TEENS,
BEHAVIOR CHANGE &
THE ENVIRONMENT

A thesis submitted to the School of Design,
Carnegie Mellon University,
for the degree of
Master of Design in Interaction Design.

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ABSTRACT

This thesis document presents the research, synthesis and design work completed for a system for object reuse. This work presents a user-centered process culminating in a service design (ReUseIt) and design guidelines to be employed when working with an audience of teenage girls and designing for behavior change with respect to the environment.

This document includes a literature review covering environmental concerns, the relationship of design for behavior change, Generation Z, game design, and the historic value of objects.

Research methods documented include journaling kits and designer-led research workshops embedded within middle school and high school art classes.

ReUseIt supports improved behavior in relation to the environment through positive feedback around the reuse of objects and attachment of stories to objects. It is a service with touchpoints in shopping malls and a Facebook application.

Reflections are offered on the design process undertaken and suggested best practices for creating embedded workshops within middle and high school classes.
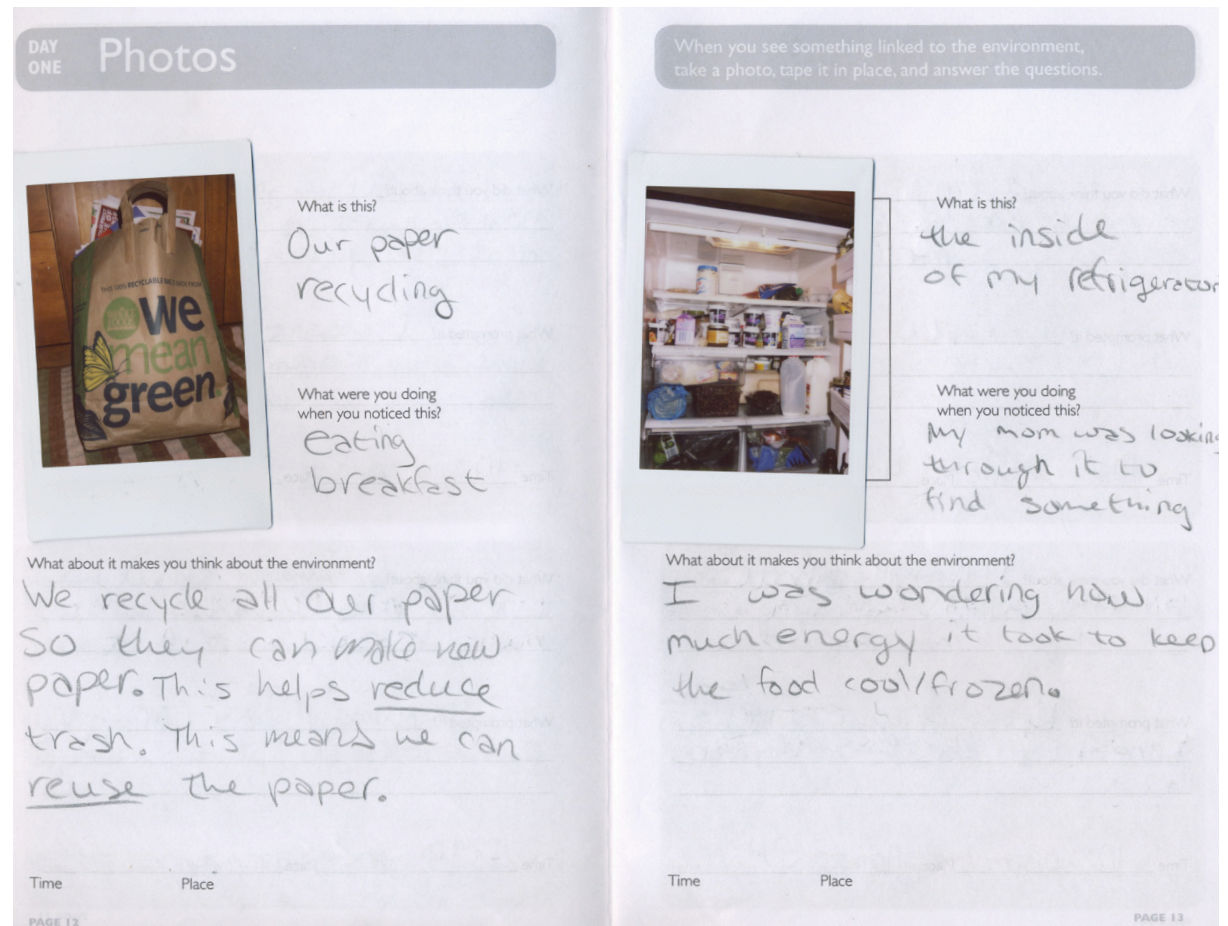
A spread in a journal completed by a teen girl. Particiaants documented moments and objects from daily life that indicated thoughts about environmental issues.

CONTENTS

Photo of work in process during generative research session with teen girls.
Participants created designs to solve environmental challenges, such as habitat
loss, litter, awareness and alienation from the natural world.

INTRODUCTION

THE NEED TO CHANGE BEHAVIOR

People are dependent on the environment for survival. Continued abuse in the form of deforestation, pollution, CO_2, and litter is detrimental to other species, the quality of natural resources and ultimately to humankind. This cycle may continue, as humans often correlate cause and effect within a short time period, yet rarely connect short term actions with long term effects. For example, let's compare a rock and the sea. A rock falling to the ground can easily be accounted for — gravity. The rising of sea levels are rarely thought of when driving to work in the morning, though they are as connected as the rock and gravity.

Currently, there are few tools that give positive feedback to good decisions involving the environment. For example, people are chastised for flying or driving, and rarely rewarded for walking or carrying cloth bags. Recycling has become a panacea for environmental issues. Reusing and reducing have not reached the same critical mass as recycling. Additionally, these terms are only vaguely distinguishable by the pubic.

This thesis addresses the design problem of fostering the reuse of objects with an audience of teenage girls as one aspect of potential behavior change related to the environment. I selected to focus on teens, aged 12-16. They will inhabit the Earth for longer than me or my parents' generation, so they have the most time to improve the state of the environment.

Materials created by a participant in a generative workshop.

LITERATURE REVIEW

INTRODUCTION

Based upon my thesis goals, an initial round of scholarly research included the attributes of Generation Z, the tenets of behavior change, and unsustainable systems of industry. Behavior change and stainability were strongly linked to positive reinforcement. This led to research in game design, as it uses similar methods of positive reinforcement. Finally, as I narrowed the focus of my solution, I researched the value of objects.

GENERATION Z

To better understand my selected user group, I researched articles related to Generation Z. This review highlights features of the generation in terms of historic and techno-logical influences as well as expected traits as they come of age.

Who are they?

Those born from roughly 1990 onwards are referred to by many names including Generation Z, Generation I, Genera-tion 1, the Internet Generation, the Net Generation and Generation @, and Generation Next. (Capece, 2010) There are about 23,000,000 members of this generation in the United States. (Schroer, n.d.)

Influences on Generation Z

The historic events influencing this group include 9/11, economic downturn and mainstream coverage of climate change. (Wallike, 2008) Technologically, they are far more advanced than previous generations and are considered digital natives. They like technology to be speedy and ever present in their daily lives.. This immediate access to information and feedback has lead to a practice of constant multi-tasking and a need for instant gratification. Many are integrated into Web 2.0, using self-publishing tools such as Facebook, Tumblr and Twitter. Regarding online publishing, they make no discrimination between public and private in-formation. (Capece, 2010) They are more environmentally aware than all previous generations. (Wallike, 2008) They are individualistic, self-directed and seeking self-discovery. (Trunk, 2009)

Expectations for Generation Z

Generation Z is expected to be the most educated genera-tion in American history. Because of their childhood as digital natives, they will process information more quickly than previous generations and prefer it in small chunks. (Trunk, 2009)They will use technology, and their own small networks to create change in the world. In the years to come they will face a lack of water, electricity and housing. They experienced a culture shock from the recession that will make them more measured, reserved and conservative with respect to money. (Wallike, 2008) When asked about the future of printed media, those surveyed by Habbo Hotel (the world's largest social game and online community for teenagers), most responded that they believe digital media will replace printed media and that interacting online will be just as important as interacting in person. (Generation Z Reveals Expectations..., 2010)

Recommendations when Designing for Generation Z

- *Create designs with online social components.*

- *Create designs with self-publishing components.*

- *Craft information in small chunks. Do not present large essays to read.*

ENVIRONMENTAL ISSUES

Humankind's effect on the environment is unsustainable. The number of challenges and amount of available literature is overwhelming. This review focuses on the current system of resource use.

Humankind and Nature

Industrialism was born of a time when both the objects created and people were viewed as being separate from the systems that govern nature. People extracted materials needed from natural systems to create products to sell for a profit. As industry expanded nature was seen as a force to be quelled and contained. This flawed outlook remains today. However, humankind is actually part of the natural system. (Braungart, 2002) The current industrial system is trashing the world and undermining the livability of the planet. The United States is to blame for much of this. The US population composes 5 percent of the world's population while consuming 30 percent of its natural resources. (http://www.storyofstuff.com/)

Current effects of this continued flawed view include global warming, the devastating health effects of environmental toxins, the peril of an ecosystem built on a monoculture, the increasing scarcity of natural resources and a tyranny over the living conditions left for future generations. (Braungart, 2002)

Linear life cycle of use

Objects are thrown away after use, and often a very fast use cycle is built into designs. This leads to a 'cradle to grave,' product life cycle. The grave is a landfill in which valuable resources are trapped. (Braungart, 2002) This system is built upon the cultural standard of buying and owning objects that is common in the United States. This

leads to an overproduction of goods. By comparison, in third world countries the need to buy and own objects is greatly reduced. (http://www.storyofstuff.com/)

Systems Approach

A shift in perspective will lead to the improved design solutions. The designers goal is to engage natural systems, not build boundaries between human and natural systems. A paradigm shift regarding the relation of humans and nature is underway. To this end, "wild" (natural) things are becoming fashionable. (Braungart, 2002)

Recycling

The process of recycling material results in the production of a material that has fewer useful qualities than the original. Additionally, the recycling process releases toxins and uses natural resources. Recycling everything will not fix a broken system.(Braungart, 2002)

Considerations for Designers with Respect to the Environment

*   *Industrialists are not amoral or intentionally destructive. The system they function within, a linear system of resource use, is just not sustainable.*

*   *Recycling does not mean ecologically benign.*

*   *"Be less bad," is not an ideal approach. Positive reinforcement is a more inspiring vision to garner change.*

*   *Nature litters and has waste. It is an effective system and the waste is consumed without harm. Mimic this system with your designs.*

*   *Focus on changing systems of object production and use.*

*   *Focus on the reuse of objects, the creation of objects with long life spans.*

*   *Products should be designed to decompose quickly or return to the industrial cycle easily.(Braungart, 2002)*

DESIGN, BEHAVIOR CHANGE & PERSUASION

Designs can persuade users to change their behavior. This review covers frameworks to use when considering behavior change through design.

The Behavior Grid

One framework for understanding various types of human behavior change is the Behavior Grid by BJ Fogg (Fogg, 2009). It is useful for studying and designing persuasive technology and categorizing human behavior. The horizontal axis organizes type of behavior change desired including *new*, *familiar*, *increasing*, *decreasing*, and *stopping*. The vertical axis is the schedule on which the behavior change is desired ranging from *one time*, *duration*, and *from now on*. Each of the 35 resultant cells correspond with a set of psychological theories, strategies and design techniques to support behavior change. Persuading a user to always tag friends in Facebook pictures would be seen in this framework as a green path behavior or a mix of a new habit that is ongoing and lasts forever. (Fogg, 2009)

Six Areas of Influence

There are six areas of persuasion that may be considered when designing for behavior change They include reciprocation, commitment & consistency, social proof, authority, liking and scarcity. (Lockton, Harrison, Stanton, 2008) Social proof is used to compare a user's actions with others of their peer group. For example, when entering a hotel room, if a user sees a card that indicates that 78 percent of hotel guests in this room opt to be more ecological and forego the daily washing of linens, they are more likely to exhibit the same behavior. Reciprocity refers to the ingrained behavior of returning a favor. Commitment & Consistency refers to the behavior of honoring goals. When a user commits to a goal they are linking that goal to their self image and are more likely to honor the commitment because of this. Authority refers to the behavior of obeying authority figures, even if the requested actions do not align with the users preferences. Liking refers to the behavior people exhibit of being easily persuaded by others they like. Scarcity refers to the behavior caused by the perception of limited quantity. This generates demand in users.
(Cialdini, Goldstein, Martin, 2008)

Recommendations when Designing for Behavior Change

- *Locate the desired behavior within the Behavior Grid*

- *Consider areas of influence to positively reinforce behavior change*

- *Always be honest with users about the behavior change a design will elicit.*
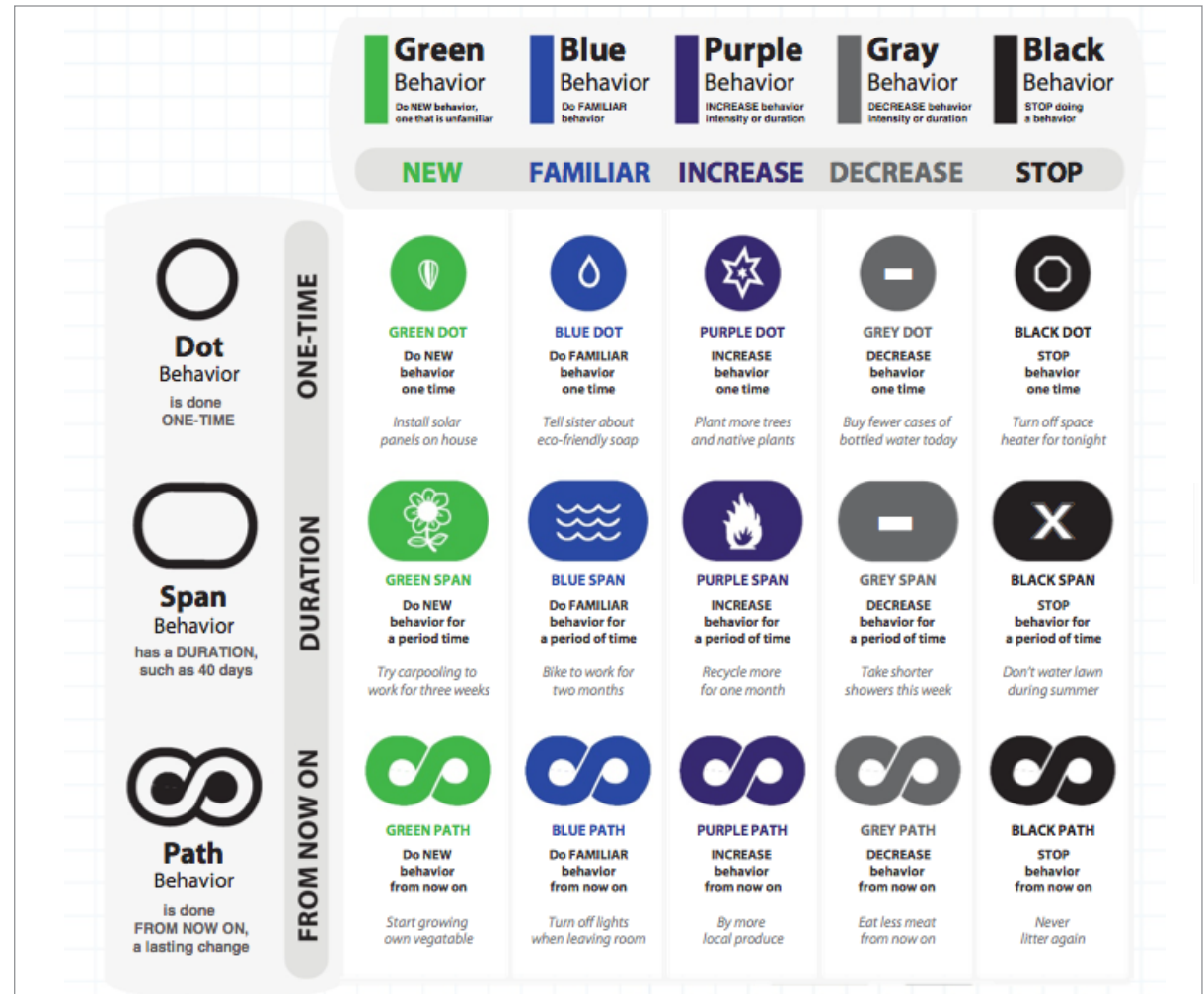
This visualization of BJ Fogg's Behavior Matrix was prepared by @EricJFernande and accessed April 20th via Scribd.

GAME DESIGN

When considering how to best reach an audience of teenagers by giving positive reinforcement to behaviors that are beneficial to the environment, one should consider the tenets of gaming.

Creating an Experience

The game elicits an experience. The game is not the experience. Through artifacts such as rule sets, game boards, or computer programs an experience is elicited in the user. Game experiences can cause feeling of freedom, responsibility, accomplishment, and friendship. (Schell, 2008)

Skills used when Designing a Game

Game design follows a user-centered process The game designer develops empathy for the user and understands that he or she is not the user. They must also verbalize what players are supposed to feel and think when playing a game. (Schell, 2008)

Essential Experience and Games

Game designers capture the essences of observed experiences and make games that elicit the same experience in users. For example, the essential experience of a snowball fight would focus on cold, snowballs, snow texture and laughter. These cues could be to used create a game so that players might have the "essential experience" but not the reality of a snowball fight. (Schell, 2008)

Surprises

Surprises are the root of humor, strategy and problem solving. Games surprise players and let players surprise each other. (Schell, 2008)

Play

Play involves willful action, usually of touching, changing or manipulating something in a way that indulges curiosity. Play involves questions like "How many times can I jump this rope, What happens when I finish this level, Can we beat this team? Can I beat this time? What happens when I turn this knob?" Pleasure in experiences arises from uncertainty about the outcome of experiences. (Kashdan, Rose, Fincham, 2004)

Motivations

Designers should consider the players' true motivations in life, and not just the goals a game has set forth. Consider the reason the player wants to achieve those goals. (Schell, 2008)

Recommendations when Designing Games

- *Consider what the essential experience players should have.*

- *Consider what aspects of the game will surprise players.*

- *Craft rules that will give players ways to surprise themselves and others*

- *Find ways to prompt players to ask and answer questions through game play.*
  (Schell, 2008)

OBJECTS AND VALUE

Objects are valued for many attributes. Two aspects closely related to the emotional value of objects are memory and story.

Seven Aspects of Objects

Objects can be viewed from a framework of value in seven areas: function, memory and story, identity, aesthetics, money, meaning, and time. The historic value of an object is transmitted through the medium of stories. Emotional attachments to objects are created by the objects memory keeping function, ability to be an expression of the user, prettiness and functionality. (Murray, 2003)

Objects and Memory

Objects act as containers for memories. This function as a memory holder causes owners to form emotional attachments to objects. (Murray, 2003)

Objects and Stories

Stories refer to the creation and lifetime of which is attached to the object. The stories can reach further than the objects themselves. "If stories are embedded into products, they bring great importance, meaning and value to the products, encouraging attachment to form." (Murray, 2003)

DESIGN PROCESS

The goal of this project was to support behavior change among teenage girls and their habits around the environment. In addition to a literature review, a user-centered process was undertaken including exploratory research, generative research, ideation, synthesis, evaluative research and reflection.

To ascertain the current worldview and the environmental attitudes and knowledge of teen girls, I conducted two research activities. A journaling exercise was independently completed by three participants. I led a series of four generative research sessions with 8 middle school and 8 high school girls.

I synthesized data collected and created a list of design guidelines and a model of user characteristics. I ideated with a group of Master's students also focused on behavior change. From 30 design ideas, I selected five to move forward with. After receiving expert feedback, I selected two ideas to develop into detailed scenario mapping wireframes, user actions, behavior change principles, and the worldviews of varied users. I researched current visual trends in campaigns focused on attracting the attention of teen girls.

During another round of generative workshops with high school girls, I received evaluative feedback on these scenarios. I selected a final design to develop and modified it based upon feedback received.
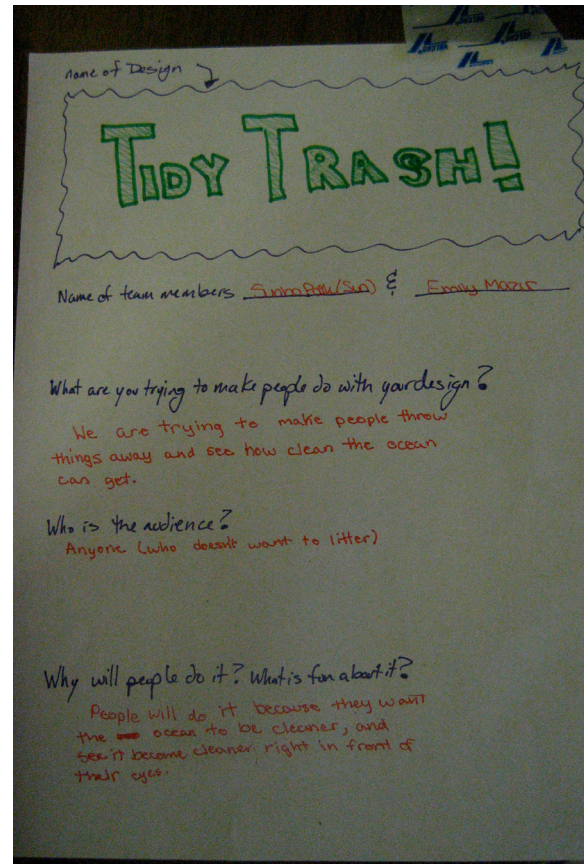
Materials created by participants in generative workshops.
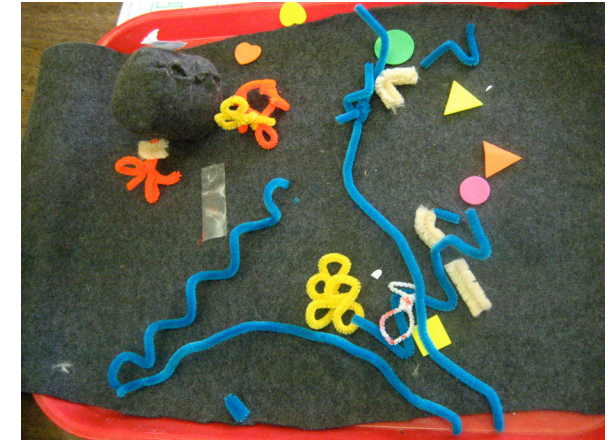
EXPLORATORY & GENERATIVE RESEARCH

JOURNALING

Beginning with the questions "What do teens know about the environment?" and "What role does environmental awareness play in their daily lives?" I created a journaling exercise. Kits included a mini instant camera, a 40 page journal, colored pencils and tape. Three participants completed the kits; girls aged 12, 14, and 16. One lived in the suburbs of Pittsburgh, one in the city of Pittsburgh and one in the city of New York.

Exercises

For five consecutive days, participants filled out the journal. The first exercise in the book was to draw the state of the world 50 years from now. Daily photo and writing exercises included documenting the actions that reminded them of environmental issues without prejudice as to "good" or "bad." They were asked to take photos of things that reminded them of the environment and then explain what it was, what they were doing that brought them in contact with it and what its link to the environment was. Samples of completed exercises were provided as scaffolding.

A written exercise asked them to describe the first time they thought about the environment. Often those who are extremely knowledgeable on the subject have had an epiphany moment in their lives.

Another written exercise asked participants to select a cleaning or personal health product and ascertain its environmental impact. I did not give directions for how to ascertain impact, but instead asked that they document their process in doing so.

A written exercise asked that they list all forms of transportation that could take them from school to home. After creating a list, they selected one and determined how much energy it would take to use this form of transit to get to travel to school once.

A drawing exercise asked that they draw the life-cycle of a product and predict where it will be in five years.

The first exercise, drawing the future state of the world, was repeated as the last in the book. As the journal as a whole is related to the environment, I was curious to find out if the experience of tracking ones thoughts and actions around the environment would change their outlook.

Findings

After reading collected data from all the journals, I noted the commonalities and patterns found among participants.

- *Recycling is the word most associated with environmentalism.*

- *Recycling is perceived as synonymous with resuse.*

- *Reuse is considered "environmental" only by those who feel environmentalism is a defining part of their personality.*

- *Often, packaging is considered for environmental friendliness, and not materials that compose a product or the expected duration of usefulness of a product.*

- *There is inquisitiveness around how much electricity is used to power everyday objects and intangibles (holiday lights, stops lights, radio stations, email).*

- *After several days, participants began considering the composition of items and possible wastefulness. (mechanical pencils)*

- *Participants saw challenging environmental issues in the world but were confident that their generation was the most aware and best equipped to solve problems.*

- *Confusion was experienced around "chemicals." , Participants were confused and overwhelmed by both the number of and scientific naming of ingredients found in personal health and cleaning products.*

- *Tracking thoughts about the environment led to an expected future state of the world with more environmental ills.*

Journaling

Research Questions
What do teens know about the environment?"

What role does environmental awareness play in their daily lives?

Participants
(1) 12 year old girl
(1) 14 year old girl
(1) 16 year old girl

Location of Participants
Fox Chapel
(a neighborhood in suburban Pittsburgh)

Oakland
(a neighborhood in Pittsburgh),

Washington Heights
(a neighborhood in New York City)

Duration
5 Days

Kit contents
one mini instant camera
colored pencils
tape
40 page journal booklet

Journaling kit given to participants. The kit included a mini instant camera, film for 24 pictures, a 40 page activity book, colored pencils and tape.
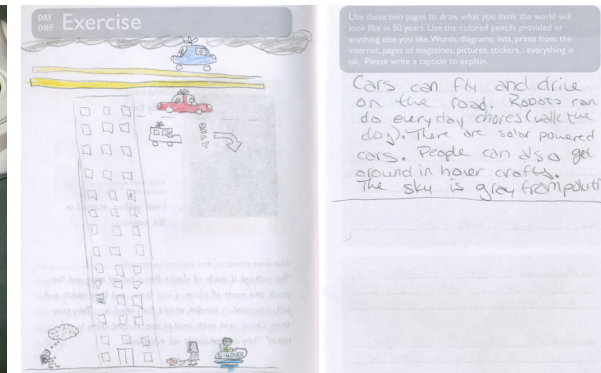
Completed exercise from the journaling kits. This exercise was completed on the first day and asked that participants draw the future state of the world.
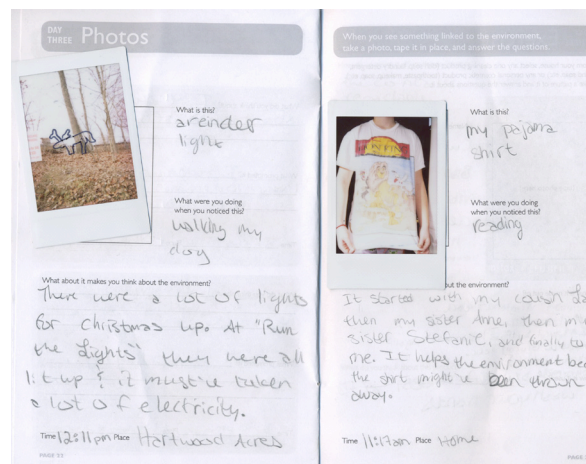
Completed exercise from the journaling kits. This exercise asked that participants take photos of things linked to the environment. This participant has cited a shirt handed down trough family members as a form of reuse and believes that this helps the environment.
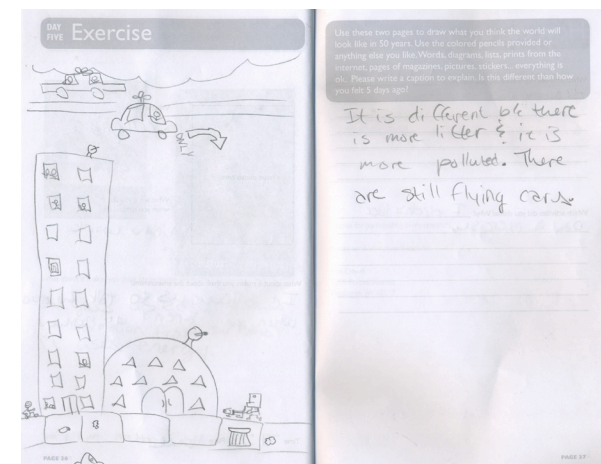
Completed exercise from the journaling kits. This exercise was completed on the fifth (and last) day. It asked that participants draw the future state of the world and asses if their view had changed through completing the exercise in the journal. This participant drew a more littered and polluted world.

GENERATIVE WORKSHOPS

Beginning with the questions "What do teens know about the environment?" and "In what areas do they see a need and opportunity for habit change in relation to the environment?" I created a protocol for generative sessions with teen girls. The Ellis School, a private girls school in Pittsburgh Pennsylvania, let me lead 8 work sessions. Four of these sessions were with ninth grade girls and four were with sixth grade girls.

Exercises

During the first session with each group, they drew one current and two future states of the environment on 18" x 24" paper using markers, pencils and crayons. I showed them samples as scaffolding. Samples included both negative and positive future states.

Next, I asked that they each choose an object I provided and draw the life-cycle of that object. Once again, I provided samples of life cycle drawings as scaffolding. Objects varied from miniature plastic figurines (Kid Robot) to candles, curling irons, jewelry and magnets. I chose objects that would be common in most households.

From these exercises, I hoped to prime them with thoughts about various environmental challenges that they will face in the decades to come. This scope for drawing exercises was large. To narrow our sessions to focus on what they considered important, we played "I see, I wish." I asked each girl to fill out at least two Post-It notes. I told them to write "I see…" on a Post-It note and fill in something they see as a challenge in the environment. For example, "I see litter." Regarding "I wish," I asked that they think of a solution. For example, "I wish people threw less away." I gave them three minutes to write on Post-It notes. I collected all the notes and affixed them to larger sheet of paper.

While standing in front of the group and near a blackboard, I assisted in organizing their thoughts into affinity diagrams. I read each the contents of each note out loud and asked the girls where I should put it. In this way, we completed an affinity diagram of their concerns. They discussed each point and later cited this portion of the research session as their favorite. One participant said, "We never get to talk about problems like this. This is the best part. We should draw less."

Next, I listed the problems they had identified — habitat loss, education, littering, dependence on screens keeping people away from nature, and use of transportation with a high carbon footprint. I asked that they choose a problem to create a design solution for and to self assign themselves to teams of 2, 3 or 4. I then gave them maketools[1] and asked that they create a design to solve their chosen issue. Kits included grey felt forms of various sizes and shapes (cubes, cylinders, and triangles from 2" x 2" to 10" x 10), colorful foam, Velcro with adhesive backing, double sided tape, markers, paper and pipe cleaners. Once more, I presented a sample design as scaffolding.

After two work sessions devoted to design development, I asked that they fill out an information sheet on their design, present their design solutions to the class and answer any questions from classmates, me or the art teacher.

Findings in relation to design
Data collected revealed the following findings:

- *Girls who knew less about product life cycles were also less interested in environmental issues.*

- *Girls who have spent more time in nature (at farms, state parks and national parks) were the most knowledgeable about the environment and most motivated to change it.*

- *Adults were seen as the group of people most negligent in regards to the environment.*

- *Protection of and assistance to animals were a prominent focus during drawing, affinity diagramming and design solutions.*

- *Conversation around the room centered on jewelry, clothes and an upcoming dance.*

Findings in relation to workshops with teen girls
- *Middle school girls were more creative and needed less scaffolding than high school girls. They were not looking for a "right" answer to appease the leader of the workshop, but instead were more engaged in the activity and requested less guidance.*

- *Team work is far more motivational than individual work.*

- *Smaller pieces of paper for drawing are preferred. Participants tried to fill the larger paper with drawings and it was time consuming.*

- *Forty minutes is too long to spend drawing. In future sessions, consider providing stickers of words, prints of images or other materials to inspire and speed the process. Consider shortening drawing time to 20 minutes to make more time for group design development.*

[1]Creation toolkits for participatory design sessions. See www.maketools for further reference.

Generative Workshop

Research Questions
What do teens know about the environment?"

In what areas do they see a need and opportunity for habit change in relation to the environment?

Participants
(8) ninth grade girls
(8) sixth grade girls

Locations
The Ellis School art room, Pittsburgh PA

Duration
(4) forty minute sessions

Tasks
Draw the current state of the environment.

Draw two future states of the environment.

Draw the life cycle of an object.

Play "I see, I wish."

Create affinity diagrams.

Select a design problem.

Using Make Tools, create a solution.

Process work during generative workshop.

Drawings from first exercise in workshop. The current state of a pond is presented on the left. It is littered and polluted. The future state is on the right and shows that people are more educated, driving electric cars, and that pollution and litter have decreased.

Affinity diagram of environmental challenges created during generative workshop.

Design created with maketools during generative workshop. The target audience of the design is adults. A large glass cube with for living insect habitats would be installed on city street corners. Informational placards would explain the importance of each species to the ecosystem and steps people could take to assist each species.

SYNTHESIS

DESIGN GUIDELINES
I looked for patterns in research collected through my literature review, journaling, and generative sessions. I reviewed what participants spoke about, what they created, and what they recorded. From this synthesis came a list of design guidelines for use when creating products for teen girls to use to lessen their impact on the environment.

Use animals
Three teams (of five) focused on animals as communication tools.

Show off actions
All participants wanted to feel proud publicly and gain recognition from their peers.

Connect to a physical object
Three teams (of five) used physical objects to incite behavior change.

Do not focus on screens
One team (of five) built a project around avoiding screens. All five teams had physical components in their final solutions.

Positive, fun feedback is good
"It's cool because they can see the ocean get better."

Add to the recycling habit
They already recycle often. Participants at all levels of environmental awareness knew about recycling. Use this habit as a base to build new habits.

Connect to online social system
One project was connected to an online competitive point system.

Create a platform to inform others
Four (of 16) participants felt motivated and empowered by the idea of teaching older and younger generations.

Create a physical community
Participants said their favorite part of the activity was talking about solving complex real world problems.

PERSONAS

After organizing the data collected, I created personas of that characterized the girls within my participant group.

yay! is optimistic about the future of the environment. She is well educated about the environment and ecosystems. She expects that all people will improve their behavior in respect to the environment.

eep! is aware of environmental issues and is somewhat educated about ecosystems. She believes that challenges that exist around improving the environment are too great for humankind to overcome. Nonetheless, she is focused improving her own impact by changing her personal habits.

sigh is well educated about the environment and ecology. She is overwhelmed and made anxious by the number of challenges that exist around improving the environment. This has led her to avoid thoughts or actions related to stainability.

nvm is not well educated about the environment or stainability. She does not believe there are any problems with the current state of things. She is disinterested in the environment.

more motivation

eep!

Catch Phrase
The future is bleak.
Let's fix it now.

Environment Goals
Change personal habits.

yay!

Catch Phrase
The future is good.
Everyone will change.

Environment Goals
Educate Others.

less knowledge

more knowledge

nvm

Catch Phrase
Whatevs.
It doesn't matter.

Environment Goals
Avoid it.

sigh

Catch Phrase
The future is bleak.
We shall all perish.

Environment Goals
Avoid it.

less motivation

PROTOTYPES & EVALUATIONS

PRELIMINARY DESIGN
After considering my literature and project review as well as design guidelines and user characteristics developed from generative research, I created many ideas. I met with a group of graduate design students also interested in behavior change. We played improv games to aid in the ideation process. After these session, I had 30 ideas. After reflection, I narrowed these ideas to five. During a public poster session, I received feedback from faculty, designers and students. Their feedback and my personal reflection on each design are summarized below.

Trashy Animals
Statues of local animals are attached to trash cans. Information about the animals habitat needs and challenges are presented on an attached graphic.

Pros: Use of physical objects and cute animals to embody message.

Cons: Effects of weather on statue of animal and attached graphic. System is static and without positive feedback.

SwapMe
Stories are attached to objects no longer used. Objects are traded among friends and the stories are discovered by new owners. More stories are added and the process is repeated.

Pros: Use of physical objects, social system, and positive reinforcement.

Cons: Technical challenges with story attachment system.

Real Tank
A digital tank is linked to water, air, ecosystem and pollution conditions of a portion of ocean. Users can collect animals and plants, complete missions and visit friend's tanks.

Pros: Use of animals, social system and real time feedback on actions to incite behavior change.

Cons: Design requires creation of additional stuff (a digital flat screen "tank") in the world and negates the tenets of sustainable development.

Service Matcher
Volunteer opportunities are explored through Facebook. Friends can choose areas of interest, such as "habitat help," and commit to changing habits and completing service projects. For example, a user interested in bird conservation might volunteer at a local sanctuary and stop using microplastics.

Pros: Use of animals, social system and real time feedback on actions to incite behavior change.

Cons: Design requires excellent coordination with many non-profit organizations. Teens are already overwhelmed with school requirements. Service seems like another requirement rather than something fun.

My Stuff
Virtual possessions are shared among groups of friends on Facebook. The choices users make about possessions (keep, throw away, share, reuse) are represented with their positive environmental impact (energy saved, pollution presented, habitats saved).

Pros: Use of social system, immediate positive feedback and familiar daily objects to incite behavior change.

Cons: Virtual objects are not valued.

Photo of ideas created during improv ideation session.
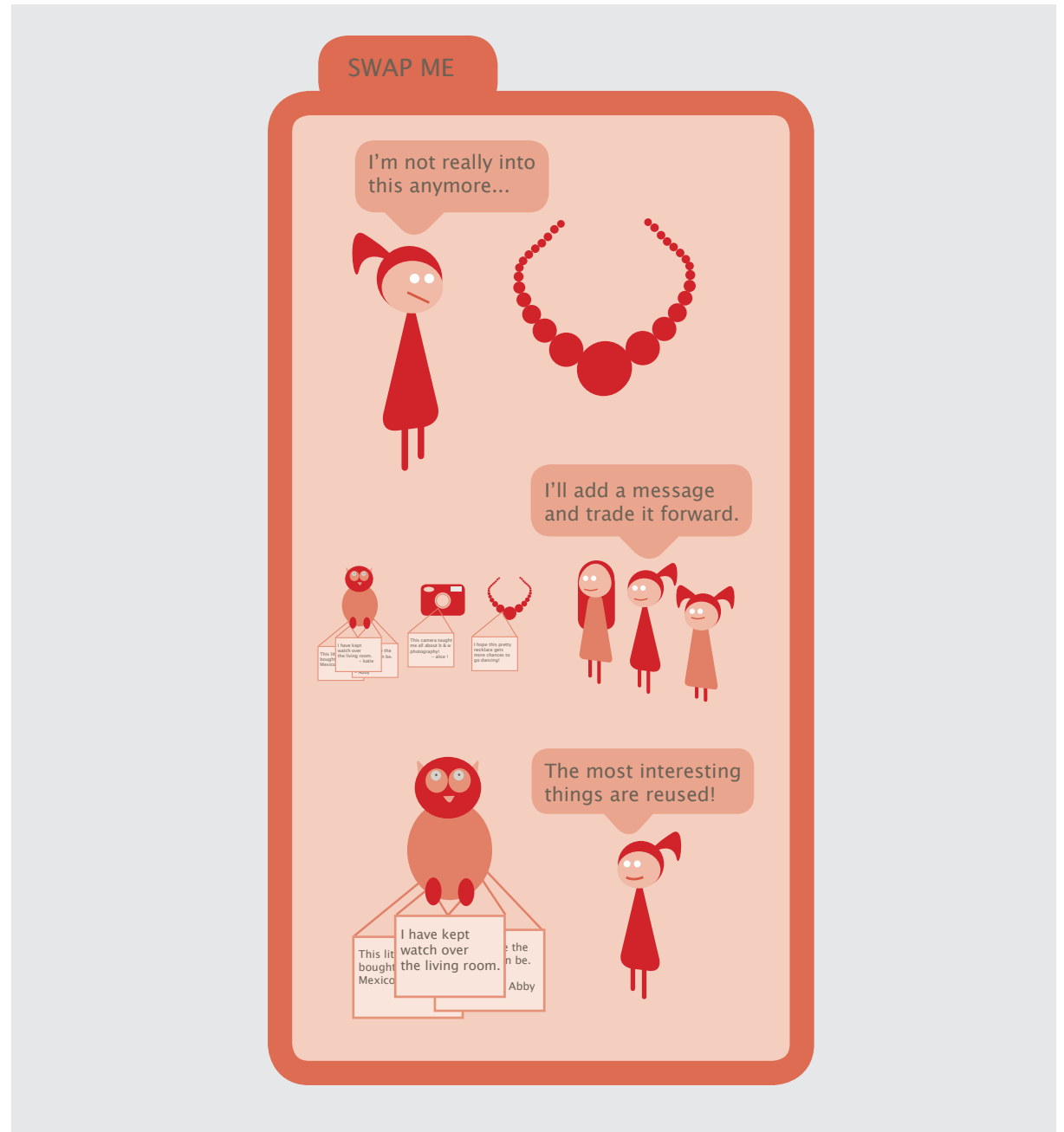
SwapMe, a design concept.

TRASHY ANIMALS

Rabbit. Pittsburgh, PA

Parks and yards are my home. I eat greens and hate fertilizers. Let dandelions grow to make me grow. Food wrappers are bad for me, so throw them out.

REAL TANK

Pete! You look hungry! It's cloudy. hmmm.

Name: Pete
Age: 1 year
Food: Plankton
Predators: People, Sharks, Birds
Location: Florida Coast
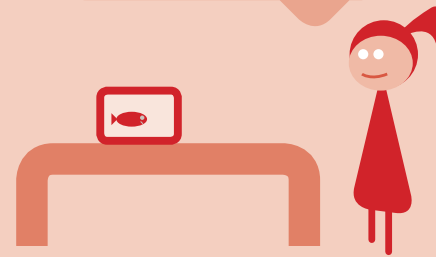
I'll send you to Dee's tank in the Gulf. Its sunny there, so there will be plankton. Careful of the birds!
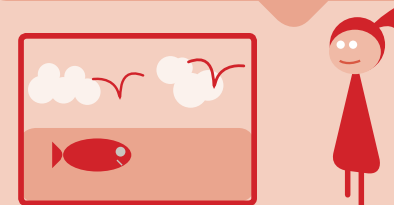
Trashy Animals and Real Tank design concepts.

SERVICE MATCHER

Facebook

I want to… save animals

stop litter

help habitats

reduce carbon

teach my parents

Facebook

I will… go to Ohiopyle

document animals
in my neighborhood

make a bird feeder

volunteer at wild
animal sanctuary

Facebook

Alice is making
a bird feeder too!
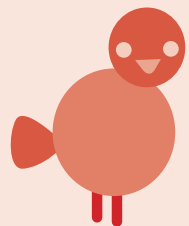
chirp!
chirp!
chirp!

Facebook

You and Alice completed the
challenge! You both get the
Habitat Helper Badge!

Service Matcher, a design concept.

MY STUFF

Facebook

You have 27 silly bandz.
What will you do with them?

Facebook

	Energy Saved	Habitats Saved	Points Earned
Keep	·	●	●
Share	⬤	⬤	⬤
Reuse	●	●	●
Recycle	●	●	⬤
Throw Away	·	●	●

Facebook

My Stuff

Energy Saved

Habitats Saved

Pollution Stopped

Points Earned

Facebook

Our Stuff

Energy Saved

Habitats Saved

Pollution Stopped

Points Earned

NARROWING FOCUS

Based upon feedback from the poster session and personal reflection, I moved forward with two design concepts: RealTank and SwapMe. While refining the designs, I renamed them to reflect changes to the design. To remove the need for creating a separate flat screen "tank" with RealTank, I moved the design to Facebook and broadened its scope to include all habitats. With these changes, I re-named the design EcoSpace. To take advantage of existing social systems and provide social proof for trading habits, I moved SwapMe to Facebook as well. I renamed it ReUseIt to highlight its connection to the environment.

SCENARIOS

To test user actions and design outcomes, I developed a scenarios of usage for ReUseIt and EcoSpace. I mapped usage of each system to the personas created previously.

EcoSpace is a Facebook game centered around building ecosystems. Users purchase plants and animals and tend to them in a virtual ecosystem. The rules of the game impart the rules of ecology. An excess of planting one species would lead to another species dying off. Animals may migrate seasonally or require the user to create conditions, like shade, to aid in the growth of a species or formation of a full ecosystem. While many plants and animals would be purchased with points earned through playing the game, some could be purchased with Facebook credits. Fifty Facebook Credits cost 5 dollars. When an item is purchased with Facebook credits the money would be donated to a related environmental cause. For example, if I were to purchase owls, the money would be given to an owl preservation group. Users would be motivated to play the game through watching their virtual world and visiting the virtual worlds of friends. They would be given goals such as building a full owl ecosystem or discovering what plants work best for the habitat they are building an ecosystem in. ReUseIt is a system with components in the real world as well as Facebook. It helps users attach stories to an object and then trade it. The trading of objects happens at small local events and the object's stories, current and past owners are tracked on Facebook. It motivates users to re-use objects and adds value to objects that have been reused many times.

This is one frame in a scenario of usage for the Facebook Game EcoSpace. Wireframes are mapped to the personas of yay!, eep!, sigh, and nvm. Their needs and feelings when using the game are described.

This is one frame of a scenario of usage for the Facebook application ReUseIt. Wireframes are mapped to the personas of yay!, eep!, sigh, and nvm. Their needs and feelings when using the game are described.

BEHAVIOR CHANGE

As a way of checking to ensure that the designs I was building incited behavior change, I mapped their intended behavior results using the Behavior Matrix developed by BJ Fogg.(Fogg, 2008)

EcoSpace is a Facebook game that cultivates an understanding of ecosystems and empowers users to educate others. This is a Green Path behavior focused on adding considerations for ecological impact to daily behaviors.

ReUseIt is a system that supports a new behavior of trading objects and attaching stories to objects. This is also a Green Path behavior.

Both EcoSpace and ReUseIt incited new positive behaviors with respect to reuse, so I moved forward with both designs.
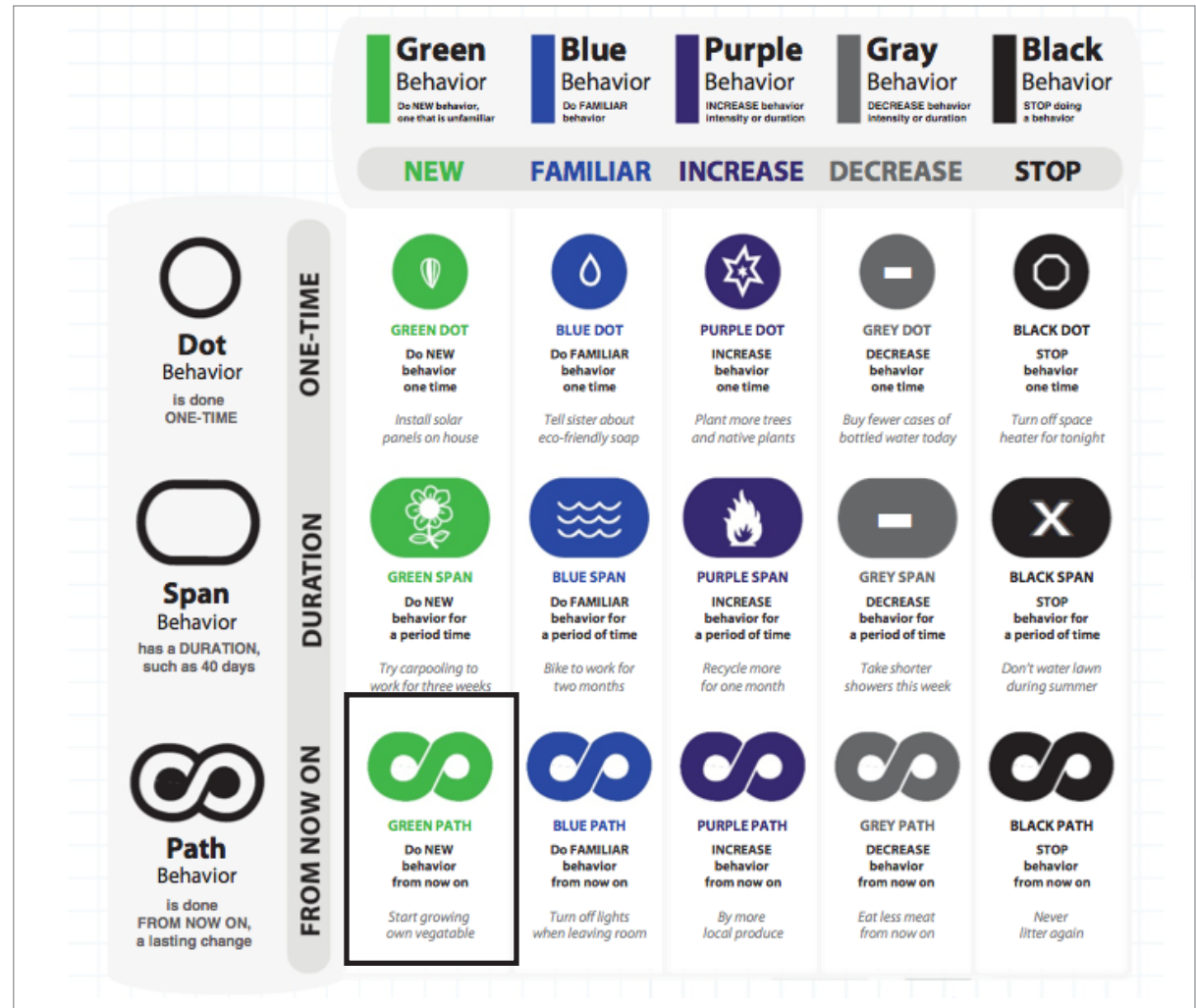
This visualization of BJ Fogg's Behavior Matrix was prepared by @EricJFernande and accessed April 20th via Scribd.

EXPERT EVALUATION

I presented the EcoSpace and ReUseIt to an expert game developer to assess technical feasibility. Feedback included a comparison to current games available on Facebook as well as steps needed to build a functioning application or game on Facebook.

For the development of both ReUseIt and EcoSpace, an agile development process should be undertaken. The first step would be to develop a more detailed scenario of usage and system architecture so as to communicate requirements to engineers. The front end development for both designs would be completed in Flash while the back end development would be completed using PHP or C++.

ReUseIt

From an engineering perspective, ReUseIt is a general web application. To complete the building and testing of the application would require 2 weeks of work from one back end developer and six months of work from 3 front end developers. ReUseIt would be feasible to complete on a small budget. From a competitive perspective, no games yet exist on Facebook that have similar features to those presented in ReUseIt.

EcoSpace

From an engineering perspective, EcoSpace is a social sandbox game or "open-world" game similar to Farmville and to web applications. EcoSpace would compete with these games, the two most developed and most used sandbox games available through Facebook. To provide a similar quality of gaming experience, EcoSpace would require one full year of design and one full year of development from a team of 40 developers.

Additionally, there are financial issues to consider when creating a game for Facebook. Facebook collects 30% of all money spent by users when using Facebook games. Gaming companies like Zynga must purchase technical support from Facebook. From a gaming perspective, ReUseIt would require the development of more complex goals to incite social visits to friend's game space as well as short term and long term goals. These additions would make the game more challenging and more rewarding.

STORY ATTACHMENT

The physical challenges of attaching a story to an object are numerous. The design requirements of story attachment for SwapMe include the following:

- *attachment to all surface types (from fuzzy to metal)*

- *attachment to all surface sizes (from the back of a ring to the back of furniture)*

- *attachment for many years*

- *a visual indication that a story is attached*

- *storage of story now and additional stories later*

- *readability of story in the near future and distant future*

- *low cost*

I discussed these design requirements with an expert in embedded technology. No one solution fulfills all of these requirements.

A Micro SD card would allow stories to be saved electronically and then be physically attached to the object. It would require an armature to attach to the object. It is not physically sturdy and the technology may soon be surpassed. It would also require a reader that attaches to computers. A Mini QR Code holds can encode up to 35 numbers or 21 characters. It is not yet standard, but may be soon. A user could use a phone capture program to take a picture of it and then access the internet. It is low cost and small. As it is not yet popular, there is no guarantee that it will become popular or be a long lasting step in our technological history. A flash drive is too large to affix to small objects and can withstand a limited number of rewrites. A bar code is too big to affix to small objects. Miniature RFID tags would require a user to posses technology that reads the radio signals emitted. This tech is not yet widespread and may never be. Stickers, although low tech, made of wash-resistant materials and high powered glue may be the simplest and most long lasting solution.

Where is George?, an online portal that tracks dollar bills is an example of simple numerical system used to track objects. (http://www.wheresgeorge.com/ accessed on April 20, 2011) I believe this is a viable option for attaching stories to objects.

VISUAL TREND ANALYSIS

I researched current trends in visual design familiar to teenage girls. I visited popular clothing sites and researched popular artists featured on Billbord.com. I also visited color-lovers.com and pantone.com and searched for color trends, teen colors and teen patterns. I found two strong trends.

First, Lady Gaga and other singers have brought popularity to an alien aesthetic. This is defined by black color blocks with pastels and high saturation, high value animal patterns. This is often supported by bold white text set in geometric sans or didone fonts.

The second and more common aesthetic I found was is retro. Polaroid style effects are layered on photos. Typography is decayed with grunge effects. Layers of aged papers are piled to divide screen areas. This was most common on sites related to shopping.

As the concept behind ReUseIt involves the reuse of objects, a vintage effect would be more effective in communicating the message of the system than the alien aesthetic.
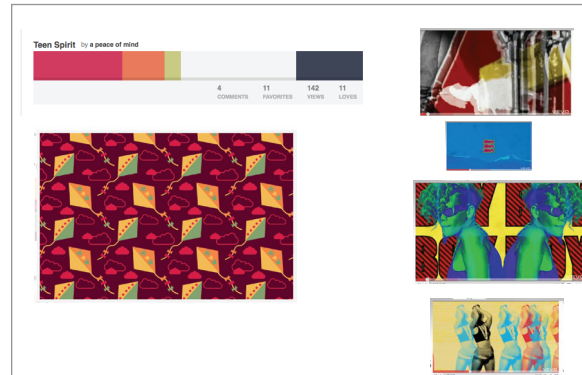
(left) Pattern and color research from colorlovers.com.
(right) Screenshots of Rhianna Video.

(all) Clothing sites featuring layered aged paper, pink, bright colors, distressed type and patterns
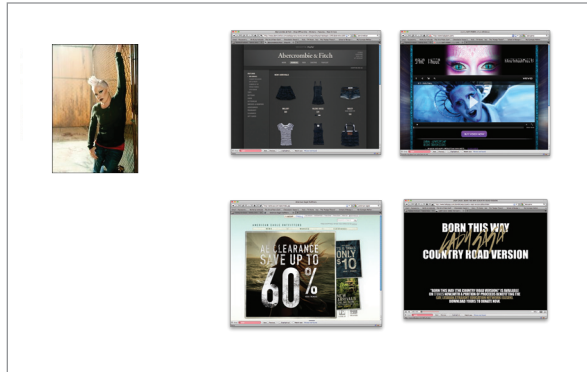
(left) Pink with goth alien look.
(top middle) Abercrombie.com with dark background and minimal color.
(top right) Lady Gaga with dark background, bright colors, animal prints & alien aesthetic.
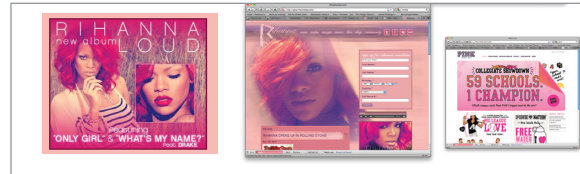
(left & middle) Vintage look and stripes of Rhianna's website
(bottom right) Layered pinks, textures and slab serifs at pink.com
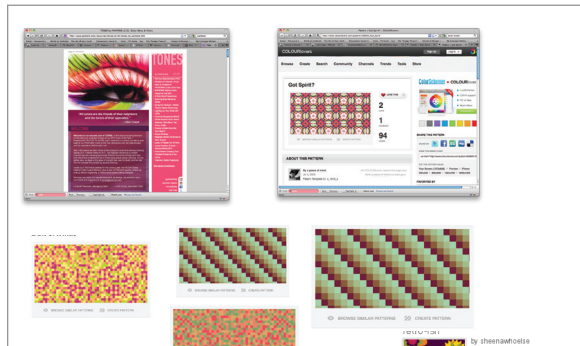
(top left) Colors of summer 2011 at pantone.com.
(all others) Brightly colored teen and retro patterns
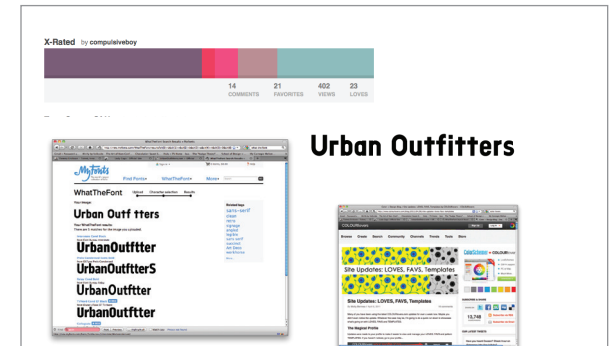
(top left) teen color scheme by colorlovers.com
(middle) Geometric sans serif logotype by Urban Outfitters
(bottom right) teen pattern by colorlovers.com

EVALUATIVE WORKSHOP INTRODUCTION

To gauge response to the two concepts being developed, I conducted evaluative workshops. Sixteen ninth grade girls participated across four sessions. All participants were new and had not been a part of previous research sessions. This evaluation was nested within lessons on information and interaction design. Over four sessions, participants were taught information and interaction design and given design challenges.

EcoSpace Workshop
The first challenge was to create a persona and design a Facebook Game around ecology. The task of designing a Facebook game around ecology aligned with the design concept of EcoSpace. I asked that they form teams of 3 or 4, create a persona and then wireframes for a Facebook game about an ecosystem. I provided examples of completed exercises as scaffolding. While reviewing work with teams during the second workshop session, a class discussion regarding Facebook games came up. When making personas, none of the teams had selected to focus on a teen girl. When discussing this, all participants said that they did not use Facebook games. Based on this feedback, I stopped developing EcoSpace, the Facebook game.

ReUseIt Workshop
The task of creating a system to attach stories to objects and trade objects aligned with the design concept of Re-UseIt. To start this workshop, I gave each the participants a random object (scarf, ring, bracelet, stuffed animal, and squishy toy). I asked that they take it home and spend time with it. Upon returning to the next session, I asked that they write a story about their time with the object and evaluate if their feelings about it had changed. They then passed the object to someone else. The new owner looked at it and wrote down her thoughts on it. She then read the previous owner's story and re-evaluated her thoughts on the object. I asked that she take this new object home and spend time with it.

After they had completed object and story trading, I explained scenario drawing and grouped them into four teams of four. I assigned each team a challenge. *Team Visual Cues* was asked to solve the problem of visually indicating that there was a story attached to their objects. *Team Story* was asked to outline the steps a user would take to attach a story to an object. *Team History* was asked to outline how one would access all of the stories attached to an object. *Team Trade* was asked to create a system for people to trade objects. While workshoping I game them five minutes to solve challenges while drawing solutions alone, ten minutes to share solutions in the team, ten minutes to draw a final team solution and ten minutes to prepare their scenario presentation for the class. This timeline for rapid ideation was based upon David Sherwin's timeboxing concept (Sherwin, 2010).

To conclude the workshop, they presented their solutions to the class and received feedback. I also presented slides of the proposed Facebook application "ReUseIt" and asked them to evaluate it anonymously. A paper questionnaire asked if they would use a system like this and if so, what objects they would trade. Another paper presented two empty columns. One was headed "I wish" and the other "I like." They wrote positive and negative commentary about ReUseIt in these columns.

Findings for EcoSpace
After looking through collected data (wireframes, personas) and considering class conversations, I synthesized findings, into the following key points:

- *Ecology is not a topic of interest for teen girls. One team created a windowsill garden that users would tend. Four teams created games unrelated to ecosystems (hunting, dancing, tea parties and skiing).*

- *Participants did not currently use games on Facebook and do not imagine that they could ever use games on Facebook.*

Findings for ReUseIt
(See more detailed findings on adjacent page and Note that one participant was absent during the fourth day of workshopping.)
After analyzing collected data including scenarios and worksheets, I synthesized following:

- *Eight of 16 girls kept the objects after the workshop was complete. Four of 16 girls kept the story books that accompanied the objects. This supports the finding that story trading adds value and interest to objects.*

- *Participants had the most positive feedback (6 of 15) to using the system for trading.*

- *More positive than negative feedback was given regarding the concept, usability and aesthetics of the system.*

- *Of 15 participants, 10 said they would use this system.*

- *Of 15 participants, 4 said they would like to see objects and stories beyond their friend list on Facebook.*

Findings for Workshop Experience
Interaction design should be taught at a high school level in art classes. Eleven of the fifteen girls said they enjoyed this lesson in interaction and information design and wanted to learn more about the human-centered design process. Although they do not play Facebook games, 14 of 15 girls responded that they enjoyed designing one and learned from the challenge.

Participants working on design concepts.
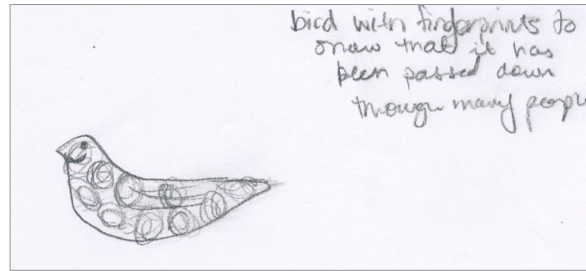
Design solution produced by Team Visual Cues. This team was tasked with adding a visual indication to objects to let stranger know now and in the future that a story is attached. This solution involves permanent fingerprints on objects.
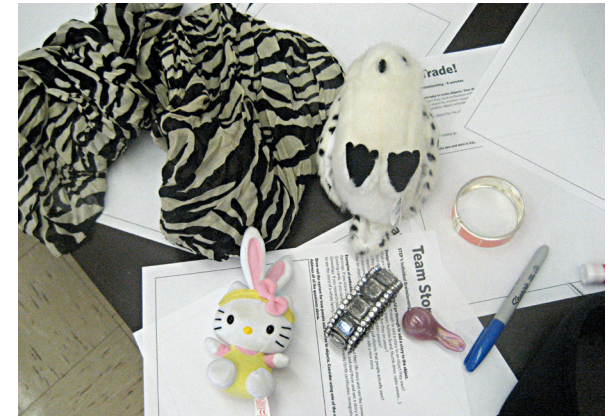
A selection of items traded by participants.
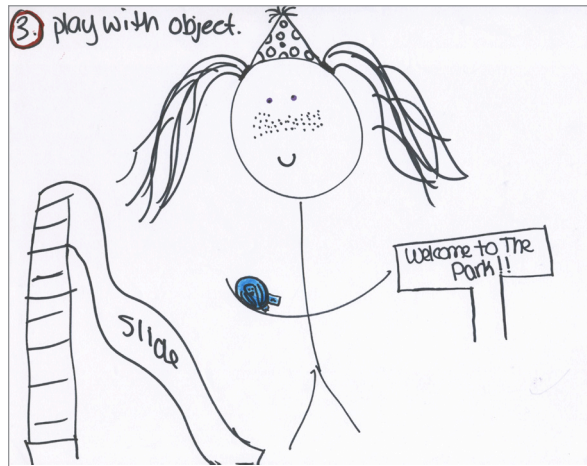
Scenario frame created by participants. This is one step in the process of attaching a story to an object.

I would trade...

decorations

books

clothes

stuffed animals

old toys

jewelry
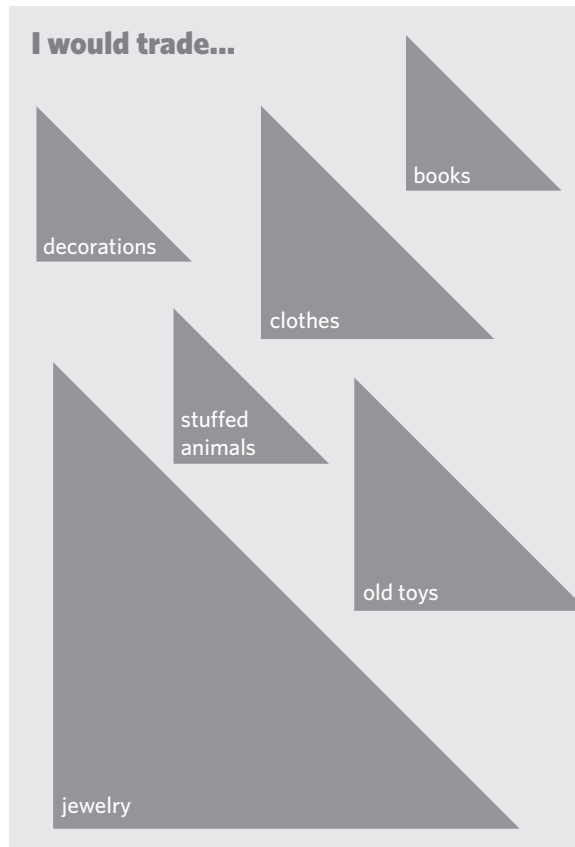
Information visualization charting objects participants would trade with ReUseIt.

Scan of wireframes for a Facebook game created by participants. Game centers around growing flowers on a windowsill.

Story of an object written by participant.

The last four sessions have covered a bit of information design and interaction design.
(Info Design Slides, Facebook Game making, Story Trading, Scenario drawing)
The following questions cover your thoughts on this experience.

1. Which activity did you like the most? Why?

I liked carrying an object around with me and writing a story about it.

2. Which activity did you learn the most from? Explain.

I think that I learned the most from the first day when we listened to Kim talk and went through her slideshow

3. Which activity did you learn the least from? Explain

I think I learned the least from the scenario drawing. I didn't quite understand the different groups + their purpose.

4. Would you be interested in learning more about this type of design in the future?

Yes. This is very interesting.

Workshop evaluation written by participant.

Screenshot of ReUseIt as shown to participants for evaluation.

I wish

- I wish you could access not only your friends but everyone else and comment on their stories too.

I like

- that you can trade with your friends
- that you can see all the stories of all the objects
- that people can comment on your object and story.
- that you have the choice to trade your item with someone else.

ReUseIt evaluation written by participant.

Would you ever use a system like this to attach stories and trade things? Explain.

Yes, it would be useful I think to have something you can trade stuff and them you can read about.

What types of things would you trade?
(little things, big things, jewelry, clothes, purses, decorations, etc)

little things like maybe jewelry, decorations.

ReUseIt evaluation written by participant.

Evaluative Workshop

Research questions
Would teens use a Facebook game centered around environmental issues?

Would teens use an object trading system with storytelling and Facebook components?

Participants
(16) ninth grade girls

Location
The Ellis School art room, Pittsburgh PA

Duration
(4) forty minute sessions

Tasks
EcoSpace Evaluation
Lecture on information design, Facebook applications & personas.

Choose a team, create a persona and wireframes for an ecological Facebook game.

ReUseIt Evaluation
Take an object home & spend time with it.

Write a story in a journal about time spent with the object

Pass the object and journal to someone else and repeat process.

Lecture on scenario development.

Choose a team, draw a scenario of use for object coding, object history, object trading or story attachment.

Present to class and get feedback.

View and evaluate slides of proposed Facebook application "ReUseIt."

Workshop Evaluation

Evaluate experience of workshop.
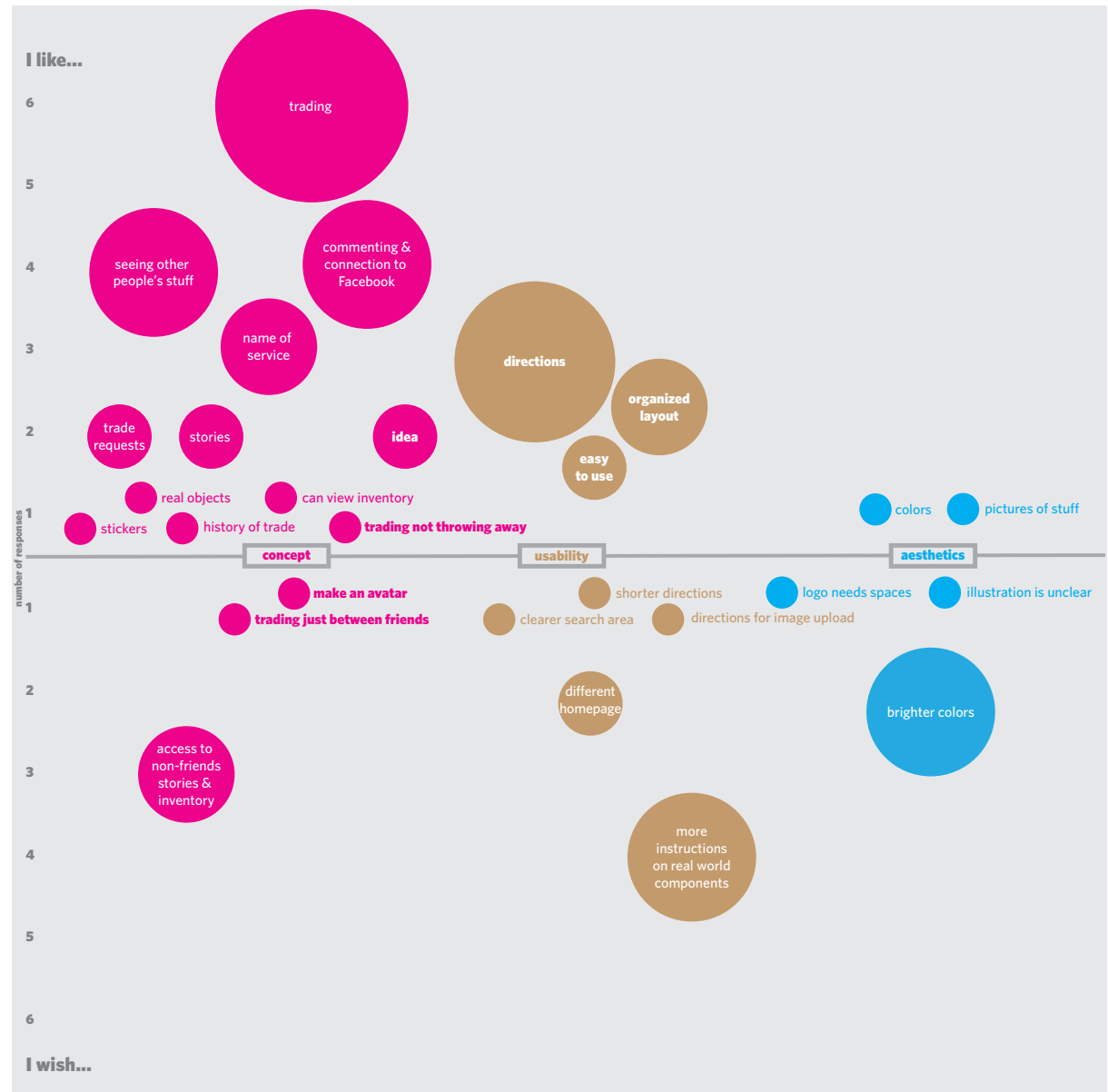
Information visualization charting evaluation of ReUseIt

FINAL DESIGN

The evaluative received through workshopping sessions validated the desirableness of ReUseIt as a system. Participants stated that they liked the concept, its attachment to Facebook, its trading components and the attachment of stories.

The final design takes the form a service called ReUseIt. It involves both online social networks and the physical world — a requirement discovered during generative research sessions. The online portion is housed within a Facebook application. Overall, the system gives positive social feedback as well as moments of fun, surprise and creativity around the reuse of objects,

ReUseIt is discovered at stores where ReUseIt cards are stocked. The cards are free and contain stickers with unique numbers. Users take a card home and look for objects they no longer use. After finding an object and affixing a sticker, users link the number to the object with the ReUseIt Facebook application. Within the application, they write stories about their objects, view their collection and view their friends' collections and write comments on friends' stories. They can suggest trading objects with friends. The application alerts users to ReUseIt events that take place at local shopping centers. This is an opportunity for users to convene and trade objects. This helps users find objects and stories outside of their immediate friend circle (an unmet need indicated in evaluative sessions). Users can register their attendance and make public which objects they will be trading to allow more users access to objects and their stories.

ReUseIt allows users to be creative, experience moments of surprise and fun. These attributes, along with the social proof of a user adopting a system her friends belong to, and the option to comment in Facebook are all factors that will motivate users. They can announce their accomplishments and receive praise and attention in both the real and virtual world, fulfilling a public praise need found in generative research sessions. The service is broad and serves users who are less interested in the environment as well as those who define themselves as environmentalists. All persona types (nvm, sigh, eep!, and yay!) would find the service of interest.

The design problem identified, neglectful daily habits with regard to the environment, have been addressed with ReUseIt. The system incites teen girls to reuse and recirculate under-used objects. As a result, fewer objects will be thrown away and the demand for natural resources to be used in the making of new objects will be decreased. During evaluative research sessions, ten of fifteen participants (all teen girls) said they would the service.

DISCOVERY OF SERVICE

PHYSICAL EVIDENCE

CUSTOMER ACTIONS

see infocard | read infocard | take infocard home

LINE OF INTERACTION

ONSTAGE VISIBLE CONTACT EMPLOYEE ACTIONS

LINE OF VISIBILITY

BACKSTAGE INVISIBLE HIDDEN EMPLOYEE ACTIONS

LINE OF INTERNAL INTERACTION

SUPPORT
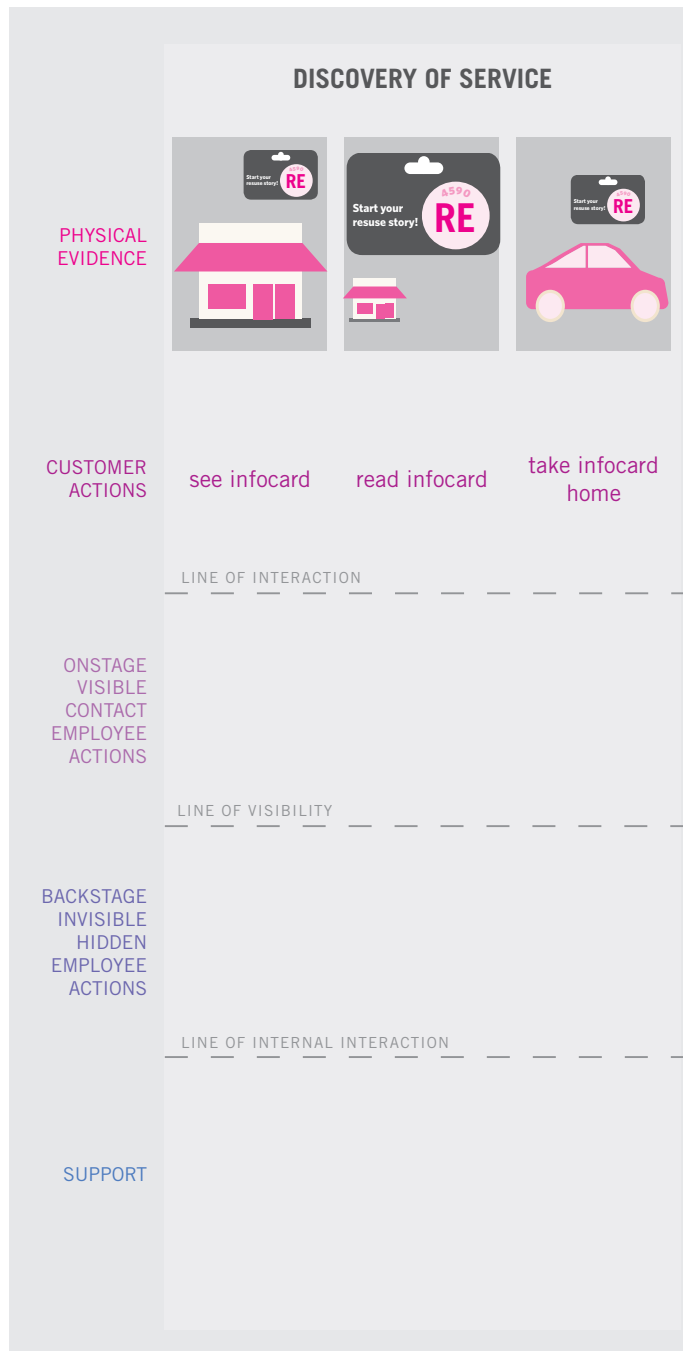
ReUseIt service blueprint delineating the discovery of service.

ATTACHING A STORY
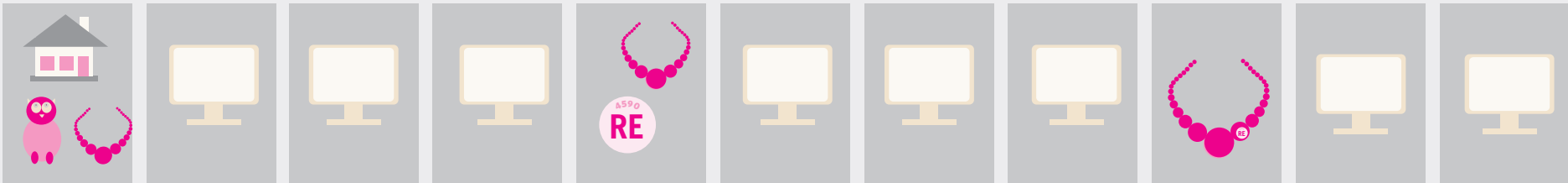
look for unused objects at home	log onto Facebook	open ReUseIt application	select create a new story	affix a sticker to the object	enter sticker number	upload photo	name the object	look at object and consider its story	enter story and	publish
	Facebook news feed screen	ReUseIt app screen	ReUseIt app screen	ReUseIt app screen	ReUseIt app screen		ReUseIt app screen		ReUseIt app screen	ReUseIt app screen
								posts activity to wall		
	backend Facebook	backend ReUseIt	backend ReUseIt	backend ReUseIt	backend ReUseIt		backend ReUseIt			

ReUseIt service blueprint delineating how stories are attached..

REQUESTING A TRADE ONLINE
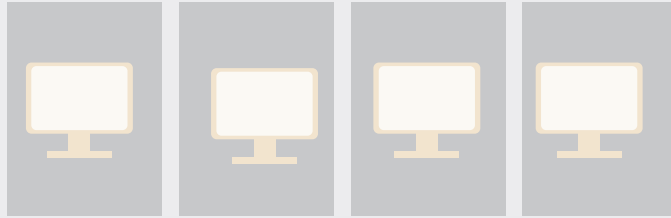
ATTENDING ECOMALL

| open ReUseIt application | click "Friend's Stuff" | read stories and view photos | select request a trade | open ReUseIt application | on home screen read events info | select I'm attending | travel to mall with tagged objects | arrive at EcoMall booth | deposit object with event planner | select new object to take home |

| ReUseIt app screen | ReUseIt app screen | ReUseIt app screen | ReUseIt app screen | ReUseIt app screen | ReUseIt app screen | ReUseIt app screen | | | | ReUseIt volunteer |
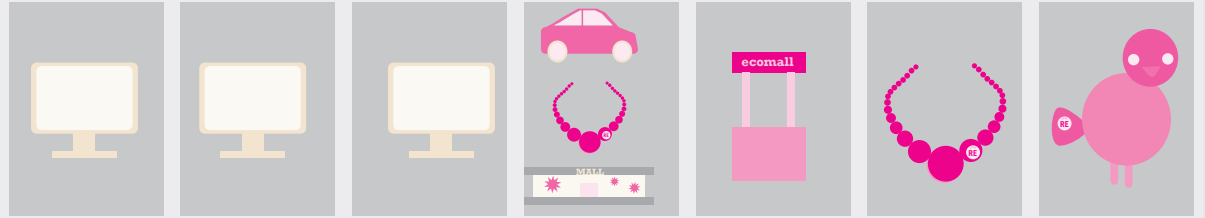
posts activity to wall

| backend ReUseIt | | backend ReUseIt | backend ReUseIt | | backend ReUseIt | backend ReUseIt | | | | |

ReUseIt service blueprint delineating online trade requests and attendance at an EcoMall event.

ReUseIt Facebook System Architecture

```
                    ┌──────────┬──────────────┬──────────────┬──────────────┬──────────────┬──────────────┐
                    │          │              │              │              │              │              │
                  Setup    Add a New    Add a new Story   My Collection    Trade        Settings        About
                           Story & Object  to an object
                    │          │          ┌───┴────┐          │             │              │
              Description    Enter      Lookup   Lookup    All objects   Look at        Profile
               of App      object #   object #   name                 friends' items  Newsletter
                    │          │                            ┌──┴───┐        │          Emails
              Make New     Enter Photo                   Current  Past   View        Privacy
               Profile     or Drawing                  collection Items  individual  Deactivate
                              │                            │      │      item
                            Enter                       │││   │││      ┌──┴────┐
                            Story                     individual individual comment suggest
                                                        items   items          trade
                                                                  ┌──┴────┐
                                                               comment  suggest
                                                                         trade
```

ReUseIt Facebook System Architecture

ReUseIt Facebook application screens.
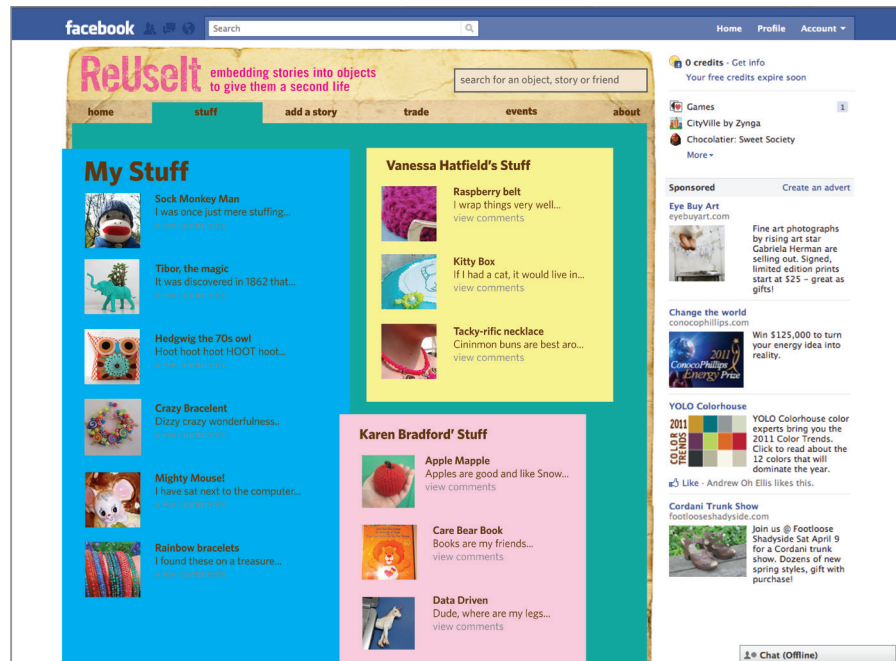
ReUseIt Facebook application screens.

REFLECTION

Through conducting research workshops while embedded within a classroom, I reaffirmed the known need for interaction and information design to be taught at middle school and high school level. I suggest that future designers creating a guidebook to assist art teachers to understand how and why to teach interaction and information design.

Regarding research methods used within a classroom, I suggest that future designers employ the game "I wish, I like." Nesting feedback within this game is an easy way to make participants feel comfortable with critiquing work. Additionally, allowing participants to write out comments rather than speak them ensures that the loudest students do not take over. Structure research sessions so that students work alone and in groups. The most successful sessions began with students working alone for five minutes and then working collaboratively in teams for twenty minutes and finally presented their work to the class. Students are accustomed to filling out worksheets and workbooks. I suggest creating worksheets for each student to fill out during each session. This is a tangible artifact that can be reviewed later and will allow the researcher to be more present for questions and guidance during the session. Reading of instructional design methodologies with special attention to scaffolding is suggested for anyone undertaking research within a classroom setting.

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APPENDIX

Process poster presented during December 2010 poster session.

Process poster presented during April 2011 poster session.