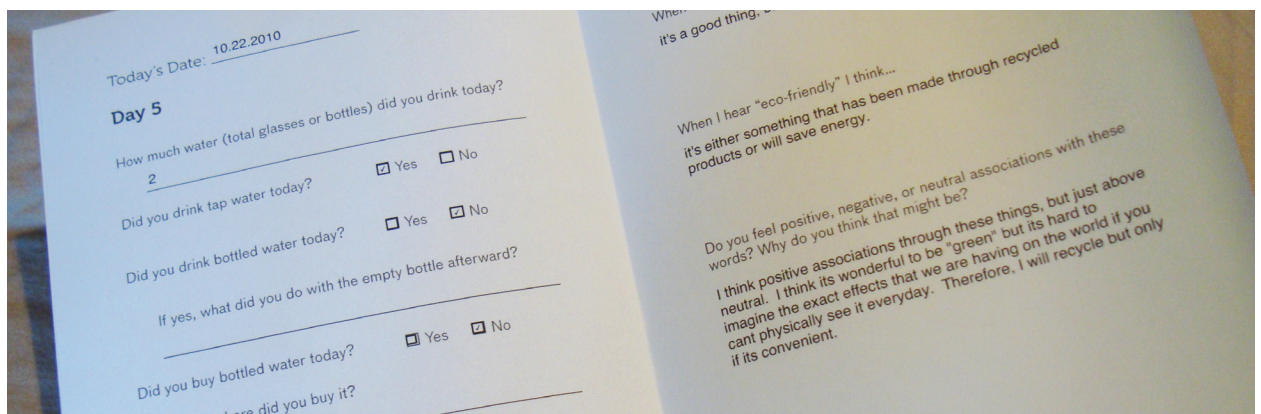
Interestingly, a sizable minority of people focused on recycling as a moral issue. Some survey respondents said they recycled because it was “the right thing to do,” or out of a sense of duty. A few participants in my journal study and



One of my contextual interview participants shows me her paper recycling

interviews also repeated this idea. One interview participant, for example, said that he recycles because his roommates “guilt [him] into it.” Because framing behaviors as morally good often seemed to be accompanied by a sense of guilt, I made a conscious decision to avoid taking what Stephen Kaplan calls an “altruism-centered approach” (Kaplan 2000, 491). A slightly different approach that I found less likely to induce guilt was for a person to focus on the positive feelings that he or she experienced by performing an eco-friendly behavior. For example, some study participants wrote or spoke positively about how they felt after doing something “good for the environment.” This subtle shift in framing seemed to help people focus on the personal benefits of performing an eco-friendly behavior, instead of focusing on guilt as a reason to act.

I found that although people had positive attitudes toward environmentally responsible behavior, they rarely engaged in activities *because* they were good for the environment. For example, one person wrote: “[recycling] is a good thing, but I’m not going out of my way to do it.” This attitude would be repeated during my interviews, and pointed to a need to tie eco-friendly behavior to other values that would be more motivational for my target audience.



Pages from a participant's journal

Finally, an important theme that emerged was the difficulty that people had connecting their individual actions to global consequences. It was not only challenging for people to imagine the negative effects of their behavior on the environment, but also to see the benefits of their pro-environmental actions. As one journal participant wrote, “it’s hard to imagine the exact effects we are having on the world.” Two of the people I interviewed reported feeling that any positive actions on their part would not make a difference. I feel that this is a challenge that could be well-addressed by using design to help people visualize the effects of their behavior—whether positive or negative.












THIRD AREA OF INQUIRY: PREFERENCES FOR RECEIVING INFORMATION

Questions I asked:

- How does medium (web versus print, for example) affect whether someone trusts the information?
- How do statistics impact whether someone trusts the information?
- How do statistics affect a person’s behavior?
- Which types of images are people most drawn to when learning about environmental issues? (see Diagram 2)
- Do people prefer long texts or short texts? Are they more convinced to take action by reading long texts or short texts? (see Diagram 3)

This area of inquiry most closely related to my thesis questions on how the medium, delivery, and emotional tone of a communication piece affect people’s behavior. Because I was interested in educational approaches to behavior change, it was crucial for me to find out how different ways of presenting people with information about an issue might affect their reactions to the information.

Trust was one of the first aspects I explored. During my initial survey, I found that people trust a message based mostly on its source and how much apparent research has gone into it, not based on its medium. Among reasons to distrust information, 18% of respondents mentioned emotional bias, leading me to wonder how objective a message would need to be in order to be trustworthy.

IMAGE	HAS A POSITIVE TONE	HAS A NEGATIVE TONE	GIVES VIEWER SENSE OF CONTROL	EMPHASIZES SOCIAL NORMS	USES STATISTICS	SHOWS A PERSONAL POINT OF VIEW
			✓		✓	
			✓			✓
		✓				
		✓				
						✓
	✓					
	✓			✓		
	✓			✓		
					✓	
					✓	
					✓	

See Appendix B for more information about the methods I used for the images and text research study.

In November, when I showed people texts about bottled water, I found that people were more likely to trust the longer texts.

I found that statistics also seemed to inspire trust, and that including a few carefully-chosen statistics was effective at convincing people of the issue’s importance. For example, when participants viewed texts with and without statistics, they unanimously preferred having statistics. The texts without statistics, which were written in first-person, were not convincing enough.

DIAGRAM 3: TEXTS USED IN NOVEMBER RESEARCH STUDY

TEXT	LONG (3 PARAGRAPHS)	SHORT (2-3 SENTENCES)	USES STATISTICS	WRITTEN IN FIRST-PERSON	WRITTEN IN THIRD-PERSON
Short, first-person text about convenience		✓		✓	
Short, first-person text about oil and energy		✓		✓	
Short, third-person text about oil and energy		✓	✓		✓
Short, third-person text about animals		✓	✓		✓
Long, first-person text without statistics	✓			✓	
Long, third-person text with statistics	✓		✓		✓

Because I had learned about the importance of social norms during my literature review, and because the artifacts I reviewed seemed to underutilize this technique, I tested out emphasizing social norms in my text and image study. I showed participants images of young adults drinking out of reusable bottles, and wrote half of the texts in first-person. The images had mixed reactions; participants who identified with the actors were drawn to the images, but other people strongly disliked them. I was also surprised to find that participants overwhelmingly disliked the first-person text; some even called it “preachy.” Because of these ambivalent and negative reactions, I did not pursue using social norms in my later studies; I felt it would be a better use of time to focus on more promising methods.

I found myself focusing a great deal on eliciting people’s preferences. For example, I explored people’s preferences for length of information in my survey and in my final study, during which I showed participants several examples of short and long texts. Paradoxically, participants in both the survey and testing session said they preferred reading short (1-2 sentence) passages, but were more convinced by longer (1 page or more) articles. I believed that the best solution to this dilemma would be to keep the longer text, but break it up into short chunks; I put this finding into practice during a later study.

When showing participants images, I was unable to evoke a clear sense of people’s preferences due to the wide variety of responses. None of the images were unanimously preferred; some participants were drawn to depictions of plastic pollution, which were highly emotional; others to more neutral images. It seemed that the emotional tone and subject matter of an image affected each person differently. For this reason, I began to consider whether it might be possible to tailor the tone and topic of a communication piece to an individual’s preferences. This question led directly into my final research studies, which I conducted during the spring semester.

See Appendix C for more details about the generative study methods and demographics.

Generative research with participants

During my final studies, I created videos and interactive communication pieces about the issue of bottled water. Because I had learned about people's knowledge, beliefs, and habits surrounding bottled water, I was able to create messages targeting the themes that had emerged. For example, each communication piece emphasized how easy it is to drink tap water, and some emphasized the cost savings participants would gain by drinking tap water instead of bottled.

Because I had found that people have different preferences for medium and emotional tone, and because one of my thesis goals was to explore how these factors affect people's behavior, I began to consider how the medium and tone of a piece might be matched to an individual's preferences. With this in mind, I focused on the following question:

How does a communication piece affect a person's behavior when tailored to his or her interests, learning style, and preferred emotional tone?

STUDY DESIGN

In order to explore this question, I designed a two-week study to measure participants' behavior change after interacting with a video or interactive piece that matched their preferences. While designing the study and the communication pieces, I applied what I had learned through my literature review and exploratory research. For example, each piece clearly and concisely explained the problem, using carefully-chosen statistics, and ended on a positive note with a clear call to action. During my exploratory research, several people had expressed feelings of guilt when viewing negative images about bottled water, so I avoided messages that I felt would lead to guilt. I also tried to avoid using moral appeals, in order to mitigate the unwanted consequences that Stephen Kaplan argues stem from an altruism-centered approach, "contributing to helplessness and stressing sacrifice rather than quality-of-life-enhancing solutions" (Kaplan 2000, 491).

During the two-week study, participants took a pre-survey, which I used to match them to a particular communication piece. I created 10 communication pieces, all of which varied according to form, emotional tone, and topic (see Diagram 4). Participants tracked their daily bottled water usage for one week before and one week after viewing their assigned communication piece, and participated in a final one-on-one phone interview with me (see Study Flowchart below).

TWO-WEEK STUDY FLOWCHART

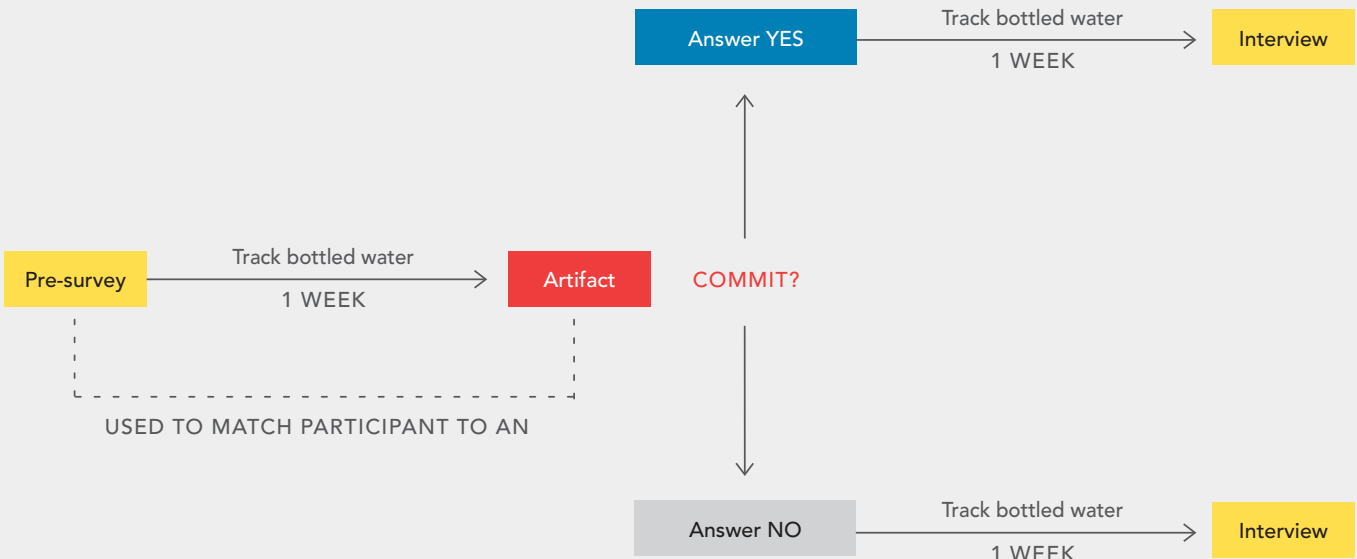


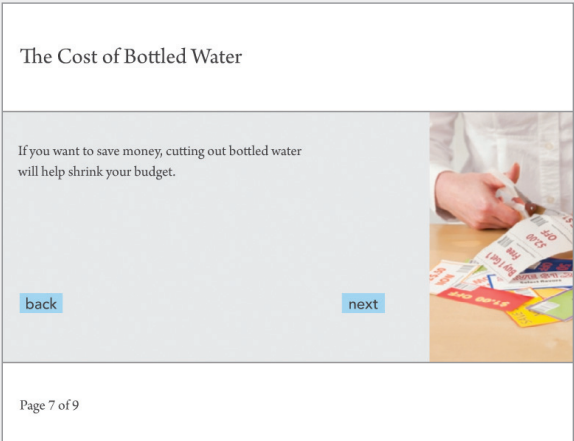
DIAGRAM 4: COMMUNICATION PIECE COMPONENTS



EXAMPLE 1




EXAMPLE 2



At the end of the two weeks, I found that seven out of 11 participants had actually changed their behavior and consumed less bottled water during the second week (see Results below). This was quite positive; however, I was uncertain as to whether the behavior change was due to the matching itself, or other factors. Because of this, I ran a follow-up study in which I gave each person a piece that did *not* match to their pre-survey answers. Due to time and budget limitations, I did not track participants' behavior or interview them during the follow-up study, which may have affected the results.

The responses to the follow-up study were puzzling. Although the second set of participants seemed to have less positive responses overall to the communication pieces, six out of eight people nonetheless made the one-week commitment to go without bottled water. Five people, when asked via a follow-up email, said they had consumed less bottled water during the second week.

RESULTS OF FIRST (TWO-WEEK) STUDY

Reported attitude change toward bottled water	YES	
Committed to not drinking bottled water for 1 week	YES	
Drank less bottled water during week 2	YES	
Didn't drink any bottled water during week 2	YES	

RESULTS AND IMPLICATIONS

Both studies had a positive outcome, with the majority of people changing their behavior. After analyzing the results of both studies, however, I did not find any indication that matching the communication pieces to participants' preferences had affected their behavior. I have two hypotheses for why the matching may not have shown an effect. First, the questions in the pre-survey may not have elicited people's true preferences. Second, although the pieces varied according to their medium, emotional tone, and topic, they all shared a similar narrative structure. Each concisely described the issue, showed that it was important to take action, and ended on a positive tone with a concrete step to take. More research would be needed to explore whether significantly altering this narrative itself would have an effect.

Other factors that did not seem to affect participants' behavior included their reported interest in the subject matter, and whether they had positive attitudes toward eco-friendly behaviors in general. Gender also did not seem to affect people's behavior, but there was a slight indication that age may have affected participants' willingness to change, as none of the participants age 35 or older changed their behavior.

In the end, there were four factors that *did* appear to affect most participants' behavior. These were:

1. A person's attitude change
2. Whether someone had committed to the new behavior
3. Whether someone felt a sense of control over the situation
4. How easy someone believed it would be to stop drinking bottled water

1. ATTITUDE CHANGE

Each participant who said that the communication piece changed his or her thoughts or feelings about bottled water also changed his or her behavior. During the first study, the three participants who did not drink *any* bottled water during week two all reported a significant attitude change. This indicates

two things: first, that a positive attitude toward the behavior was influential, and second, that viewing the communication piece itself was important to making the change. For example, one person said, “I remember the images were vivid. [...] The images really deterred me from drinking out of a plastic bottle.” Another participant explained,

“Normally the reason I drink bottled water is that I prefer the taste, but after watching [the video] I thought, it’s really not any different, not better quality [than tap water] and if I can save some money, there’s no harm in trying [to stop drinking it].”

In my literature review, I found that correspondence between attitudes and behavior is highly dependent on many factors (Maio and Haddock 2009, 57-66). In this case, participants’ attitudes may have matched their behavior because I asked about a very specific behavior. In contrast, positive attitudes about the environment in general did not seem to affect behavior.

2. COMMITMENT

In addition, each participant who made a one-week commitment to the new behavior was able to cut back on the amount of bottled water consumed. During the interviews, many participants said they believed that their commitment had strongly influenced their behavior. One person said “I was conscious about it; [it was] fresh in my mind [every night].” Another person said:

“Making a commitment to something puts that in your mind more constantly. It gave me a goal—any time I went to drink bottled water I thought, no I made the commitment.”

Tracking their behavior also seemed to make participants more aware of their habits by “priming” them for the commitment. One person said she was “alarmed” at realizing how much bottled water she drank, which made her more willing to change.

3. CONTROL

I had found during my exploratory research that a person's sense of control in a situation is a direct predictor of his or her behavior. In addition, psychologists have pointed out that a perceived sense of control is crucial to whether someone actually performs the behavior (Schultz 2002, 69; Stern 2002, 206; Valente and Schuster 2002, 113). During the two-week prototype study, I found that three out of the four people who did *not* change their behavior did so because they felt that their tap water was unsafe to drink. When asked what one thing would make it possible for them to stop drinking bottled water, they responded with changes that were beyond their personal control, such as "if the city would regulate the water better," or "if I lived in a house with newer pipes." For these types of cases, I believe that an educational approach alone, no matter how persuasive, would not change behavior. Another type of intervention; for example, one aimed at changing the water system or city regulations, might have a more positive effect.

4. PERCEIVED EASE

Early on during my exploratory research, I had been puzzled to find that some people perceive drinking tap water as easy and convenient, while other people perceive bottled water to be more convenient. The desire to do things that are easy was repeated by my journal study participants and interview participants. During the two-week prototype study, I found that those who felt it would be easy to stop drinking bottled water were consistently able to follow through with their commitment. And during the final interviews, each person who had not had any bottled water said it was fairly easy to do.

On the other hand, participants who did not change their behavior viewed drinking tap water as something difficult to do. One person, for example, said his "on-the-go lifestyle" made it impossible for him to give up bottled water. Unfortunately, I have no clear-cut answer for this, since perceptions of ease are highly subjective—the same behavior can seem easy to one person and

daunting to another person. I believe it is important for designers to be aware that this can affect their audience, and to consider ways of making a behavior easier for those who find it difficult, as suggested by Fogg's Behavior Model.

CONCLUSION

Although I was unable to find an indication that matching specific components of a communication piece to a person's preferences will influence behavior, this might be a question that could be explored in other ways in future studies. For example, perhaps the participants themselves could choose which artifact they would like to view, rather than interacting with one chosen for them based on a pre-survey. Or, future researchers could explore whether changing the narrative structure of a communication piece might affect a person's behavior.

Nonetheless, I was able to draw out some indications of success, and elements that seem to lead to behavior change. Each of these four elements—attitude change, the commitment to try out a new behavior, feeling a sense of control over the situation, and feeling that the desired behavior is easy to do—can be applied to other case studies. For example, if a campaign encouraged people to use compact fluorescent light bulbs (CFLs) instead of incandescent light bulbs, a message might emphasize the fact that CFLs last longer than incandescent bulbs and allow people to go longer without changing their light bulbs, making CFLs more convenient. A campaign asking people to cut back on eating meat could ask for a short-term commitment: for example, the “Meatless Mondays” campaign asks people to eat vegetarian on Mondays, creating a way for people to participate without having to give up meat altogether (<http://www.meatlessmonday.com/>).

In the end, I included these findings, along with what I had learned from my exploratory research, in my final design solution: a roadmap for creating campaigns aimed at fostering behavior change.

Design roadmap

INTRODUCTION

My research studies led me to create a resource that pulls together all of the observations and ideas I uncovered. And since one of my primary goals with this thesis project was to connect designers to existing research, I also included many references in my roadmap to the literature I reviewed. In this way, I hope to point designers toward resources that will enable them to design effective campaigns for behavior change. I created the roadmap for environmentally responsible behavior change in the form of a book containing ethical principles, observations, and application ideas.

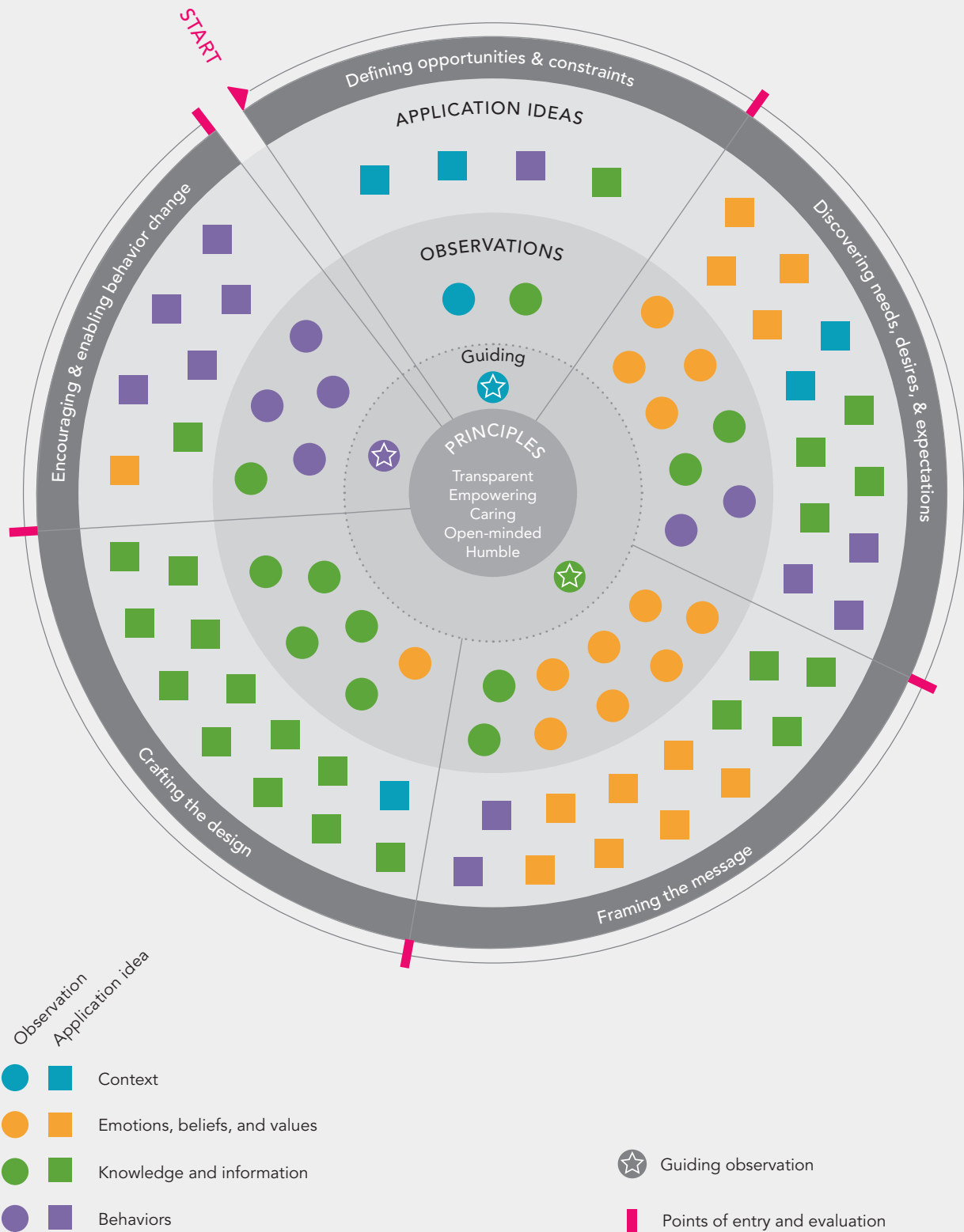
AUDIENCE

I wrote the roadmap for behavior change specific to environmental issues, but it might be helpful for other types of behavior change as well. Although the text is intended for communication designers, I believe it could also be used by people who are less familiar with design, or as a tool to engage multiple stakeholders during the creation of a campaign. To that end, the roadmap also points people toward resources to find out more about human-centered design, if they so desire.

ROADMAP STRUCTURE

The four rings of the accompanying diagram show the structure of the information contained in the roadmap (see Diagram 5). The inner core contains ethical principles, to emphasize that these should form the heart of any project aimed at changing behavior. The next ring contains observations that can be applied to many situations; guiding observations inform all observations included in one or more phases of the process. The third ring includes practical ideas for how someone can apply the observations. Each observation and application idea is based on research from my own thesis project, existing literature, or both.

The outer ring shows the five major phases in an ideal design process. I felt that using the design process as an organizing structure would provide common ground for those familiar with the human-centered design process. Of course,



in the real world, the design process is not as clean as I have depicted it here, but is instead often messy and indirect. Although I have outlined the book according to an idealized process, my intention is for the roadmap to be flexible, not prescriptive. A designer might only need the roadmap for a particular phase, face limitations due to time or budget constraints, or might create his or her own unique route. I hope the circular form and multiple points of entry help to suggest this flexibility.

The design roadmap contains three distinct types of content: ethical principles, observations and application ideas, and points of entry and evaluation.

1. ETHICAL PRINCIPLES FOR DESIGNING FOR BEHAVIOR CHANGE

As I have mentioned, I have been concerned with the ethical nature of persuasion since beginning this thesis project. To design in an ethical way, I believe that an audience should have agency and choice, something that I felt could be accomplished by allowing people to learn about an issue and choose how to respond. If, on the other hand, learning is left out of the design, I saw a risk of leading people to act in a way that they would not choose on their own. This was my criticism with some of the approaches I had reviewed, including some of the methods mentioned in Lockton's *Design with Intent* toolkit.

The counter-argument is that since the future of our planet is at stake, educational measures are too slow and ineffective, and we should use any means necessary to create change. To this, I would respond that although individuals might need assistance beginning or sustaining a new behavior, people should always know *why* they are being asked to change. As Bernardine Atkinson points out in her critical review of persuasive technology,

“[education and advocacy] remain respectful of the individual’s own ability to synthesise the offerings provided by new information into a worldview that is meaningful for that individual.”

—Atkinson 2006, 180

In the end, I developed a set of five ethical principles that I used for my own research studies. I was inspired by Emily Pilloton’s beautifully-written set of values for designers, called the “Designer’s Handshake” (Pilloton 2009, 29), as well as other sources on ethical design (Berman 2009, Heller 2003).

Each principle is in the form of an adjective, stating that design for behavior change should be *transparent, empowering, caring, open-minded, and humble*.

To read about each ethical principle in detail, please see Appendix D.

2. OBSERVATIONS AND APPLICATION IDEAS

Each page is structured around one particular observation from a research study or multiple studies. Some observations might seem like common sense, but I did not want to leave out the simple observations, because even these are sometimes overlooked. Each page contains an explanation of the observation, and, when applicable, details from my own research studies related to it. In addition, I point readers to places where they can learn more about the existing research behind the observation (see Sample on next page).

Application ideas are located at the bottom of the page, under “How can I put this into practice?” These practical tips are meant as ideas to spark action, but each idea will not be applicable to each case study or audience. Designers might come up with many more ideas than what I have included in the roadmap.

SAMPLE PAGE

Observation

Findings from my research studies

Quotes

Defining

Discovering

Framing

Crafting

Encouraging

Education encourages learning and choice

● Most people want to do their part, but taking care of the environment isn't usually their first priority

People are busy and have a great deal of demands on their time. Most people don't go through life thinking about how they can live in a more environmentally-responsible way. For this reason, we may need to tie a behavior to other factors that might be more motivational for our target audience.

Personal Observations

During my research studies, participants continually expressed a desire to "do their part." Yet, many also said that convenience was very important to them, emphasizing the need to balance a desire to help with small actions to take.

● "[Recycling] is a good thing, but I'm not going out of my way to do it."

—Journal study participant

● "It's not my main priority... like sometimes we buy CFLs, but I don't like the way they look"

—Interview participant

How can I put this into practice?

Try to use design to help people visually connect their priorities to the issue

Consider using participatory design methods in the process, in order to involve end users in the creation of the product or service

Try giving people small actions to take that will make a difference

Where can I find out more?

Kaplan, Stephen. "Human Nature and Environmentally Responsible Behavior." *Journal of Social Issues* 56, no. 3 (2000): 491-508.

Page 14

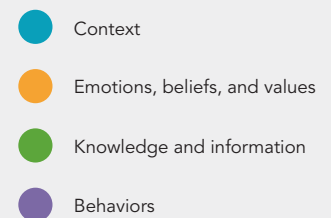
Application ideas

Resources

Each observation and application idea is color-coded according to the subject that it best represents: *context*; *emotions, beliefs, and values*; *knowledge and information*; or *behaviors*. For example, the color blue stands for observations related to the *context* surrounding a person or issue. Purple stands for observations about people's behaviors or ways to encourage action. The subject areas are sometimes loosely defined and may overlap. I hope that the color-coding provides another useful way for designers to access the information, as well as to see how the focus shifts from context to emotions, and from knowledge to behavior, while going through the design process.

3. POINTS OF ENTRY AND EVALUATION

The points of entry and evaluation are meant to facilitate a mindful transition from one stage to the next. In each point of entry, I have included suggestions for what to be mindful of when beginning that particular phase, as well as resources to help those less familiar with human-centered design (see Sample Point of Entry, next page). Each point of evaluation contains a series of questions to ask; these are suggestions to help someone decide if they are ready to move on to the next design phase.



SAMPLE POINT OF ENTRY

POINT OF ENTRY

Discovering needs, desires, & expectations

The observations and ideas in the Discovering section are meant to help you as you draw out the needs and desires of individuals in your audience, as well as prior expectations or knowledge that they may have that will influence how they perceive your communication designs.

BEFORE YOU BEGIN

Think carefully about how to discover what your audience needs. Often, people will not be able to tell you exactly what they need or want—you will have to interpret this from your conversations with them and from careful observation of their behavior and environment.

RESOURCES

For “51 Ways to Inspire Design,” see the *IDEO Method Cards*, 2003 (<http://www.ideo.com/work/method-cards/>).

For specific methods to discover needs related to usability, see *User and Task Analysis for Interface Design* by JoAnn T. Hackos and Janice C. Redish. (1st ed. New York N.Y.: John Wiley & Sons, 1998).

Reflections

FEEDBACK AND AREAS FOR FURTHER EXPLORATION

I tested my roadmap book with four graduate students from the Master of Design program, and I also received feedback from three design professors during a poster presentation. Overall, I have received extremely positive feedback; people found the book useful and desirable. Based on some comments, I was able to change the navigational icons to make it more usable.

Nonetheless, there are several aspects of the roadmap that I believe could be further explored. For example, I can imagine asking practitioners who are working on campaigns to use the roadmap in conjunction with their own projects. This would likely provide helpful feedback. In addition, several of those with whom I tested the roadmap expressed a desire to see success stories from actual case studies throughout the book.

It is possible that certain observations would be more applicable for certain types of environmental behaviors or situations. I think this might be another area for further development that would be most readily apparent during actual use.

Finally, a few of the people to whom I showed the book said they believed that illustrating or pointing out resources for specific design research methods could also be helpful. For example, tips for how to conduct an interview, and when this method might be most valuable. This is not something I have considered thus far; I would have to do more research to determine whether this would add value to the roadmap, or whether this would result in an overwhelming amount of content. Currently, I have taken the approach of creating the roadmap for audiences already familiar with human-centered design research methods, and pointing to other resources for those who want to learn more. However, it is possible that some audiences might desire specific instructions on research methods within the roadmap itself.

Conclusion

POSSIBLE CONTRIBUTIONS TO THE FIELD

Before I began this project, I found that the question of how the medium and emotional tone of a communication piece affect behavior had not been fully answered. This applied especially to communications related to environmental issues. I have explored this question by conducting several research studies looking at these specific components of a communication piece. The results of my study attempting to match pieces to participants' preferences did not conclude as I expected; nonetheless, I hope other researchers might be able to build on what I have found.

In addition, although many practitioners are creating campaigns for environmental issues, I could not find a comprehensive resource for those who design these campaigns. A great deal of practical, in-depth knowledge exists, and designers simply need to be connected to this knowledge. This became clear to me when I attended a group discussion on individual behavior change during the 2011 AIGA Compostmodern conference. I found that the designers in this discussion group were largely unfamiliar with research in psychology and other fields. They expressed a need for a resource that would teach them how to create more effective communication campaigns.

In pointing toward resources in psychology, decision sciences, persuasive technology, *and* design, I hope my roadmap will help to close this knowledge gap. In addition, I urge designers to seek out practitioners and researchers in other fields and work in an interdisciplinary manner. Just as designers can learn a great deal from those in other fields, we also have much to offer through our expertise in human-centered design.

My ultimate desire is that my work will help designers use communication to empower individuals with knowledge, encouraging them to begin and sustain a journey toward positive behavior change.

Appendices

APPENDIX A: DEMOGRAPHIC INFO FOR EXPLORATORY RESEARCH STUDIES

APPENDIX B: RESPONSES TO IMAGES AND TEXTS

APPENDIX C: GENERATIVE RESEARCH STUDY DETAILS

APPENDIX D: ETHICAL PRINCIPLES

APPENDIX A

Demographic info for exploratory research studies

My study protocol for research with participants was approved by the Carnegie Mellon University Internal Review Board on October 4, 2010, under IRB Protocol Number HS10-553.

OCTOBER: LARGE-SCALE SURVEY

- 101 respondents
- *Gender:* 33 men, 67 women, 1 no response

Age range: all ages over 18 (survey was completed before I chose a target audience).

- 18 to 24 years old: 28 people
- 25 to 30 years old: 36 people
- 31 to 40 years old: 18 people
- 41 to 50 years old: 6 people
- More than 50 years old: 13 people

Level of education

- High school: 1 person
- Some college: 4 people
- Bachelor's degree: 21 people
- Master's or PhD degree: 75 people

OCTOBER: WEEK-LONG JOURNAL STUDY

- 6 participants
- *Gender:* 4 men and 2 women
- *Age range:* 25 to 36 years old
- *Level of education:* 6 with a Bachelor's degree

NOVEMBER: CONTEXTUAL INTERVIEWS IN PARTICIPANTS' HOMES AND RESPONSES TO IMAGES AND TEXTS (COMBINED)

- 7 participants
- *Gender:* 4 men and 3 women
- *Age range:* 23 to 33 years old
- *Level of education:* 1 with some college; 5 with a Bachelor's degree; 1 with a Master's degree

APPENDIX B

Responses to images and texts

STUDY DETAILS

In November 2010, I asked seven participants to respond to images and texts that aligned with some of the common themes I had developed from my artifact review. These six themes I identified were: positive messages, negative messages, evoking a sense of control, using statistics, emphasizing social norms, and using a personal perspective (see Diagram 2 on page 21). In addition, I wrote several texts about bottled water that were short (2-3 sentences) or long (3 paragraphs). Half of the texts were written in first person and did not include statistics; the other half were in third person and included statistics (see Diagram 3 on page 22).

During the study, each participant first viewed all of the images and answered a set of questions, and then read all of the texts and answered a similar set of questions. I used William J. McGuire’s “Communication/Persuasion Matrix” as the basis for the questions. This matrix portrays a classic theory of how persuasive communication operates. Along the top, various elements of communication that influence persuasion are listed (called the “input”). Along the left are the various ways that people must respond in order to change their behavior (the “output”).

Since I was interested in the participants’ responses to the text and images, I focused on the output. Based on steps 3 through 6, I asked participants which images and texts they were most/least drawn to; which they found understandable; which taught them something new, and which would be most/least likely to change their feelings about bottled water. I also asked whether they preferred the shorter or longer texts.

INPUT: Independent (Communication) Variables	SOURCE	MESSAGE	CHANNEL	RECEIVER	DEST- INATION
	number unanimity demographics attractiveness credibility ..	type appeal type information inclusion/omission organization repetitiveness ..	modality directness context ..	demographics ability personality life style ..	immediacy/delay prevention/cessation direct/immunization ..
OUTPUT: Dependent Variables (Response Steps Mediating Persuasion)					
1. Exposure to the communication					
2. Attending to it					
3. Liking, becoming interested in it					
4. Comprehending it (learning what)					
5. Skill acquisition (learning how)					
6. Yielding to it (attitude change)					
7. Memory storage of content and/or agreement					
8. Information search and retrieval					
9. Deciding on basis of retrieval					
10. Behaving in accord with decision					
11. Reinforcement of desired acts					
12. Post-behavioral consolidating					

McGuire’s Communication/Persuasive Matrix (McGuire 1989, 45)

APPENDIX C

Generative research study details

TWO-WEEK PROTOTYPE STUDY

Participant demographics:

- *Gender:* 3 men and 8 women
- *Age range:* 23 to 38 years old
- *Level of education:* 1 with a high school degree, 1 with some college, 5 with a Bachelor's degree, 4 with a Master's/PhD degree

STUDY DETAILS

During this study, I recruited participants between 25 and 40 years old who were habitual bottled water drinkers. In order to prevent bias, I did not explain ahead of the time that the study was about behavior change; participants were told they would respond to information that they viewed online.

The two-week study began with participants taking an online survey, during which they answered questions unrelated to environmental issues about their preferences—for example, types of TV shows they enjoy watching, or topics that would be most likely to catch their interest. These questions were meant to measure participants' preferences for topic (animals, waste, or money), emotional tone (humorous, matter-of-fact, or dramatic), and medium when learning about a new topic (interactive or video).

I used participants' answers to match them to a specific communication piece. In some cases I had to use my judgment when participants' preferences were less clear. I am uncertain whether using this type of survey was an ideal method for matching people with communication pieces.

After taking the pre-survey, participants tracked their bottled water use for one week via a daily email. After seven days, the participants viewed their assigned artifact and took an immediate post-survey, during which they were asked questions about their reactions to the piece. The post-survey also asked whether the participant would like to make a one-week commitment to drink tap water instead of bottled water.

Next, each person continued to track his or her behavior for another week, in order to measure any actual behavior change. Finally, I interviewed each person and asked questions related to the design qualities of the communication piece, in order to find out how specific components might have affected his or her behavior.

TWO-WEEK PROTOTYPE STUDY

Participant demographics:

- *Gender:* 3 men and 5 women
- *Age range:* 23 to 41 years old
- *Level of education:* 7 with Bachelor's degrees, 1 with a Master's/PhD degree

STUDY DETAILS

The follow-up study used the same recruiting materials, pre-survey, post-survey, and communication pieces as the two-week study. The participants in the follow-up study, however, were given communication pieces to view that did *not* match their preferences, according to the pre-survey.

Because I was limited in budget and time, participants did not track their behavior or participate in one-on-one interviews. One week after participants had viewed their artifacts, however, I sent an email to each person who had committed to not drinking bottled water, and asked whether they had followed through. In this email, I included four options for a response:

1. I drank the same amount of bottled water as usual last week
2. I drank a LITTLE less bottled water last week
3. I drank a LOT less bottled water last week
4. I did not drink any bottled water last week

Five people reported drinking less bottled water (#2, #3, or #4). However, because I was relying on participants' recollection of how much bottled water they had consumed during the past week, I could not verify the accuracy of their resulting self-reports.

“[The designer’s] social and moral judgment must be brought into play long before he begins to design, since he has to make a judgment [...] as to whether the products he is asked to design or redesign merit his attention at all. In other words, will his design be on the side of the social good or not.”

—Victor Papanek 1984, 55

APPENDIX D

Ethical principles

I developed the following guidelines for myself to use throughout the year. The following principles are not meant to be a complete set; rather, my hope is that they will give the design community something to aim toward as we attempt to create design that is good, in all senses of the word.

PRINCIPLE 1: BE TRANSPARENT

This guideline is often suggested when it comes to the ethics of persuasion (Deterding 2009, 141; Fogg 2003, 224). It is clear that we should avoid deception or coercion in all cases, but some persuasive strategies are subtle. Whether it is ethical to attempt to change someone's behavior without informing them of your intentions may need to be evaluated on a case-by-case basis. I believe that in nearly all cases, a person should be aware when someone is attempting to use a designed artifact to influence his or her behavior.

We can be transparent in many ways. Transparency can be as subtle as a small button that says “learn more,” or as explicit as directly asking people to change. With my studies, I chose to ask my participants if they wanted to change their behavior. By giving people the option to say no, we run the “risk” of non-compliance, but we preserve the integrity and agency of the individual.

PRINCIPLE 2: BE EMPOWERING

In addition to being transparent, I tried to maintain my participants' agency by designing in an empowering manner. Empowerment as a mindset helps us remember that the power to act resides in the end-user, not the designer. Emily Pilloton writes that “environmental and social sustainability are, in fact, based on the same central tenet: the support, health, and *empowerment* of our world, both human and natural” (Pilloton 2009, 31, my emphasis).

We can give people information and tools to aid in reflecting, creating, and sustaining new habits, and aim to give the individual more than what they currently have, not less—more knowledge, more power, more choice. Constraint is indeed one way of designing for persuasion, but because it is

inherently limiting to individuals, I believe it should be avoided. This can be difficult with environmental issues, especially when we are asking people to stop or limit a behavior, but shifting how we frame the behavior can help. In my research studies, I explained to participants that by shifting from one behavior to another, they could make a positive effect on the world. I hoped this message would be empowering, rather than constraining.

PRINCIPLE 3: BE CARING

Those of us designing for environmental issues care deeply about nature. Throughout the year, I asked myself if I cared for my participants just as much. Human-centered design methods can help us to understand and empathize with our audience.

I believe that another way to be caring is to realize that people are not perfect, and to build that realization into our designs. I tried to do this during my final interviews of my two-week study by acknowledging participants' successes, no matter how small.

We can also consider what happens when people encounter setbacks—can we encourage people to easily reenter their journeys? I believe it is important to actively avoid making audiences feel guilty. Flaws are part of what makes us human, and overcoming obstacles often leads to a greater sense of accomplishment than we have when everything is easy.

PRINCIPLE 4: BE OPEN-MINDED

No behavior exists in a vacuum. Environmental issues are often more complex than we see at first glance. These are systemic, wicked problems, where changing one part of the system affects another part, and sometimes leads to unintended future consequences. It may be tempting to rush toward immediate action, but I believe we should proceed with thoughtfulness and an awareness of the situation surrounding a particular behavior.

We can aim to be open-minded by considering all options, and realizing that individual behavior change might not be the best solution to a problem, especially when many external factors make individual change difficult.

PRINCIPLE 5: BE HUMBLE

Finally, I believe that we should design with humility and a recognition that we also have biases and flaws. I appreciate Stephen Anderson's humble approach in the copy for his Mental Notes cards. By simply using the word "we", he avoids creating an "us versus them" mentality. Kaplan points out that we are often misguided in our judgment of others, because usually people's lack of environmental responsibility "cannot be interpreted as a simple example of disinterest or inappropriate attitude or sloth" but rather stems from "a lack of appropriate infrastructure, or of multiply desirable choices, or of cultural support" (Kaplan 2000, 501).

Being humble includes being non-judgmental. Judgment in design is not necessarily bad—we need to use our judgment in making design decisions, or when faced with an ethical dilemma (see Papanek 1984, 55). But judging people leads us down a dangerous path. It inherently places the judger in a position of being "better than" the one being judged.

In conclusion, I urge other designers to join in me in committing to design for behavior change in a way that is transparent, empowering, caring, open-minded, and humble.

Works Cited

- 5 Gyres. "5 Gyres: Understanding Plastic Pollution through Exploration, Education and Action" (website). Accessed May 7, 2011. <http://5gyres.org/>.
- Adventure Ecology. "The Plastiki Expedition" (exhibit). Accessed May 7, 2011. <http://www.theplastiki.com>.
- Anderson, Stephen P. 2010. "Mental Notes cards" (print). Accessed May 7, 2011. <http://getmentalnotes.com/>.
- Atkinson, Bernardine M.C. 2006. "Captology: A Critical Review." In *Persuasive Technology: First International Conference on Persuasive Technology for Human Well-Being, PERSUASIVE 2006, Proceedings*, edited by Wijnand IJsselstein et al., 171–182. Berlin, Germany: Springer.
- Bator, Renee J., and Robert B. Cialdini. 2000. "The Application of Persuasion Theory to the Development of Effective Proenvironmental Public Service Announcements." *Journal of Social Issues* 56(3): 527–541.
- Berman, David B. 2009. *Do Good Design: How Designers Can Change the World*. Berkeley, CA: AIGA, New Riders.
- Carli, Igor. 2008. "Save the River Jadro" (artwork). Finalist in the AIGA 2008–09 Aspen Design Challenge. Accessed May 7, 2011. <http://www.aspendesignchallenge.org/content.cfm/save-the-river-jadro>.
- Cialdini, Robert B., Raymond R. Reno, and Carl A. Kallgreen. 1990. "A Focus Theory of Normative Conduct: Recycling the Concept of Norms to Reduce Littering in Public Places." *Journal of Personality and Social Psychology* 58(6): 1015–1026.
- Deterding, Sebastian. 2009. "Persuasive Design or The Fine Art of Separating People from Their Bad Behaviours—Online." Presented at reboot 11, Copenhagen, June 25, 2009. Accessed May 7, 2011. <http://www.slideshare.net/dings/persuasive-web-design-how-to-separate-users-from-their-bad-behaviours>.
- Fogg, BJ. 2003. *Persuasive Technology: Using Computers to Change What We Think and Do*. San Francisco, CA: Morgan Kaufmann Publishers.
- . n.d. "Fogg's Behavior Grid." Accessed May 7, 2011. <http://www.behaviorgrid.org/>.
- . n.d. "Fogg's Behavior Model." Accessed May 7, 2011. <http://www.behaviormodel.org/>.
- Forgie, Derek. 2010. "A Skwirl's Eye View—Bottle VS Tap" (video). Accessed May 7, 2011. <http://vimeo.com/9785294>.
- Garcia, Manuel et al. 2008. "Rethink Your Green" (artwork). Finalist in the AIGA 2008–09 Aspen Design Challenge. Accessed May 7, 2011. <http://www.aspendesignchallenge.org/content.cfm/rethink-your-green>.
- Gardner, Gerald T., and Paul C. Stern. 1996. *Environmental Problems and Human Behavior*. Boston: Allyn and Bacon.

-
- GOOD Magazine. 2010. "Use Less Plastic" (video). Accessed May 7, 2011. http://www.youtube.com/watch?v=LZ71svh1RVo&feature=player_embedded.
- Gore, Albert. 2007. *An Inconvenient Truth: The Crisis of Global Warming*. Rev. ed. New York: Viking.
- HCI Institute at Carnegie Mellon. "StepGreen" (website). Accessed May 7, 2011. <http://cmu.stepgreen.org/>.
- Heal the Bay. "Trashed: Heal the Bay" (website). Accessed May 7, 2011. <http://trashed.healthebay.org/#>.
- Heller, Steven. 2003. "Past Principles: A History of Good, Ethical Graphic Design." In *Conscientious Objectives: Designing for an Ethical Message*, by John Cranmer and Yolanda Zappaterra, 10–17. Mies, Switzerland: RotoVision SA.
- Janis, Irving L., and Leon Mann. 1976. "Coping with Decisional Conflict." *American Scientist* 64 (December): 657–667.
- Jordan, Chris. 2007. "Plastic Bottles" (artwork). Accessed May 7, 2011. <http://www.chrisjordan.com/gallery/rtn/#plastic-bottles>.
- Kahneman, Daniel, Jack L. Knetsch, and Richard H. Thaler. 1991. "Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias." *Journal of Economic Perspectives* 5(1): 193–206.
- Kaplan, Stephen. 2000. "Human Nature and Environmentally Responsible Behavior." *Journal of Social Issues* 56(3): 491–508.
- Kekeritz, Timm. "The Virtual Water Project" (artwork). Accessed May 7, 2011. <http://virtualwater.eu/>.
- Leonard, Annie and Free Range Studios. n.d. "The Story of Bottled Water" (video). Accessed May 7, 2011. <http://storyofstuff.org/bottledwater/>.
- Lockton, Dan, with David Harrison and Neville A. Stanton. 2010. *Design with Intent: 101 Patterns for Influencing Behaviour Through Design*. Windsor, Berkshire, UK: Equifine. Accessed May 7, 2011. http://www.danlockton.com/dwi/Main_Page.
- Maio, Gregory R., and Geoffrey Haddock. 2009. *The Psychology of Attitudes and Attitude Change*. London: SAGE Publications Ltd.
- McCoy, Katherine. 2000. "Information and Persuasion: Rivals or Partners?" *Design Issues* 16(3): 80–83.
- McGuire, William J. 1989. "Theoretical Foundations of Campaigns." In *Public Communication Campaigns*, edited by Ronald E. Rice and Charles K. Atkin, 43–65. Newberry Park, CA: Sage Publications.
- McKenzie-Mohr, Doug. 2000. "Promoting Sustainable Behavior: An Introduction to Community-Based Social Marketing." *Journal of Social Issues* 56(3): 543–554.
- Moore, Capt. Charles. 2009. "Capt. Charles Moore on the Seas of Plastic" (presentation). Recorded in February 2009 by TED.com. Accessed May 7, 2011. http://www.ted.com/talks/capt_charles_moore_on_the_seas_of_plastic.html.

-
- MSLK. 2009. "Watershed" (exhibit). Accessed May 7, 2011. <http://mslk.com/reactions/watershed-a-new-mslk-eco-installation>.
- National Research Council. 2002. *New Tools for Environmental Protection: Education, Information, and Voluntary Measures*. Edited by Thomas Dietz and Paul C. Stern. 1st ed. Washington DC: National Academy Press.
- Norman, Donald A. 2004. *Emotional Design: Why We Love (or Hate) Everyday Things*. New York: Basic Books.
- . 1993. *Things That Make Us Smart: Defending Human Attributes in the Age of the Machine*. Cambridge, Ma: Perseus Books.
- Papanek, Victor. 1984. *Design for the Real World: Human Ecology and Social Change*. Rev. ed. Chicago, IL: Academy Chicago Publishers, 2005. Page references are to the 2005 edition.
- Pilloton, Emily. 2009. "Introduction: Design Can Change the World." In *Design Revolution: 100 Products That Empower People*. 2nd ed. New York, NY: Metropolis Books.
- Salina, Irena. 2008. *FLOW: For the Love of Water* (film). Oscilloscope Laboratories. Accessed May 7, 2011. <http://www.flowthefilm.com/>.
- Schultz, P. Wesley. 2002. "Knowledge, Information, and Household Recycling: Examining the Knowledge-Deficit Model of Behavior Change." In *New Tools for Environmental Protection*, by the National Research Council, 67–82. Washington DC: National Academy Press.
- Soechtig, Stephanie, and Jason Lindsey. 2009. *Tapped* (film). USA: Atlas Films. Accessed May 7, 2011. <http://www.tappedthemovie.com/>.
- Stern, Paul C. 2002. "Changing Behavior in Households and Communities: What Have We Learned?" In *New Tools for Environmental Protection*, by the National Research Council, 201–211. Washington DC: National Academy Press.
- The Fun Theory. 2009. "Bottle Bank Arcade" (artwork). Accessed May 7, 2011. <http://www.thefuntheory.com/bottle-bank-arcade-machine>.
- The Plastiki Expedition. "Plastic Issues" (artwork). Accessed May 7, 2011. <http://www.theplastiki.com/plasticsissues/>.
- Valente, Thomas W., and Darlene V. Schuster. 2002. "The Public Health Perspective for Communicating Environmental Issues." In *New Tools for Environmental Protection*, by the National Research Council, 105–124. Washington DC: National Academy Press.
- Wurman, Richard Saul. 2001. *Information Anxiety 2*. 2nd ed. Indianapolis, IN: Que.
- WWF. 2009. "Change the Way You Think About Everything" (video). Accessed May 7, 2011. http://www.youtube.com/watch?v=-nekqKESbdU&feature=player_embedded.