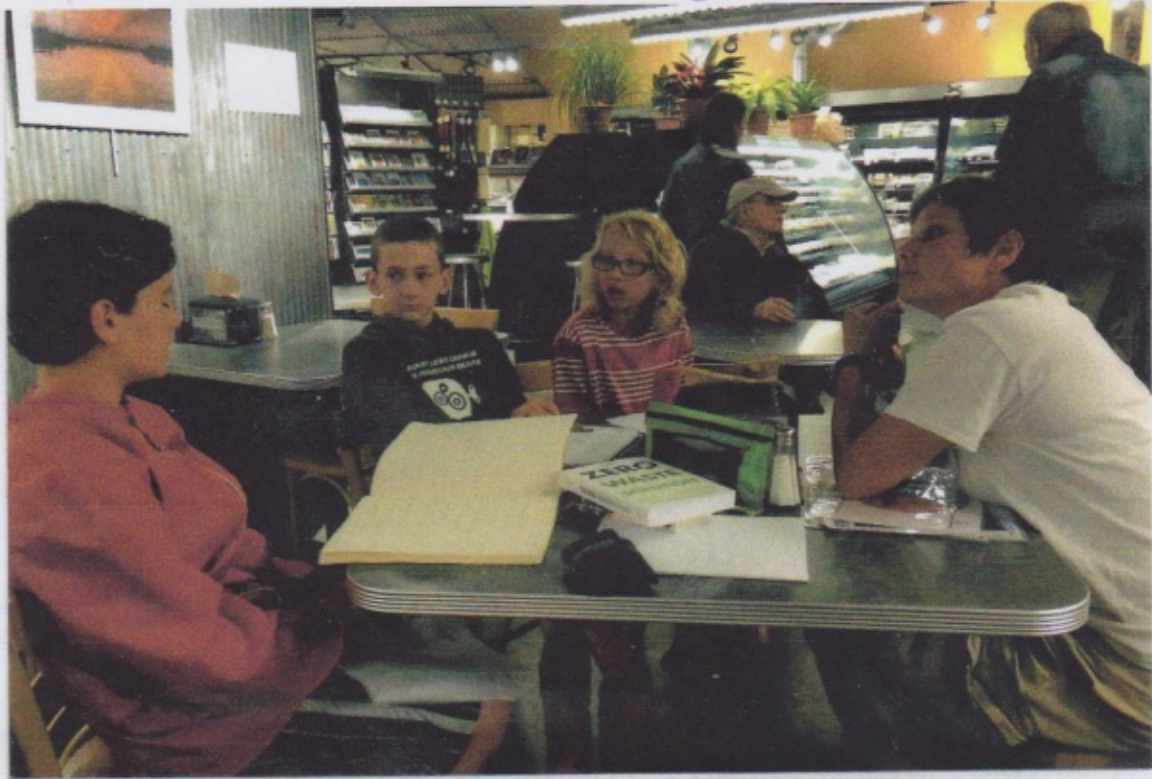


1st Type of Evidence: **Of Problem**
Direct Observation



and type of evidence: of Problem
expert interview



3rd Type of Evidence: Facts from books (Problem)

SELECTED PRODUCTS, PERCENTAGE BY WEIGHT OF TOTAL LANDFILLED TRASH

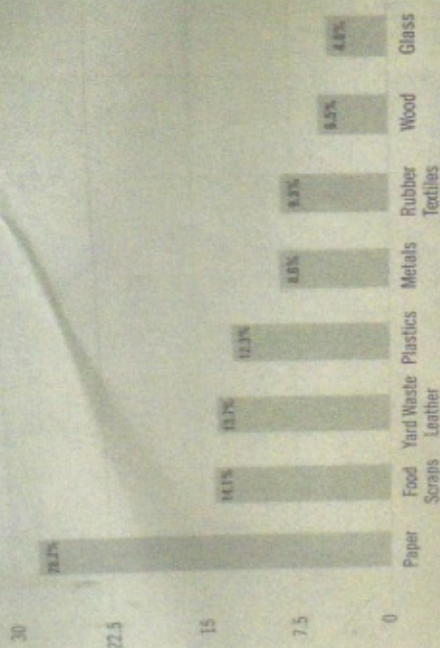
Furniture & Furnishings	6.1%
Clothing & Footwear	4.9%
Wood Packaging	4.9%
Corrugated Boxes	3.2%
Disposable Diapers	2.4%
Beer & Soft Drink Bottles	2.3%
Bags, Sacks & Wraps	2.2%
Carpets & Rugs	2.0%
Rubber Tires	1.9%
Junk Mail	1.1%
PET Plastic Bottles	1.1%
Major Appliances	0.8%
Trash Bags	0.6%
Newspapers	0.6%

Source: EPA*

*Although the EPA data on the quantity of waste generation in the U.S. is flawed, its analysis of the composition of trash depicted here continues to be useful and reliable. These calculations are informed in part by studies of real-world samples of typical Americans' trash—how much of it is plastic, metal, paper, food scraps and so on. These figures are expressed in the EPA annual municipal solid waste reports as percentages of the total waste stream, as in the example of carpets and rugs, which are reported to comprise 2 percent of the total weight of trash sent to landfills. This is a different methodology from the flawed material flow analysis used to calculate total tonnage of waste. Extrapolating national estimates from real-world samples is a tried-and-true, scientifically valid technique.

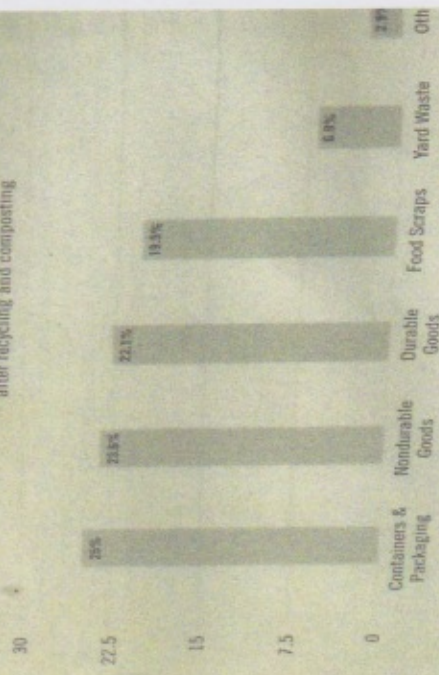
GARBEOLOGY

What's in Our Trash?
Percentage of materials we throw away, by weight, before recycling and composting



What's in Our Landfills?

Percentage of product categories we bury in landfills, by weight, after recycling and composting



4th type of evidence

Act 148: Universal Recycling & Composting Law - CSWD

cswd.net/about-cswd/universal-recycling-law-act-148/

CHITTENDEN SOLID WASTE DISTRICT
(802) 872-8111 | info@cswd.net
Responsible Resource Management for Chittenden County, Vermont

Home A-Z List Locations & Fees Reduce & Reuse Recycling Composting Hazardous Waste Trash For Haulers About Us

Act 148: Universal Recycling & Composting Law

In 2012, the Vermont Legislature unanimously passed **Act 148**, a universal recycling and composting law that offers Vermonters a new set of systems and tools for keeping as much as possible out of the landfill. The first thing the Legislature did was jettison the concept of waste itself.

Our "waste" stream is composed largely of recoverable resources. With so many options for recovering and reusing recycled materials, and with landfill space steadily shrinking, the State of Vermont has determined that the best tool for keeping as much as possible out of the waste stream is a materials management system, where valuable resources that we are currently burying in landfills are instead collected and marketed as commodities. To achieve this, the current system needed to be upgraded. Act 148 is a giant step in that direction.

Why do we need a universal recycling and composting law?

Much of what could be recycled or composted is still ending up in the landfill. Over the past 25 years, three things have happened:

- The overall amount of material that Vermonters have been sending to the landfill has increased.
- Landfill capacity has decreased.
- Markets for recyclables and compostables have expanded, enabling us to redefine those materials as resources rather than as waste.

The universal recycling and composting law is designed to encourage the development of infrastructure and systems that will enable everyone in Vermont to keep reusable resources out of the landfill and make progress in energy and resource conservation.

Tools and systems will be designed as much as possible based on the following assumptions:

- **Convenience** – If it's not convenient, recycling rates plummet. The law includes service and infrastructure requirements that offer more recycling opportunities to the public.
- **Incentives** – Recycling is cheaper than land-filling; when everyone pays the real cost for the amount they choose to throw in the landfill, it is more likely that they will participate in recycling.
- **Mandates** – Requirements for universal participation for keeping yard debris, food scraps, and recyclables out of the landfill will increase participation in recycling and composting.

A few facts:

- In 1987, Vermonters threw an average of 3.15 pounds per person per day into the landfill. By 2011, it increased to 3.62. In Chittenden County, that figure was 3.08 pounds in 2012.
- In 2009, about 58,000 tons of recyclables with a value of \$131 per ton were landfilled in Vermont. That adds up to about \$7.5 million worth of material.
- Components of Act 148, such as organics collection, mandatory recycling, and financial incentives to separate resources from trash, will help Vermont approach higher recovery rates that similar programs in the U.S. have achieved
- Each ton of material recycled saves about 2.92 metric tons of carbon dioxide (CO₂). If we can capture just 50 percent of the recyclables now going to the landfill in Vermont (or 29,000 tons per year), then we could eliminate upwards of 85,000 metric tons of CO₂ per year, the equivalent of taking 17,708 cars off the road. (4.8 metric tons/year/vehicle, according to the EPA.)

What does the universal recycling and composting law include?

Bans on the disposal of certain materials. Landfill bans will be phased in through the year 2020 (see

Search CSWD Search

Standardized Symbols for Act 148

Wouldn't it be great if the entire state of Vermont used one set of symbols to let everyone know where to dispose of recyclables, compostables, and trash? We think so! And so do all the folks from around the state who saw the passage of **Act 148** as an opportunity to come together to create such a set.



Download Symbols

Download symbols for use on posters, signs, stickers, online – everywhere! Because the more we can help people see alternatives to the trash can when they're wondering what to do with their recyclables and food scraps, the more valuable resources we can keep out of the landfill.

Who came up with this set of symbols? A team of solid waste management entities, staffers from the **Vermont Agency of Natural Resources**, private haulers such as **Myers Container Service** and **Casella Waste Systems**, as well as the **Highfields Center for Composting**, among others.

Documents Related to Act 148

- ANR Information Page
- ANR Implementation Report
- Act 148 Timeline Summary Table
- Act 148: As Enacted into Law
- Vermont Materials Management Plan

Timeline for Implementing Act 148

July 1, 2014:

- Facilities that offer services for managing trash (licensed transfer stations, drop-off centers, etc.) must also accept mandatory recyclables
- Mandatory composting/donation of food residuals for generators of more than 104 tons/year, if composting facility is within 20 miles of generator

July 1, 2015:

- Landfill ban for all businesses and residents: mandatory recyclables
- Facilities that offer services for managing trash (licensed transfer stations, drop-off centers, etc.)

Problem

Research

Problem Analysis:

Andrew: According CSWD, Vermont sends 58,000 tons of recyclables to a landfill.

According to CSWD, people produce 3.62 pounds in 2012.

That is for 2,172,000 lbs for 600,000 people in Vermont.

If 18% (David Hume) of that waste is food waste, then 390,960 pounds of waste could be diverted.

This would be 195,480 tons material not entering into the landfill.

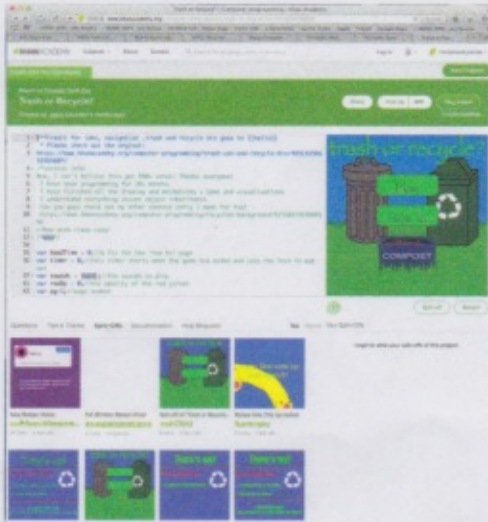
If everyone sorted properly, Vermont could divert 253,480 tons.

Problem

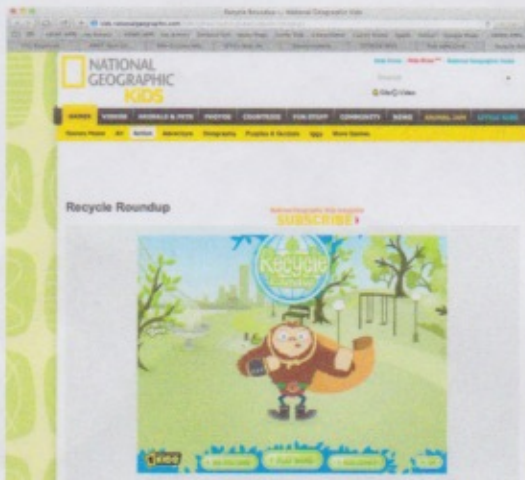
1st Type of Existing Solutions: Games

Innovation 1

<https://www.khanacademy.org/computer-programming/trash-or-recycle/4617174069149696>



<http://kids.nationalgeographic.com/kids/games/actiongames/recycle-roundup/>



http://www.kidsgoflash.com/games/sort_your_waste.html



2nd Type of Existing Solutions: Signs Innovation 2



snack bags | candy wrappers | plastic stirrers | straws
plastic utensils | sugar and condiment packets
hot & cold paper cups | styrofoam | plastic bags

If in doubt, put it here.



CSWD | CHITTENDEN Solid Waste District | 872-8111 | **CSWD.NET**

<http://cswd.net/wp-content/uploads/2014/05/trash-events8.5x11-1.jpg>



fruits & vegetables | meat & bones | fats & sauces
cheese & dairy | bread & grains



clearly marked, BPI Certified compostable cups | uncoated
paper plates | napkins | paper towels | pizza boxes



CSWD | CHITTENDEN Solid Waste District | 872-8111 | **CSWD.NET**

<http://cswd.net/wp-content/uploads/2014/05/compost-events-8.5x11-1.jpg>



empty bottles, cans and cups | remove bottle caps
clean food from containers and plates



cans & bottles



plastic containers & coffee lids



plastic cups & plates
(not compostable or biodegradable)



uncoated paper

CSWD | CHITTENDEN Solid Waste District | 872-8111 | **CSWD.NET**

<http://cswd.net/wp-content/uploads/2014/05/recycle-events8.5x11-1.jpg>

Implementation

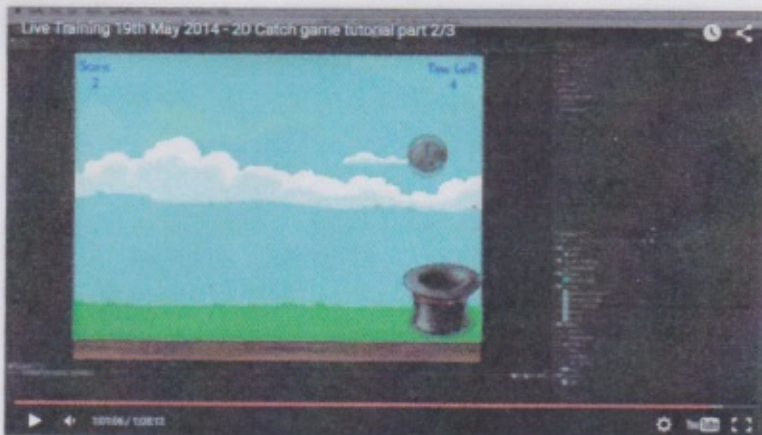
- 1) Have computer, internet, tablets and phones (\$2000)
- 2) Research game, find appropriate tutorial (free)
- 3) download Unity (free)
- 4) purchase anime studio pro (\$200)
- 5) purchase photoshop (\$600)
- 6) download xCode (free)
- 7) download Android Developer SDK (free)
- 8) download Java JDK, JRE
- 9) download test flight App
- 10)download Unity 4 App
- 11)join Apple Developer (\$100)
- 12)join Android Develop (\$25)
- 13)research and select a game with a tutorial on how to make it
(Kaboom—Hat Trick 3 hours)
- 14)Design a game with levels, a story and characters (8 hours)
- 15)write game in Unity in order to Frankenstein (10 hours)
- 16)compose music using Garage Band Loops and paper/pencil (1 hour)
- 17)create original art work in Anime Studio (3 hours)
- 18)use filters to make backgrounds in Photoshop (1 hour)
- 19)Alpha Test using Unity Remote 4 on iPad, iPhone
- 20) Alpha test using Unity Remote 4 Android Tablet, ZTE phone
- 21)Upload beta testing version to Apple Connect for internal/
external testing using TestFlight
- 22)Survey Monkey Beta Testing Results
- 23)Launch App on Google Play and Apple iTunes store
- 24)Promote Game at Maker Faire
- 25)Promote Game on Social Media
- 26)Review Analytics on Google Play and iTunes store

Develop Story Board

Kaboom Atari 2600 <http://www.classicgamesarcade.com/game/21674/kaboom.html>



Hat Trick <https://unity3d.com/learn/tutorials/modules/beginner/live-training-archive/2d-catch-game-pt1?playlist=17093>



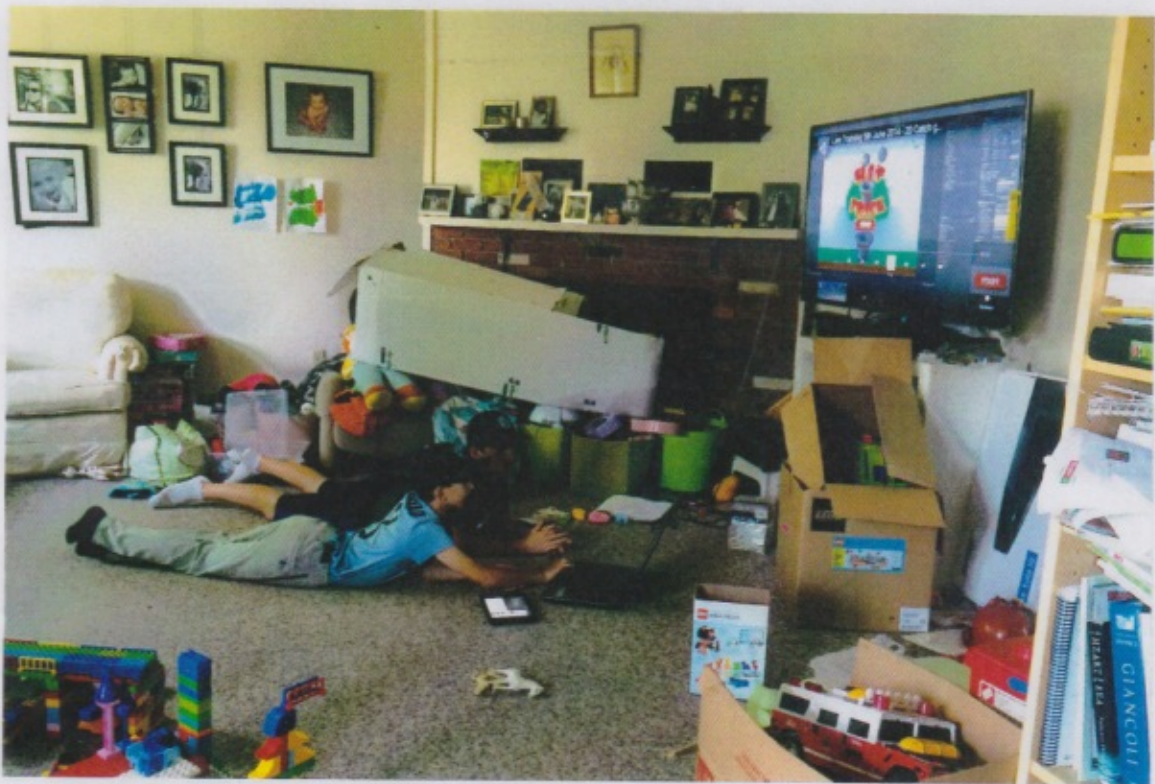
Sorta' Scappy <https://play.google.com/store/apps/details?id=com.GreenMountainGearsSortaScappy>



Watching Tutorial Videos



Watching Tutorials on Hat Trick



More Tutorial Videos



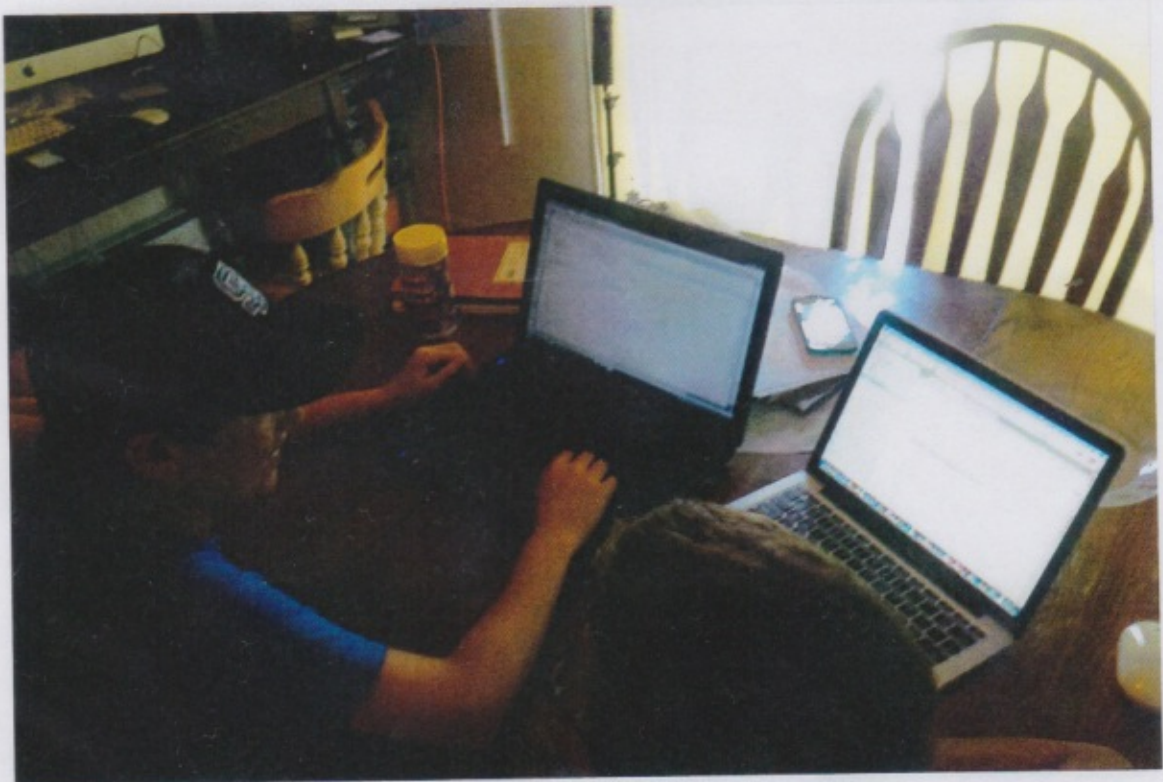
Tutorial Videos



Watching tutorial videos



C# Coding



Cooling in C#



Changing Filter in Photoshop



Unity



Changing Filter in Photoshop



Unity



Anime Studio



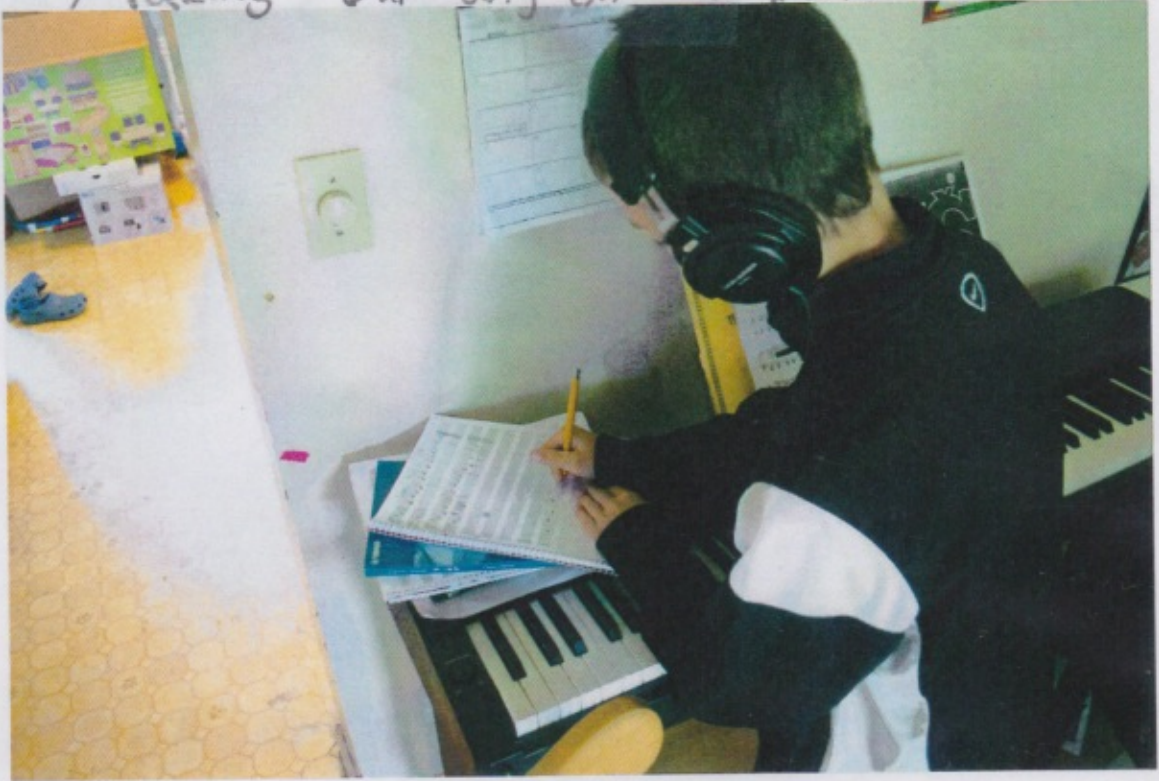
Anime Studio



Making our Song on the Piano



Making our song on the piano



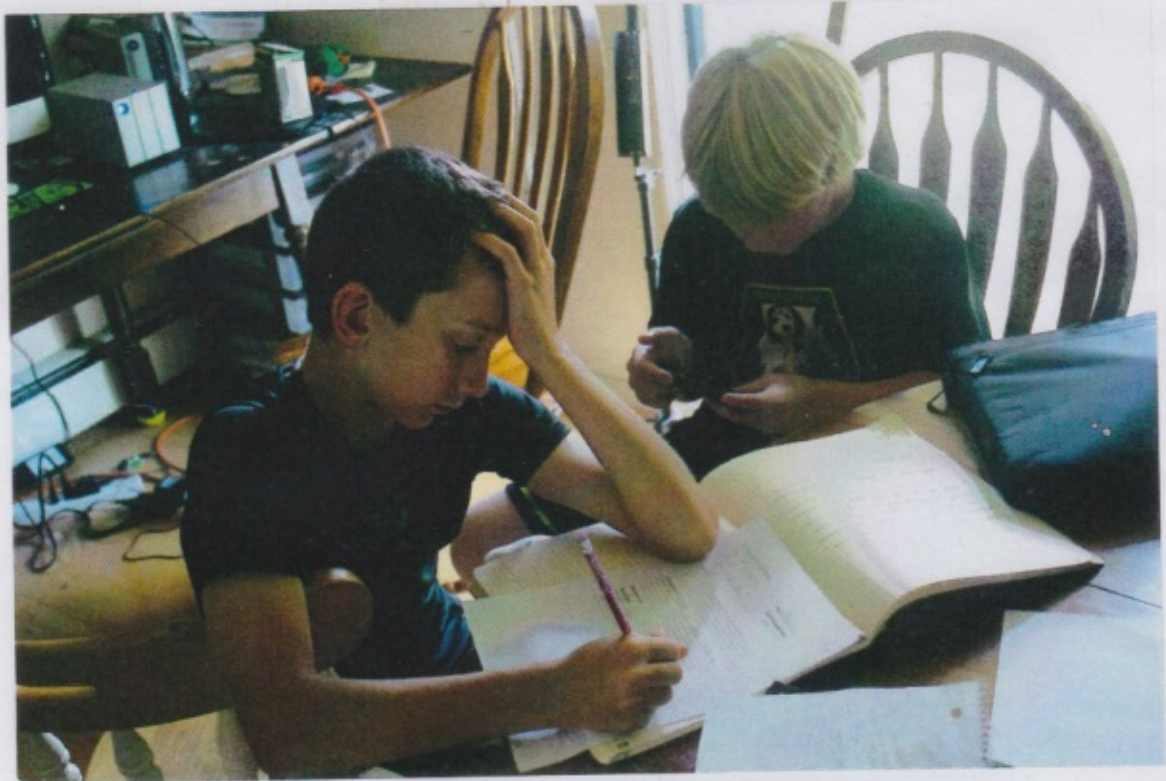
Making our Character (Scroopy)



Making our Character (we did not use)



Alpha
Filling out the ~~Beta~~ Test Form



Alpha Beta testing our game



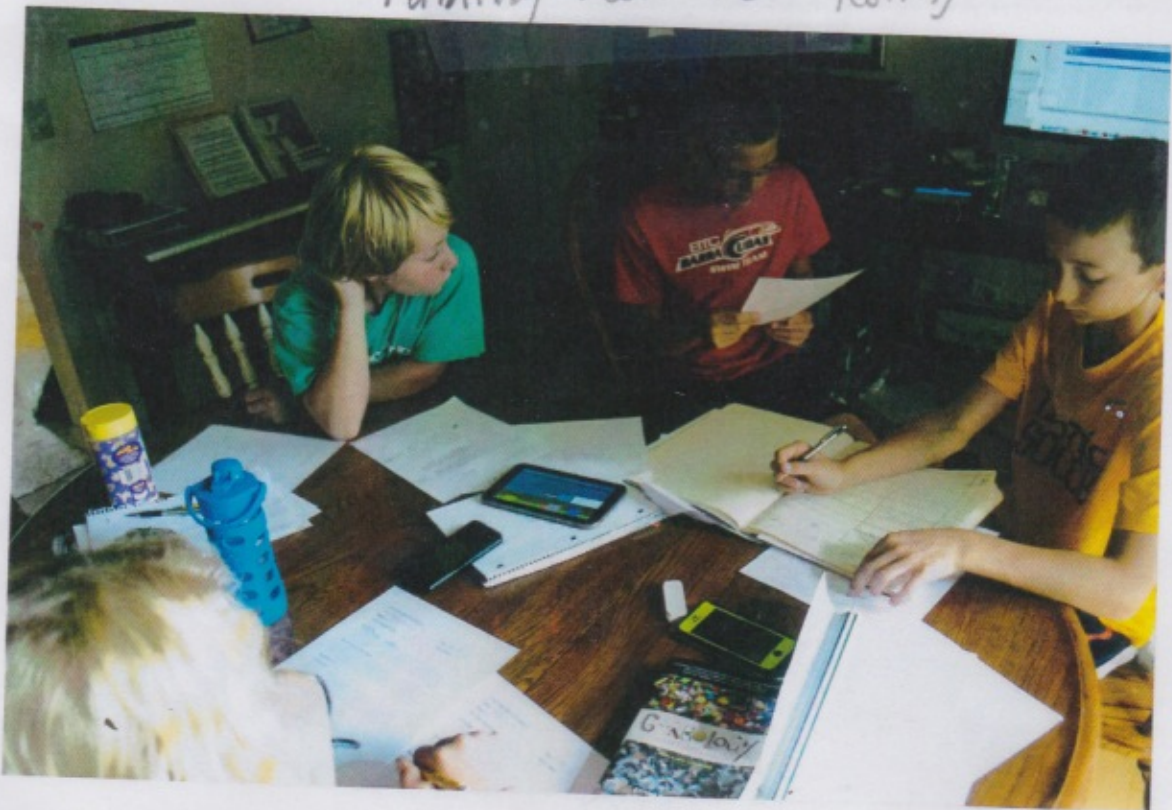
Alpha
~~Beta~~ Testing our Game outside



Brainstorming a logo for our game



Talking about ~~Beta~~ Alpha Testing



Alpha ~~Beta~~ Testing



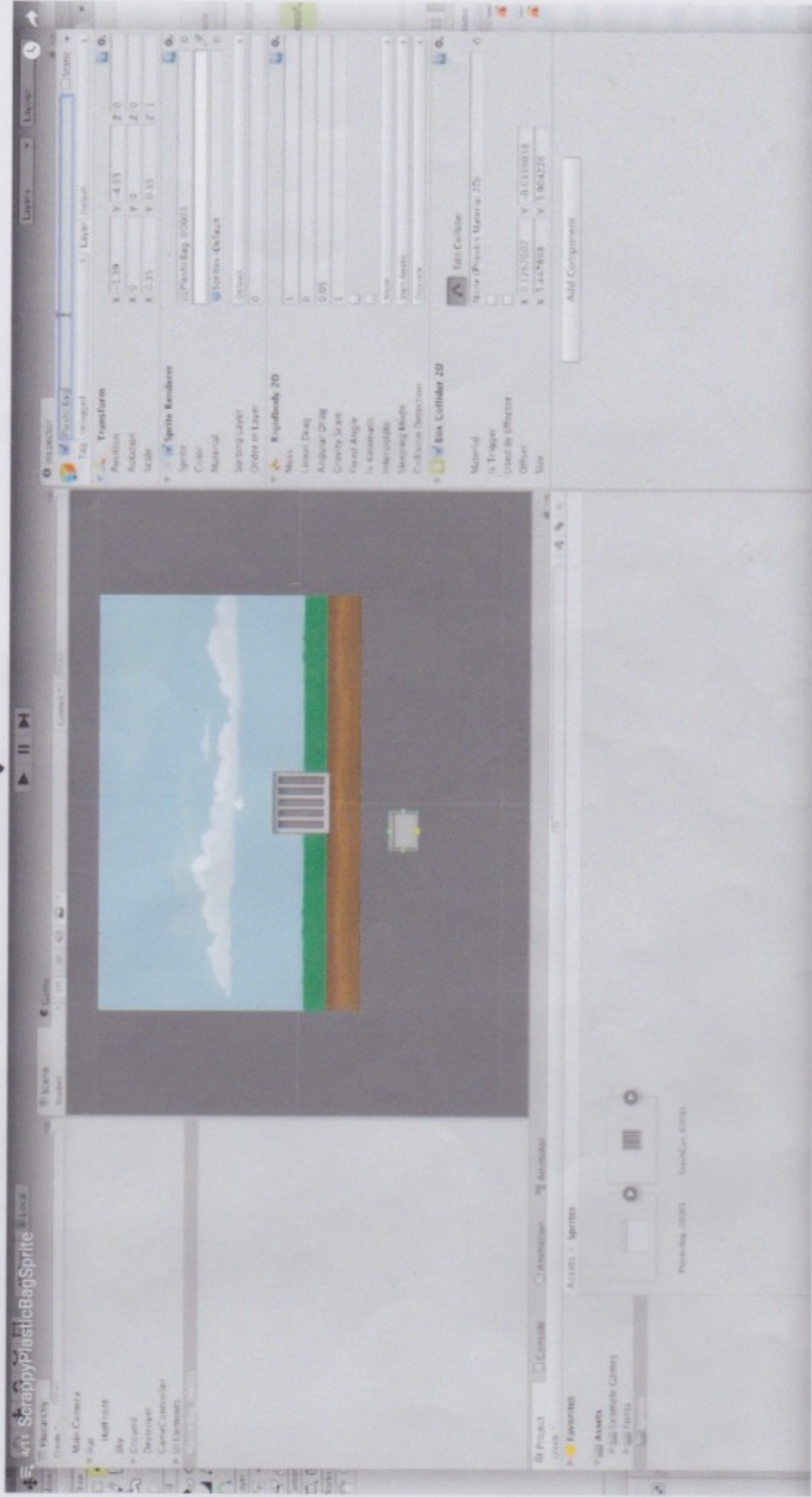
Checking Results



Sharing our logos



Stem Physics Body



STem

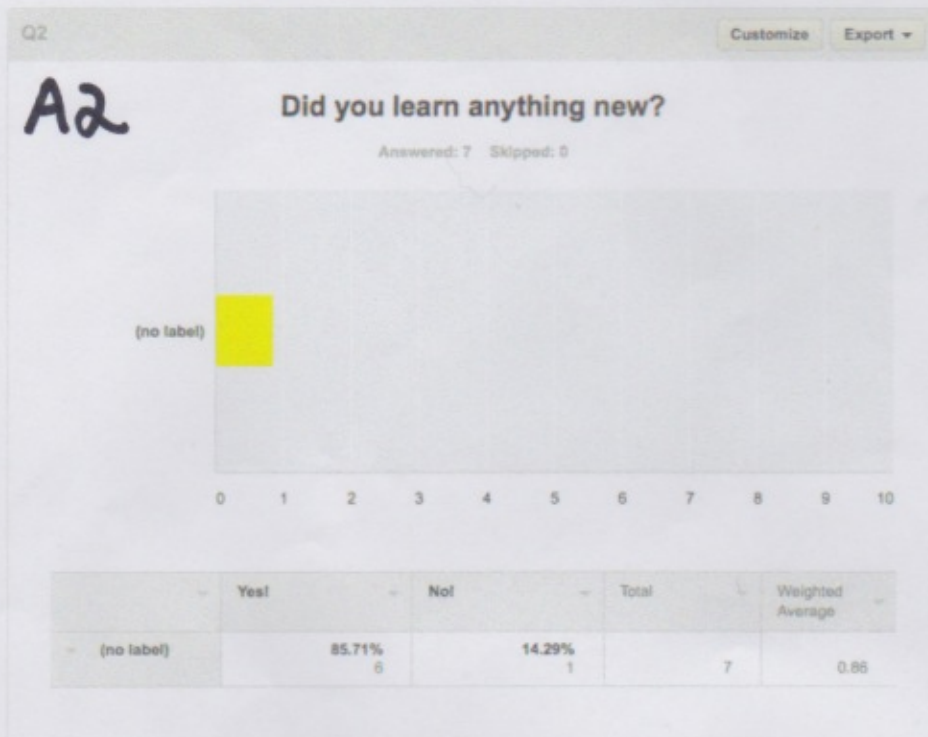
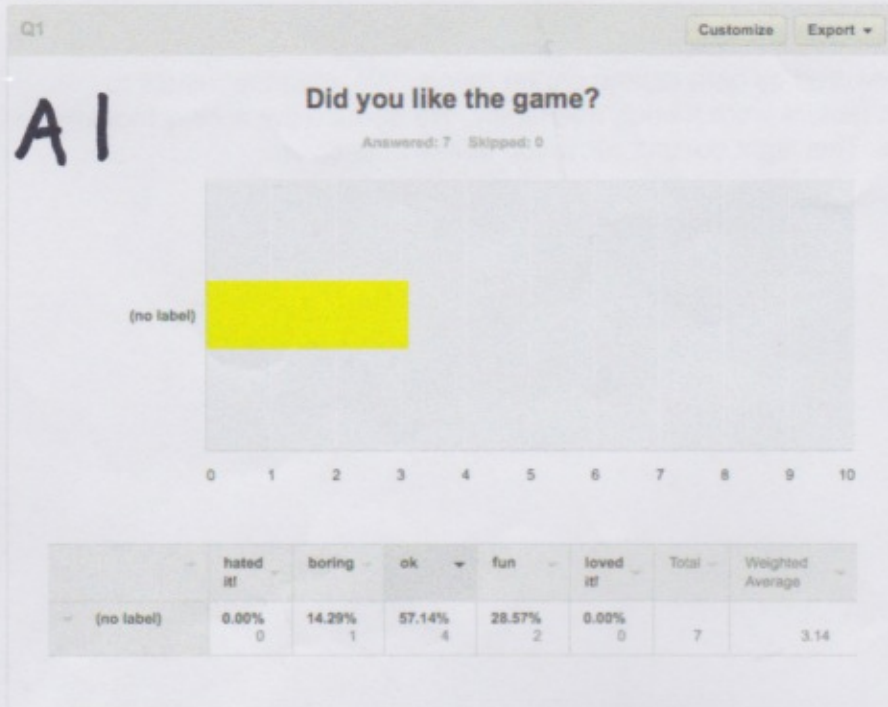
Survey Monkey Results

We got questions answered by beta testers on the game. We used the results to improve the game. The beta testers were friends and family. We needed the survey monkey so we could ask them questions. Test flight doesn't allow you to ask questions.

STEM

Survey Monkey Results

PAGE 1



STEM

Q5 Export ▾

~~A4~~ A5

How would you improve the game?

Answered: 7 Skipped: 0

● Responses (7) ▲ Text Analysis ▼ My Categories

Categories as... ▾ Filter by Category ▾ 🔍

Showing 7 responses

I was unclear the of the objective of the game: to get the items into the trash can or to determine which items should be true trash, recyclable, and/or compostable. I couldn't get past level 2 although I did once make it to level three where there were apples falling (I assumed they did not go into the trash can). Maybe a bit on the objective of the game at the beginning. I did enjoy the facts very much!
 9/5/2015 3:21 PM [View respondent's answers](#)

More shapes- colors - different items
 9/3/2015 4:25 PM [View respondent's answers](#)

I couldn't get beyond level 2. It was frustrating!
 9/2/2015 2:33 PM [View respondent's answers](#)

Second level did not work so well for me
 7/31/2015 10:32 PM [View respondent's answers](#)

if there was a bar to control how fast the trash can went
 7/28/2015 7:49 AM [View respondent's answers](#)

Needs instructions for each level. I'd like to see more of a fun story or some kind of challenge to get me excited to make it to the next level. Would like to see the points pop up on the screen when I catch something in the basket.

Q6 Customize Export ▾

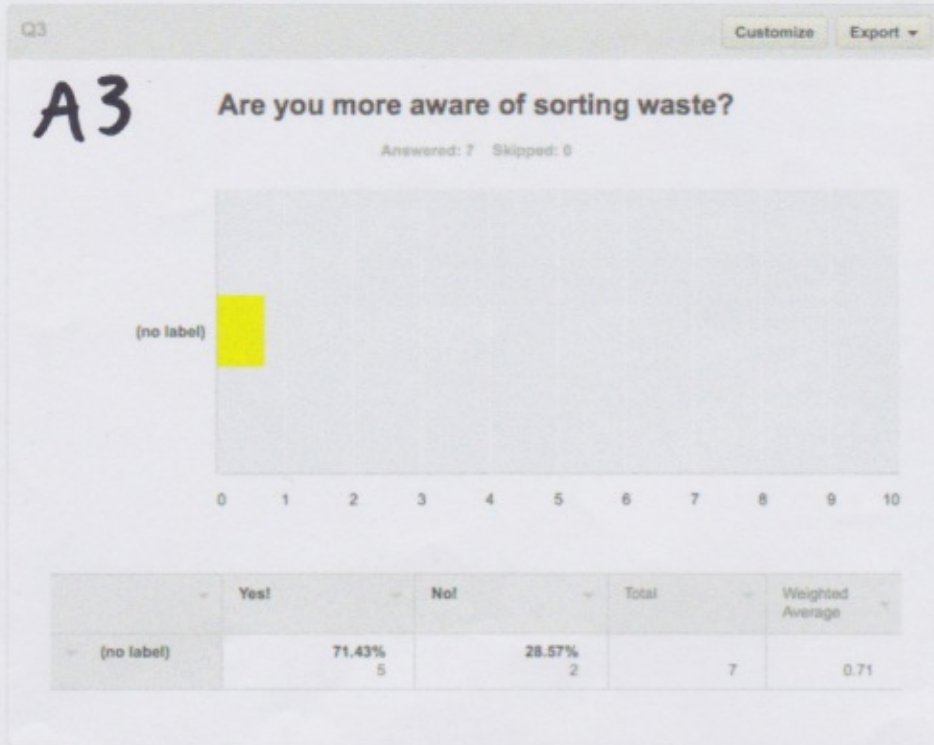
A6

What device did you use?

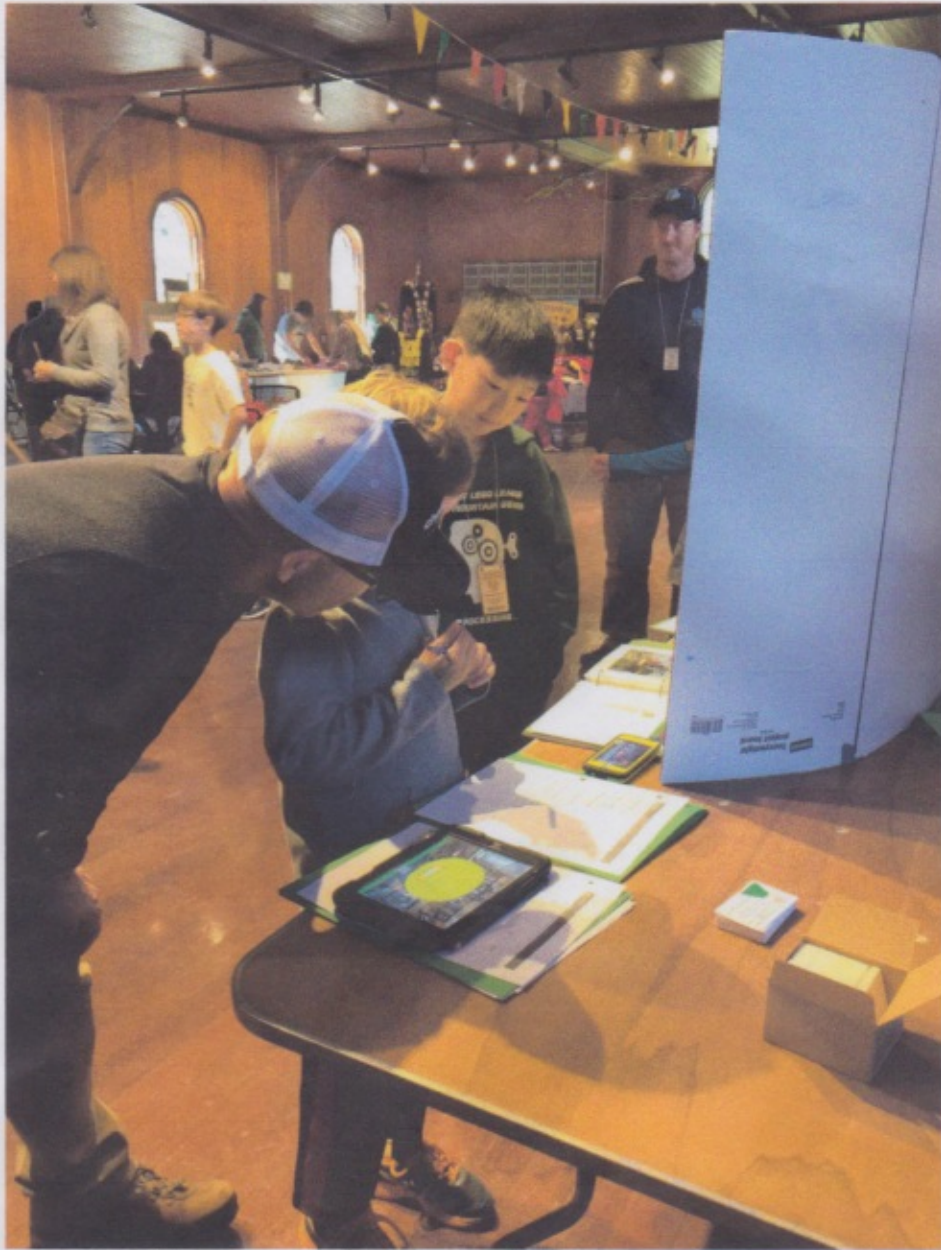
Answered: 7 Skipped: 0

	Tablet	Phone	Computer	Total
Apple	40.00% 2	60.00% 3	0.00% 0	5
Android	50.00% 1	50.00% 1	0.00% 0	2
Other	0.00% 0	0.00% 0	0.00% 0	0

STEM



STEM Fair



Maker Fair Results

At the Mini-Maker Fair we asked people who played our game 4 questions. After analyzing the results of the answers we came to a conclusion. Which was: people like the game and said they would sort better in real life. We were satisfied with our results, but we still needed to see if our game would actually improve how people sorted waste. To treat this we went to Mater Christi, and observed the 8th grade lunch, to see if our game actually helped.

Maker FAIR Survey data

STEM

Question 2. Did you learn anything new? n=71

- Yes
- No

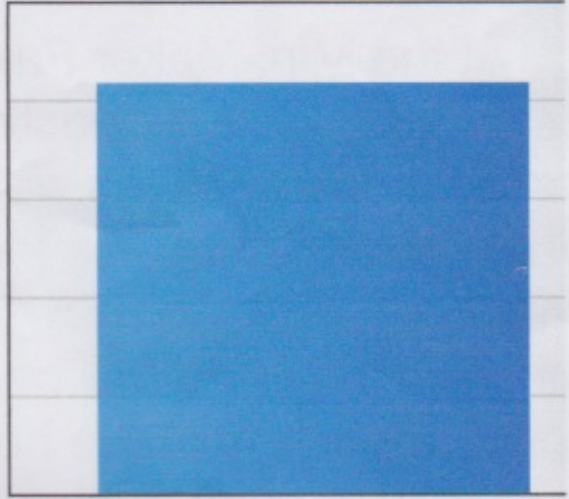


Question 3. Are you more aware of sorting waste? n=67

- Yes
- No



Question 1. Did you like the game?
Scale of 1-5, n=71



Question 4. Do you think you will sort better in real life? n=68

- Yes
- No



STEM



Mater Christi
Sorting presentation



STEM

Mater Christi testing



Mater
Christi

We wanted to see if our video game had any effect on kids. To test our game, we went to the 8th grade lunch at Mater Christi. We used science when we put together the data that we received.

The Control 1 graph shows the percentage of correct sorting of a group of kids that didn't play the game. 8% of the kids sorted incorrectly. That means that 92% of the Control kids sorted correctly.

The Control 2 graph shows the percentage of kids that sorted correctly and incorrectly on the second day we went to Mater Christi. This time, 18% of the sorted food was sorted incorrectly. The percentage of correctly sorted food went down to 82% that day.

The Test 1 graph shows the percentage of food items that were correctly and incorrectly sorted by a the test group. The test group would be the group that played the game. We asked the kids to play the game so that we could see the difference in how the kids sorted. The test group sorted 21% of food items incorrectly. 79% of food correctly.

The Test 2 graph shows the correct and incorrect sorting of the Test group *after* they had played the game. 31% of the kids sorted food incorrectly. Only 69% of food was sorted correctly.

The group that ended up playing the game sorted worse the second day. That doesn't necessarily mean that our game made them sort worse. This is true because the control group had also gotten worse.

We had asked the kids if they had played the game. The test group had said that they had played the game. That is what they told us, be we didn't believe them. Some had played the game, but we believe that most lied and had not even tried. If we had the chance, we would have asked to play the game during science class. This would ensure that they would have played the game. Even though we didn't get the of best data, at least we now know that our video game didn't make the kids sort worse!

MATER
Christi

STUDY

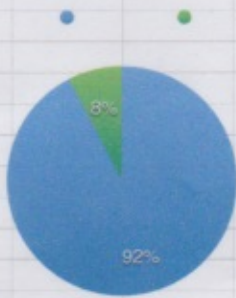
STEM

STEM

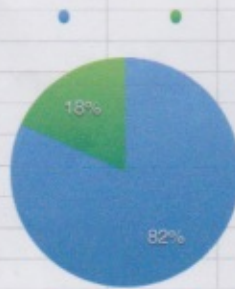
Mater Christi Study

Table 1

Control 1	Correct	Incorrect	Control 2	Correct	Incorrect
1	2	0	1	9	1
2	2	0	2	1	1
3	3	0	3	2	0
4	2	0	4	3	0
5	2	0	5	1	1
6	1	1	6	2	2
7	2	0	7	2	1
			8	2	0
	12	1	9	2	0
	93.33	6.67	10	2	0
			11	1	0



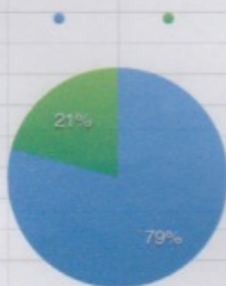
27	6
81.82	18.18



Test 1

1	2	0
2	2	0
3	2	0
4	1	1
5	1	1
6	1	0
7	1	1
8	1	0
9	1	0
10	1	1
11	1	0
12	2	0
13	0	1
14	3	0

19	5
79.17	20.83



Test 2

1	2	1
2	2	0
3	2	0
4	0	1
5	1	0
6	1	2
7	2	1
8	2	0
9	2	0
10	1	1
11	2	0
12	1	0
13	0	2

18	8
69.23	30.76

