Dial Down Energy Stewards Challenge

FINAL REPORT

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1. Abstract

The Dial Down Challenge is a 4-week educational module that gives teenagers the opportunity to save energy in their home through interactive activities, surveys, and video tutorials. Every week is themed with a big picture idea that emphasizes energy saving knowledge and habits for a specific energy conservation behavior in the household. Through a week-long pilot program, we were able to collect data on five major categories: engagement with parents, willingness to change attitude, knowledge, electricity consumption, and participant engagement. While we did observe an increase in knowledge acquired by new behaviors that can be adapted to save energy, there was a significant trend in decreasing engagement as the challenge progressed. In addition, we encountered many challenges ranging from incentivizing participation and maintaining engagement, to technical API issues related to backdoor web development. Further research on engagement retention, incentivization, and API streamlining will be required.

Introduction

Residential energy use makes up a significant portion of the total energy consumption in the United States and also happens to be one of the sectors of energy use that can be impacted most significantly by small changes that individuals choose to make on a daily basis. Although one individual might not be able to easily reduce the energy consumption of their offices, cars or the production of the goods they use, anyone can make small lifestyle shifts toward operating a more energy conscious and environmentally friendly home. In 2019, residential energy use made up 16% of all energy consumption in the U.S., and although that appears to be a modest portion of total energy use, it still represents 11.9 quadrillion Btu (*U.S. Energy Facts Explained,* 2019). Small shifts in daily routines can significantly reduce this figure, but the first step is understanding what shifts can have the most impact and what areas of energy consumption need to be prioritized. This is what our project attempts to do.

Tackling the issue of excessive energy use in American households quickly and efficiently demands participation from as many people as possible.. Our project will target teenage students, a demographic that is, at the moment, an underutilized resource for spreading environmental education. We will engage them using a four week long educational module that will teach them about energy saving practices and lifestyle adjustments they can make at home. This program will push the participants to take on roles as energy stewards in their own households, as well as drivers of change amongst their friends and within their communities. This project will be utilized by our client, the California Public Utility Commision, as a means of furthering their mission to safeguard the environment and promote environmentalism to California's population. Although this project will span two years, we have made significant progress in the development of the module and will look to next year's practicum team to polish and market this program so that it can reach the widest audience and have the greatest impact.

2.1 Background

Our module involves numerous surveys, quizzes and informative videos intended to empower students to make energy conscious decisions within their households and instruct their parents on how to do the same. In preparation for the development of our module, our team conducted research in several relevant areas in order to optimize our program's accuracy, engagement, and

effectiveness. This research consisted of looking into what environmental programs and activities currently exist for teenagers, how teenagers are able to communicate with and influence their parents effectively, and the easiest and most impactful ways to conserve energy in the household.

After looking into existing educational programs on energy consumption, we discovered a challenge at UC Berkeley from which we took inspiration for our own project. This challenge, called the Cool Campus Challenge, was targeted at college students with the goal of reducing waste and energy consumption on University of California campuses in order to help the UC system reach its goal of carbon neutrality by 2025. This challenge was also four weeks long and launched in 2019. This challenge was incredibly successful, engaging nearly 8% of the UC system's population (22,000 participants) who completed 200,000 tasks and reduced UC CO2 usage by over 10,000 metric tons (Berkeley Sustainability & Carbon Solutions 2019).

3. Methods

Our goal is to build an engaging, educational program that empowers teenagers or participants with the knowledge and confidence to carry out energy saving behaviors in their household, and that would then influence their families. By carrying out energy saving behaviors, such as lowering their A/C thermostat use, teenagers are "dialing down" their energy use. Thus, the program is called the Dial Down Challenge. To achieve this goal, we designed a 4-week challenge that involves surveys, activities, and video tutorials.

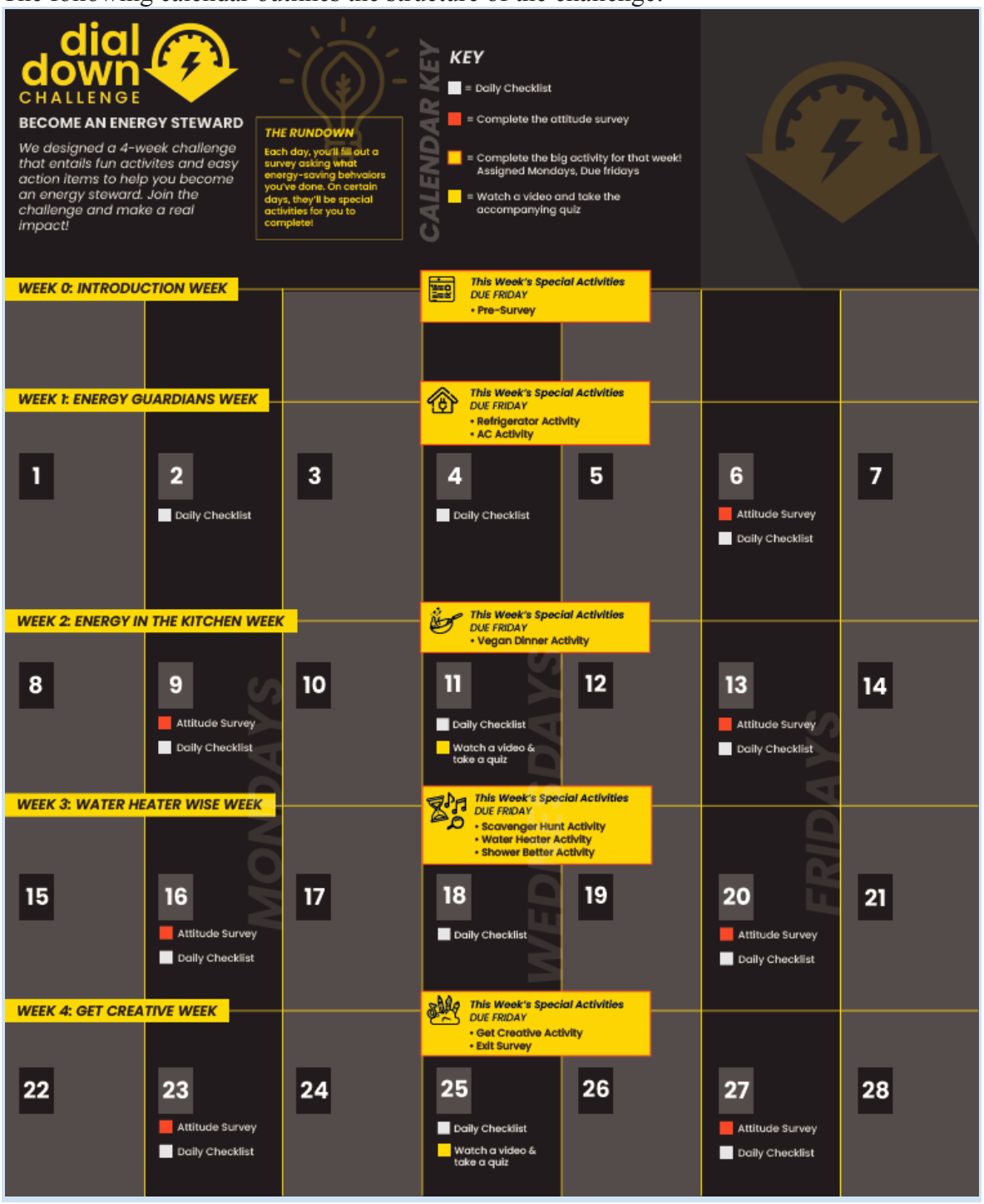
To help structure the challenge, we organized the 4 weeks by theme and created theme-related activities, 15 different surveys, and videos. These surveys are used to gather information on participants' opinions, demographics, and to take account of their energy conservation behaviors. The surveys are also used to educate and test the participants' knowledge. We looked at home appliances that consume the greatest energy to help create some of the themes that these surveys would follow. Since water heating, the refrigerator, and A/C thermostat account for some of the greatest energy consumption we created the following weekly themes: *Water Heater Wise Week* and *Energy in the Kitchen Week*. To gather information about the household energy consumption and garner family involvement in the challenge, we created the *Parent Guardians Week*. *Get Creative Week,* the last week of the challenge, allows the teenagers to apply what they have learned in creative free form.

We used the platform, *qualtrics,* to create the surveys. These surveys consist of a consent form to participate in the challenge, pre-challenge surveys and post-challenge surveys, and activities that aim to educate, test their knowledge, and measure their performance. For instance, the *Scavenger Hunt* survey during the *Water Heater Wise Week* has the participant count the amount of LED light bulbs in the house and look at the efficiency rating on the Energy Guide label found on their water heater. The *Scavenger Hunt* survey evaluates their energy consumption and shows the teenager and their parent(s) areas in their home that consume energy and can be improved.

We use Mailchimp and the website to distribute and access the surveys. Mailchimp allows us to automatically send emails to the teenagers once they sign up for the challenge on the website. These automated emails follow the thematic timeline and allow teenagers access to the survey links. We also plan to have the website, created on *Webflow,* to host the survey links, resources,

and additional information about the challenge which participants can gain access to when they sign up for the challenge. When participants sign up, they can create a personalized account that allows them to track their progress when they complete the surveys. However, creating personalized accounts remains a challenge which is discussed in the challenges section.

The following calendar outlines the structure of the challenge:



3.1 Attitude Surveys

The attitude surveys take up a larger proportion of the activities. It is important to keep track of how the students are learning and feeling throughout the course of the program in order to determine how to improve the challenge over time. Attitude surveys were designed and created using qualtrics to track students learning biweekly and the way they feel about their progress throughout the weeks. These surveys are given out twice a week, once on Monday and once again on Friday, this is a way to check in with the students to find out if they are learning and keeping up with the pace and intensity of the challenge.

3.2 Pre/exit survey

The pre survey and exit survey were both created using qualtrics. The pre survey is assigned on Monday of week one. The presurvey is to check in with students regarding their current knowledge of energy. We ask baseline information about their household, electricity usage, and typical energy consumption practices. It takes roughly 15 min to complete and it is encouraged for both parents and students to take this survey separately. The pre survey is required in order to compare how much the students have learned from the start of the challenge to the end. The exit survey is a way to determine the collective learning experience for each student. What they have gained from the challenge, what they would like to change, what impacted them the most, and how has this challenge changed the way they view and use energy at home. This survey helps to determine the growth when comparing it to what knowledge the students have started with.

3.3 Weekly Checklist

The checklist is given out once a week on a wednesday. The checklist was also created using qualtrics. The weekly checklist contains a list of items that require completing. Ranging from turning off the lights when leaving the rooms to turning off the AC or heater when not in use. These activities are designed to get the students to begin taking small actions that lead to bigger change. It helps students to visualize the progress they are making throughout the course of the challenge and helps us to keep track of the effectiveness of the challenge.

3.4 Big Activities

The big conservation activities were designed on qualtrics. There is roughly one big activity each week, typically given on monday and made due by the end of the week on Friday. These big activities are aimed to teach the students something new. With the energy in the kitchen activity, students learn how to use energy more efficiently while trying new recipes of their choice. The scavenger hunt activity aims to teach students about the appliances around their home and encourage them to discover and learn about the various energy use appliances across their homes. The shower activity was created to help students keep track of their shower habits, how long and how efficiently they use their shower time. Lastly, the creative big activity is aimed for students to express what they have learned through various platforms. This is a chance for them to express to us how creative they can be with what they have learned from the previous weeks. All of these activities help the students to start taking action while teaching them new and fun ways to be energy efficient.

3.5 Video/Quiz

The two videos were made by a student in the Geffen Lab School. The quizzes are taken on qualtrics. The videos are assigned once on week 2 and once on week 4, these videos aim to teach

the students about energy guardianship. The video for week 2 focuses on energy in the kitchen, how students can become aware of things around their home. These tips and examples include setting the right temperature, avoiding putting hot food in the fridge and more, all of which aim to save energy. The week 4 video focuses on the dialogue between students and parents. The steps listed out are aimed to make the conversations with parents easier. The video also helps the students to begin thinking about the week 4 big activity and how to get their parents involved with it. The videos are short and fun to watch, followed by a mini quiz in order to see what the students have learned from watching it. The mini quiz is made to check what the students were able to take away and learn from the video.

4. Results and Discussion

4.1 Surveys

The three variables we measure in this project are: engagement with parents, willingness to change attitude, willingness to take action, and gaining knowledge. In order to test these variables we created 16 surveys that the participants will complete throughout the challenge. The following table lists the survey names, description and the variable it measures. The variables are defined as:

- ➢ Engagement with Parents = if the survey asks if the student's parents participated in helping complete the survey
- ➢ Willingness to change attitude = if the participant is willing to keep up the change by being consistent with an action
- ➢ Willingness to take action = if the participant completed the activity such as changing the dial to reduce energy
- ➢ Knowledge = lists information/facts or quiz on information previously learned
- ➢ Engagement = If the participant completed the survey; clicks
- ➢ Other definitions
    - ○ Actions = physically doing something
    - ○ Activities = the assignment

Name	Description	Engagement with Parents	Willingness to change attitude	Willingness to take action	Knowledge	Electricity Consumption	Engagement
Pre-Survey	Used to get a baseline information about household, electricity usage, and typical energy consumption practices.	x	x	x	x	x	x
Week 1 | Fridge Thermo	An activity used to engage with fridge thermostat and	x		x			x

stat Activity	inform how to maximize energy efficiency.						
Week 1 | Thermo stat Activity	An activity used to engage with thermostat and inform how to maximize energy efficiency.	x		x	x		x
Week 1 | Friday Attitude Survey	Asks for the participants' opinions on that week's actions.	x	x	x	x		x
Week 2 | Monday Attitude Survey	Asks for the participant's understanding of previous week's activities.		x	x			x
Week 2 | Energy in the Kitchen Big Activity	An activity to reduce energy in the kitchen.	x		x	x		x
Week 2 | Friday Attitude Survey	Asks for the participants' opinions on that week's actions.	x	x	x	x		x
Week 3 | Monday Attitude Survey	Asks for the participant's understanding of previous week's activities.		x	x			x
Week 3 | Home Energy Efficien cy Scaveng er Hunt	An activity that engages the participant with energy consuming items in their homes.	x		x			x

Week 3 | Shower Better	An activity that shows how to reduce energy while showering.	x		x	x		x
Week 3 | Friday Attitude Survey	Asks for the participants' opinions on that week's actions.	x	x	x	x		x
Week 4 | Monday Attitude Survey	Asks for the participant's understanding of previous week's activities.	x	x	x			x
Week 4 | Creative Activity	An activity that asks for a creative project on reducing energy.	x		x			x
Week 4 | Friday Attitude Survey	Asks for the participants' opinions on that week's actions.	x	x	x			x
Weekly Checklist	Asks for action items the participant completed.		x	x			x
Post-Survey	Asks for the participant's experience in the challenge and information about electricity usage, and typical energy consumption practices.	x	x	x		x	x

Research Flow

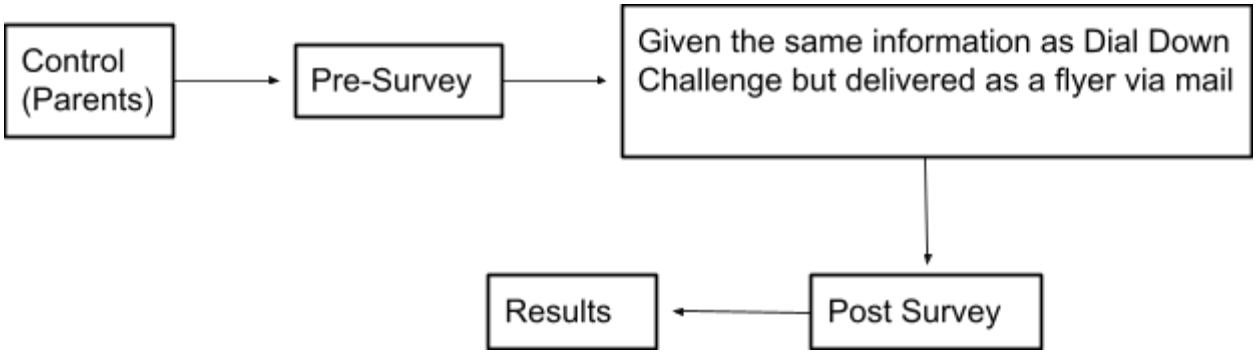


Figure 4.1. The control group will be a group of parents whose children will not participate in the Dial Down Challenge. The parents will complete a Pre-Survey. Then they will receive the same information as the Dial Down Challenge participants but in a flyer forum through the mail throughout the weeks. After the parents are exposed to the information, the parents will complete a post survey and the results can start being analyzed.

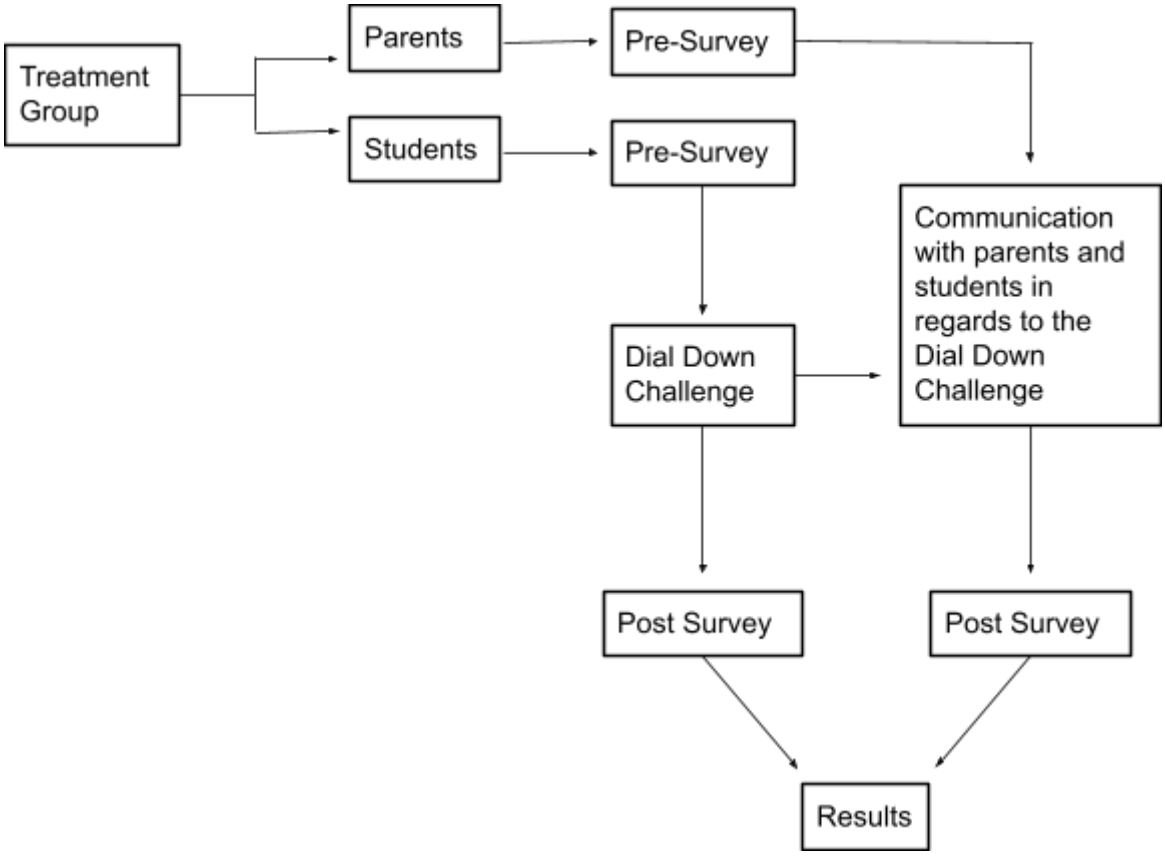


Figure 4.2. The treatment group is the household, the parents and students. In this group parents and students complete a Pre-Survey. Then the students participate in the Dial Down Challenge. Throughout the Dial Down Challenge the students will communicate with parents the information they learn from Dial Down Challenge. After the program is completed the parents and students will complete the Post Survey and the results can start being analyzed.

4.2 Pilot

Overview

The goal of the pilot was to test the effectiveness of 6 out of 16 surveys that our team created, and experiment with mailchimp to assess where our project could improve. The pilot ran for a week from May 17, 2021 to May 21, 2021. We had 18 individuals sign up but only 9 individuals officially participated in the pilot. Figure 4.3 shows the percent of participation for each survey with 9 total participants as a baseline. This figure shows that the participation rate fell as the week progressed, highlighting the need for marketing. To see the areas we need to work on, we created a pilot critic list shown in appendix A. Using the pilot critic as a guide, our team revised the surveys accordingly.

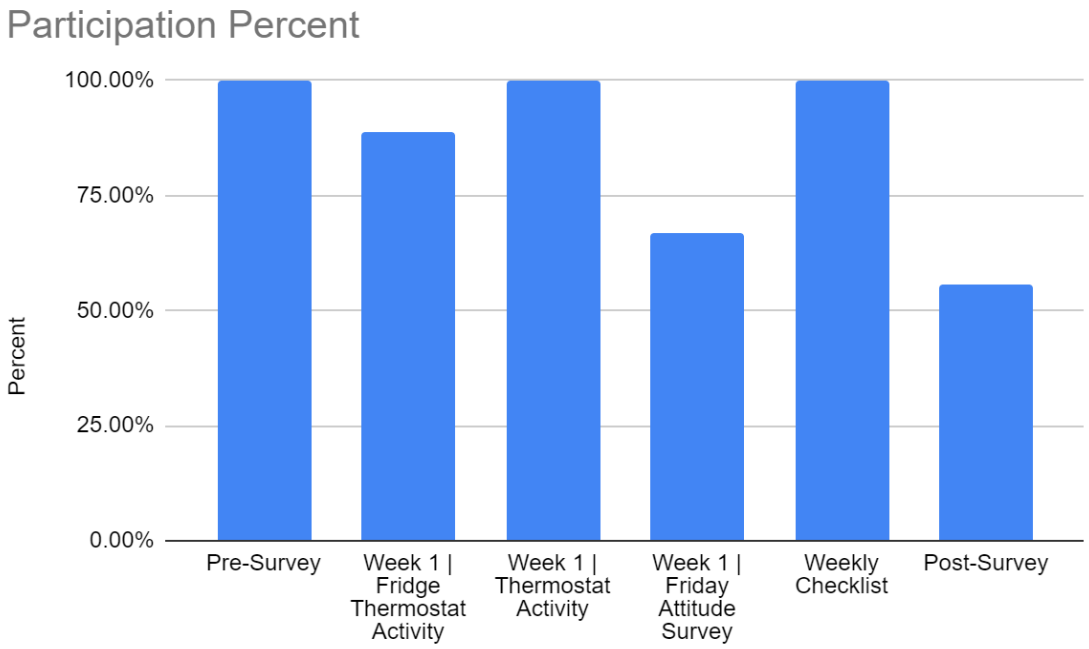


Figure 4.3. Participation rate of the surveys for the pilot.

Pre-Survey

A total of 9 participants completed the pre-survey. Out of the 9 participants, 2 participants completed as parents. From figure 4.4, the average age of the participants was 25. The majority were females and/or Asian. From figure 4.5, the average concern score was 24.7 and average knowledge score of 4.7. The concern was out of a total of 30 points and were deduced from self reported concern on 6 different questions. The knowledge score was out of total 7 points. Points were given based on the number of questions that were correctly answered out of 15 questions. Figure 4.6 lists the electricity and gas consumption reported in the pre-survey. There are values missing for the gas consumption since not everyone uses gas. There are also values missing because participants did not answer them.

Demographics

Age	Gender	Race
21	F	White
21	F	White
22	F	Asian
23	F	Asian
22	F	Asian
21	F	Asian
45	F	
	M	

Figure 4.4. Demographic data from Pre-Survey.

Scores	
Concern	**Knowledge**
27	5
26	5
28	5
30	7
24	6
26	4
19	1
14	4
27	5

Figure 4.5. Concern and Knowledge score data from Pre-survey. Total Concern is out of 30 and Knowledge score is out of 30.

Usage	
Electricity Consumption kWh	**Gas Consumption in Therms**
969.00	5.00
324.00	23.00
2,346.00	
298.00	
227.72	30.99
897.00	21.00
2.00	

1.00	2.00
0.00	

Figure 4.6. Data from Pre-survey on electricity and gas consumption. Data is missing because not everyone uses gas.

Week 1 | Fridge Thermostat Activity

A total of 8 participants completed the Fridge Thermostat Activity. 25% of the participants completed the survey with a parent. The fridge thermostat asked to change the dial according to the appropriate setting depending on the type of fridge thermostat the participant has. The data from Week 1 | Fridge Thermostat Activity can be seen in figure 4.7. The collection of this was incomplete since one individual did not upload a picture of the change dial.

Week 1 | Fridge Thermostat Activity Data			
Type of Fridge Thermostat	**Percent of participants that had this type of Fridge Thermostat**	**Original Dial**	**New Dial**
1. Circular Dial with Numbers	0.00%	Coldest	Warm
2. Circular Dial with No Numbers	25.00%	Coldest	Medium
3. Circular Dials with Numbers and Mini Pictures	25.00%	6/9	5/9
4. Sliding Dial with Numbers	12.50%	5	4/7
5. Sliding Dials with Letters and Numbers	0.00%	4/7	5/7
6. Digital Interface with notable Fahrenheit Units	25.00%	37	37
7. Digital Interface with no notable units	0.00%	23	
8. Digital interface with no numbers	12.50%	2/4	4/7

Figure 4.7. Data from Week 1 | Fridge Thermostat Activity

Week 1 | Thermostat Activity

A total of 9 participants completed the Thermostat Activity. 33% of the participants completed the survey with a parent. 100% of the participants watched the video within the survey. The thermostat was asked to change according to the appropriate setting depending on if it was the cooling or heating month. The data from Week 1 | Thermostat Activity can be seen in figure 4.8. The collection of this was incomplete since some participants did not have their AC/Heat on and

were not able to change the dial. A choice for not having AC/Heat on needs to be added to account for this condition.

Week 1 | Thermostat Activity Data			
Original Thermostat Dial	**Ambient Temperature**	**Cooling or Heating Month**	**New Thermostat Dial**
0	63	H	1
0	72	H	78
78	82	H	78
10	82	H	1
50	65	H	50
23	23		23
70	70	C	80
70	64	H	70
66	61	H	66

Figure 4.8. The data from Week 1 | Thermostat Activity. The data is in Farenheit.

Week 1 | Friday Attitude Survey

A total of 6 participants completed the Friday Attitude Survey. The Friday Attitude Surveys asks the participants to reflect on the activities. The most consistent activity among the students was using natural light during the day and the least consistent was unplugging the appliances and electronics when not using them. The participants were asked to talk to their parents about what they were most consistent with. The participants' parents were most consistent with using natural light during the day, using a table lamp instead of ceiling lights, using cold water for laundry, and turning off the thermostat when not in use. Figure 4.10 shows the setting for the thermostat and ambient temperature. Some of the data is not accurate because some of the thermostat was turned off. In order to avoid this issue a choice for thermostat being off needs to be added.

Week 1 | Friday Attitude Survey - Data			
	Most consistent - Student	**Least Consistent - Student**	**Most consistent - Parent**
Turned off the lights every time you left the room	3	1	2
Used natural lighting during the day	4	0	3

Unplugged appliances and electronics when you were not using them	0	3	1
Unplugged appliances and electronics when you were not using them	1	4	0
Used cold water to brush teeth and wash hands	1	1	0
Turned off water while lathering, shaving or brushing teeth	2	2	0
Lowered monitor brightness	1	1	0
Used table lamp instead of ceiling lights	2	1	3
Used cold water to wash laundry	2	0	3
Ran a full load of laundry	1	3	1
Used a microwave, crock pot, or toaster oven instead of a conventional oven	1	1	1
Air dried utensils instead of heat dry in the dishwasher	2	1	2
Turned of A/C when not in use	2	0	3

Figure 4.9. Data from Week 1 | Friday Attitude Survey. The number represents the number of participants who checked that activity.

Thermostat Dial Setting	**Ambient Temperature**
3	3
1	64
70	64
78	85
61	59
50	70

Figure 4.10. Week 1 | Data about the Thermostat Dial from Friday Attitude Survey. The data is in Farenheit.

Week 1 | Weekly Checklist

Total of 9 participants completed the Weekly Checklist. This data was analyzed two ways. The first way is shown in figure 4.11, where it was analyzed depending on the activity. This data shows the least checked activity is unplugging appliances and electronics when they were not in use. Whereas, the most checked activities are turning off the lights every time the participant leaves the room, using natural light during the day, and turning off the thermostat when not in use. Figure 4.12 analyzes the data based on the number of activities checked per participant. Figure 4.12 data shows one participant checked 80% of the activities, the highest number of activities checked in this pilot program.

Week 1 | Weekly Checklist Data by Activity	
Dial Checklist Activity	**Percent of participants that completed Activity**
Turned off the lights every time you left the room	66.67%
Used natural lighting during the day	66.67%
Unplugged appliances and electronics when you were not using them	0.00%
Used cold water to brush teeth and wash hands	55.56%
Turned off water while lathering, shaving or brushing teeth	55.56%
Lowered monitor brightness	22.22%
Used table lamp instead of ceiling lights	33.33%
Used cold water to wash laundry	44.44%
Ran a full load of laundry	55.56%
Used a microwave, crock pot, or a toaster oven instead of a conventional oven	55.56%
Air dried utensils instead of heat dry in the dishwasher	33.33%
Air dried clothes	22.22%
Turned off thermostat when not in use	66.67%

Talk about DDC with family	22.22%
None	22.22%

Figure 4.11. Data based on activity for Week 1 | Weekly Checklist

Week 1 | Weekly Checklist Data by Participant	
Number of activities completed per participant	**Percent of activities per participant completed over total number of activities**
8	53.33%
5	33.33%
12	80.00%
6	40.00%
6	40.00%
0	0.00%
5	33.33%
10	66.67%
0	0.00%

Figure 4.12. Data based on participant for Week 1 | Weekly Checklist

Post-Survey

Total of 5 participants completed the Post-Survey. The average concern score was 28.4 and the average knowledge score was 5. These two scores increased from the pre-survey showing there was an increase in concern and knowledge throughout the week. Figure 4.13 shows the data of the scores from post surveys. Since this was only a one week pilot, the post survey was not able to get any other valuable information.

Scores - Post Survey	
Concern	**Knowledge**
29	4
28	6
30	7
26	3
29	5

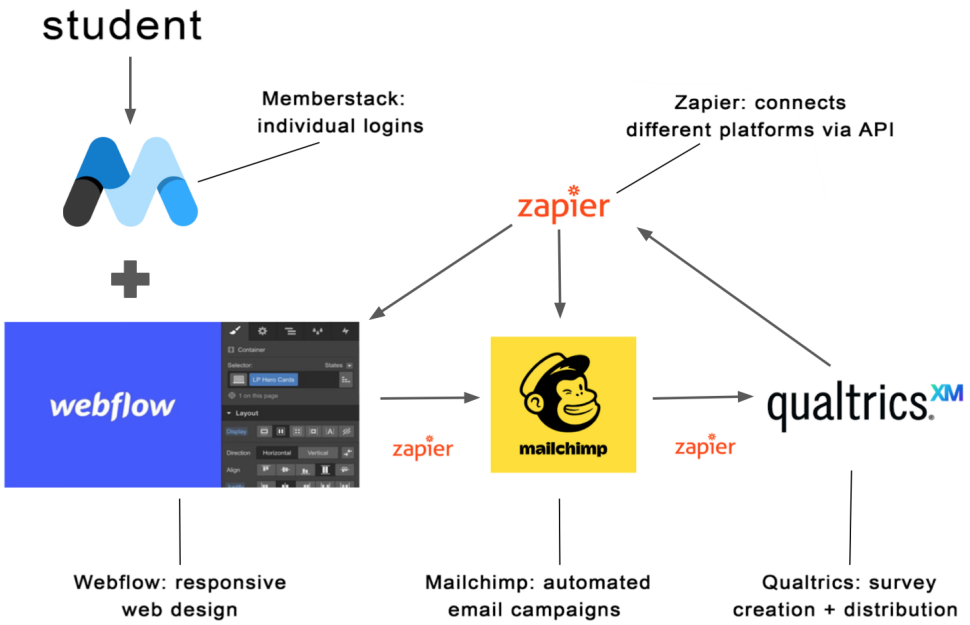
Figure 4.13. Concern and knowledge score in the post-survey.

5. Challenges

One challenge we currently face is incentivising participation. Currently, we intend to appeal to teenagers' desire to learn about energy conservation, save money, and reduce their energy footprint. We created a promotional, call-to-action video in which clips of activists, many who are young, were put together to speak on the matter of saving the planet, and why it matters. However, beyond this internal motivation, we have yet to find a strong external incentive that can draw in more participants. So far, we have created a certificate that commemorates the teenager for completing the challenge, which they receive digitally through Mailchimp on the final day of the challenge. We also hope the ranking system or leaderboard can appeal to the teenagers desire to compete for a top spot in the challenge. A question that remains unanswered is if these factors are strong enough to incentivize participation and what might be other motivators.

Another challenge we have is designing a personalized portal or account for each participant when they sign-up on the website. Ideally, the teenager would sign into their account and view their progress in the challenge, such as how many surveys were completed. Their account will also display the amount of points they have, which teenagers can earn when they complete surveys and invite their friends to the challenge, and these points place them on a leaderboard or ranking system that allows participants to compete. We currently have difficulty understanding how to create individual accounts for each participant. To address this, we outlined the steps of the participant experience, from signing up to completing the challenge, and plan to seek professional help from a user experience designer or someone capable of addressing our needs.

Continuing with that thought, the majority of our setbacks have come from the data infrastructure side. No one on our team is an experienced coder coming into this project, so we have had to use third-party applications to create the program we wanted with Dial Down. Below is a diagram that outlines the flow of data through the project.



As of now, we have three main platforms, Webflow, Qualtrics, and Mailchimp. Webflow is a responsive web-design platform, Qualtrics is what we used to create and distribute surveys, and Mailchimp is an automated email campaign service. We hope to add Memberstack to this list which would allow for individual logins. To connect all of these platforms we use Zapier, which connects websites APIs (application programming interfaces) and triggers interactions on different platforms.

In an ideal world, a student would sign up on the website and that would trigger a set of interactions. The first step in the interactions would be creating an account through the Memberstack application in Webflow. This sign up would link the Memberstack login information to Mailchimp which would send them an introduction email. Zapier would be triggered in this process and this would connect an individualized survey link from Qualtrics for the pre-survey and would be sent in the introduction email from Mailchimp. Once the student completes the first survey Zapier would connect back to Qualtrics and Mailchimp and trigger the second survey being emailed to the student. This process would cascade through the four week program and would also catch students by sending a reminder email if they didn't complete a certain activity.

Simultaneously being updated when the student completes the surveys would be their individualized login portal which is created with Memberstack and Webflow. The student could see what they have completed and what they haven't based on their Qualtrics results and Mailchimp backend data. They would have an individualized Dial Down calendar on their portal in the website that updates when a survey is completed and also would tally their earned points if they are competing within their classroom/amongst friends.

Although this sounds great on paper, connecting these platforms has been difficult because Zapier, the platform which triggers interactions between site's APIs (application programming interfaces), requires a specific "Pool ID" from Qualtrics. We have not been able to secure this

specific ID which would allow us to connect the points from Qualtrics to Mailchimp and Qualtrics to Webflow. Once we do secure the ID the platforms will still need a period of testing the connections to iron out any kinks in the system. We have been working with UCLA's Scott Gruber to help us understand the world of APIs, but there is still a fair amount of work to do on the data infrastructure of this project before it is ready to launch.

6. Future Work

Having constructed a majority of the challenge's primary infrastructure, the future trajectory of Dial Down is predominantly centered around resolving the few remaining technical kinks, and utilizing marketing to aid in the challenges adoption. Ultimately, this challenge aims to permeate the teenage social media market and attract recognition as an educational sustainability resource within popular networking platforms like Tiktok and Instagram. Eventually, this challenge also hopes to gain traction within elementary and middle schools, and make for an adoptable auxiliary segment that teachers can easily add to their existing curriculums.

Currently, we have laid out a blueprint to guide the future team into fully developing the week 5 recruitment page, an optional segment of the challenge which involves having the teenagers invite their friends to join Dial Down in exchange for additional points. This page will also include the digital leadership board and hall of fame segment, both of which are still currently in its construction phase and will require further testing and API-experimentation. In its completion, this particular page will be crucial in motivating future energy stewards to join the challenge, and also cultivate a competitive environment to compel teenagers to try and outcompete one another. We also intend to embed the #dialdownchallenge Instagram feed within the Dial Down Gallery page so that teenagers or other viewers can scroll through the arcade of different projects that they've built. For example, all teenagers will be expected to upload their week 4 "Get Creative" big activity assignment onto their personal Instagram account and hashtag it with #dialdownchallenge so that we can establish a link between the teenager's project and a constantly updated Dial Down feed. As such, the future team will largely be in charge of purchasing and linking together the appropriate APIs and application softwares to put this section of the project in motion. In addition, the mechanisms to link the teenagers point progress with the leadership board is still not entirely apparent, and will require additional troubleshooting and experimenting.

With that said, the core infrastructure of the challenge has already been constructed and the solidity of the primary content (i.e surveys, big activities, weekly surveys) have already passed several rounds of testing and experimentation. However, the primary challenge when it comes to our site infrastructure, as detailed in the previous "Challenge" section, is to link each teenager's progress to a personalized portal account. Currently, we've looked into Memberstack and have also fleshed out a preliminary wireframe illustrating what personalized portals within the Dial Down Challenge would look like. This can be found in the transition document within our shared google drive. As such, the future team should look into further developing this wireframe and consider refining the user experience of the challenge.

The future team will also play a huge role in the distribution and repackaging of the Dial Down brand. For example, they will be responsible for building a distinct brand image for the Dial Down Challenge with the help of social media and digital marketing tools. While our team has

already created a Facebook and Instagram page, we have yet to create any social media content (i.e. share graphics, memes, posts) to build a following and cultivate hype and engagement around the challenge. In addition, since we intend to penetrate the education sector in the distant future, it would be helpful to develop a Facebook page geared towards parents or teachers in order to raise awareness about the challenge and provide educators with a resource to challenge their students to think holistically and critically about energy usage concerns and solutions. Lastly, we have yet to create a Dial Down Tik Tok account. Tiktok currently stands as one of the most popular social media platforms among users aged 10-29, meaning that this digital tool will be an imperative medium in helping Dial Down gain influence among the teenage crowd. The future team should work to develop Dial Down centered Tiktok content in order to help the challenge earn name recognition and gain influence among various teenage genres like comedy, school, pranks, sustainability, education, etc.

7. What We Learned

Simon: The majority of what I focused on during this project had to do with digital infrastructure. Building the website and attempting to connect it via APIs to two new platforms to me, Mailchimp and Qualtrics, challenged me to learn about how websites interact on the internet. I also learned that having someone like Scott Gruber on the team would have been useful much earlier in our journey.

Evelyn: As the leader of our team, organizing and managing our project has been a tremendous learning experience and opportunity. From self-setting team goals and milestones, to diving into the world of APIs and backdoor web development, this entire experience has taught me how to navigate uncertainty through the lens of a leader. Going into the project, I was not at all cognizant of the number of moving parts and components required of the Dial Down Challenge, and as such, upon bumping heads with different technical hurdles, would often find myself having to forego or restructure previously planned timelines. With the gift of hindsight, I now recognize the importance of pairing long-term planning with strategic goal prioritization and will be sure to bring these skills with me into my future endeavors.

Rebecca: The infrastructure of the website is highly complex and requires planning. What would have been beneficial in the beginning is to have prototyped the website to understand the resources to build out the webpages.Another thing I learned was that while many household items drain energy, the largest energy consumers are the water heater, AC thermostat, and the fridge thermostat. In order to tackle energy consumption at the individual level, it is necessary to communicate and educate that these appliances are the primary consumers.

Allison: Over the course of this project, the most important thing I learned was how to create something seamless and cohesive out of the work of several different people. We all focused our efforts on different parts of the program initially and once we had perfected our individual portions, it was more difficult than I anticipated to connect all of the pieces across numerous platforms and refine them using a uniform communication style. We all write and create so differently that it was extremely satisfying to see how we could meld our different styles into one cohesive deliverable. Being able to adapt and adjust in a team environment to create a polished final product is a skill that this project definitely helped me hone in on and one that I'm sure will be incredibly useful in the workplace.

Harneel: This project has taught me the amount of work that goes into making an idea a reality. As we brainstormed ideas they did not seem too difficult but once we started to build them the amount of work soon became a reality. We had to adjust our timeline here and there in order to adjust for the amount of work. Luckily, having such a great team we were able to meet our goals. I also learned different ways to reduce energy consumption at home. As we did our research for the project I started implementing some of things at home, such as using cold water to do laundry. This project taught the importance of energy consumption and several soft skills that I can take with me as I join the workplace.

Roxana: Throughout the duration of this project, I learned how much time and effort it takes to do a research project that has several moving parts and interactions from different parties. It was important to prioritize tasks and complete them by certain deadlines. The year allotted for this project went by incredibly fast and not everything went to plan. We had major data infrastructure setbacks towards the end of our project that extended our timeline. But with these challenges, I learned that it's important to fix one problem at a time. As I join the workforce, there will be stressful situations in which tasks don't go to plan. This project has taught me how to balance stressful tasks with ease while communicating with my team. I am beyond grateful for participating in this research project with my team.

Kimiya: Being a part of something as impactful as this has changed my perspective on the possibilities of change. When something as little as an idea can become a reality inspires me to continue making these changes and not just quitting because something becomes challenging. Although there were many points of challenge in the last school year my teammates have always found a way to get through it and find new ways to reach our goals. I have learned the value of teamwork and the difference it can make in impactful changes. I have also learned to reach out when help is needed which will come in handy in any future project that requires teamwork. I am grateful for the lessons and values I have taken away from this practicum project.

8. Literature Cited

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9. Appendix A - Pilot Program Critique

General

- All surveys: use **Energy Stewards**
- All surveys: standardize buttons - some surveys have back buttons while others don't.
- Change question ID for all file uploads (i.e. Elec_picture1 for electricity bill in pre-survey, Elec_picture2 for electricity bill in post-survey, etc).
- All picture uploads must read: File format can be .jpg, .jpeg, or .png and no larger than 10Mb. (Add pdf for utility bills only).

- Check consistency among Friday Attitude surveys.

Pre-survey

- Issue with the following question -- “If you set back your temperature 7-10 degrees Fahrenheit for 8 hours a day during a month, how much does it lower your heating cost? (estimate percentage of monthly cost, no decimals please)”
    - Is the answer in percentages? Cannot enter percentage sign in the answer box.
- Make utility bill section optional
    - Some participants live in apartments and don’t have access to utilities bills.
- Percentage sign is doubled in the first option (overhead lighting) from the question “What percentage of electricity usage do you estimate coming from the following sources? Enter the percentages”
    - We could not remove %% so we will contact Qualtrics
- Change Constant Sum question (percentage of electricity used) to vertical formatting
- Percent of electricity - there are zeros that need to be removed for this to work. It is tedious and has no option to have blanks.
    - The percentage goes above 100%
- If you set your temperature, it does not show a percentage.
- Issue with the question -- “How would you rate the following statement: my community expects me to conserve energy.”
    - The scale should be the same as the previous question (False to true NOT unlikely to likely).
- “Did you see your teenager” should be “Does your teenager”
- For home appliances, the questions should be tailored for either the parents or students to answer. One question says “For students, please confirm with your parents” and this is confusing.
- Add option for PG&E.
- Explain the cooling and heating season.
- Question for future team: Should participants upload their bills twice if gas is on the same bill as electricity?

Second Email Including Fridge and Thermostat Activities

- If we’re sending a reminder to complete the Pre-survey, then add a link to the pre-survey so people don’t have to go back to the old email.
- We will need to use the "energy guardians" label with parents in the control group.
- I think a TON of people will only click one of the links. These two activities should both be in the same link.

Fridge Activity

- The first question asks if parents are involved in the activity, assuming it’s the teenagers completing the survey. There should be an option only for parents (control group).
    - Changed to: Who is answering the questionnaire?
- Fridge dial image #2) Circular with no numbers - provide five options instead of three: warmest / warm / medium / cold / coldest. Also, it could be a slider instead of multiple choice.
- Only request to upload the picture after participants have updated settings and type in the initial setting.

- Add back buttons to survey

AC Thermostat Activity

- Change the first question to: who is answering the questionnaire?
- Add an option to check if AC or heat is off.
- On the recommendations for cooling months, add “if you are in California” to “78℉ is a good rule of thumb.”
- Only request to upload the picture after participants have updated settings and type in the initial setting.
- Awkward phrasing -- “This time we will be dealing with your heating and cooling practices within your household, or better known as your thermostat settings.”
    - Changed to: “Hi energy stewards! In this activity we will explore another way to save both energy and money in your household by adjusting your heating and cooling thermostat settings. This activity will take 5 - 10 minutes.”
- Changing a question -- “What is the ambient temperature compared to outside temperature?” consolidate to “How does the ambient temperature in your house vary from the temperature outside your house?” (i.e. outside temperature is 70℉ and inside is 68℉ then the difference would be 2 degrees on slider)
    - Make it into a slider question with choices in degrees fahrenheit from -10 to 10.
- There is a lot of text in the description of activity.
- They need to be told to first go to the fridge and look for the dial.
- The picture uploaded at the end was not a required question.
- Video -- Embed the video so participants can watch on the page rather than giving them a link.
- Delay timing so participants can’t move on without spending at least as long on the page as the video length plus a few seconds.
- Use JS to add a “ ℉” after the text box where they input temperature with code below.
    - jQuery('input[type="text"]').eq(0).after(" °F")
- The description of cooling and heating months has a lot of text and should be pared down and broken down into multiple pages.
- Removing heating and cooling question - we should know based on the date.

Friday Attitude Survey and Weekly Checklist

- These items may be combined with the Exit survey. Or use one single link in the email to open surveys.
- Add the option of “None of the above” to the list of activities.
- The following comments are related to the image below.
    - There are two °F in answer.
    - For participants who do not have a thermostat, add option “does not apply.”

- The recommendations to talk to parents should be on a separate page.
- "Turned of A/C when not in use" is missing an "f"
- The checklist has questions for teenagers and then "ask your parents" which should be removed for the parents in the control group.
- Make sure the activities (least and most consistent with) relate to the activities in the challenge.
- Also, we don't have a baseline for these activities (we don't know if participants already unplug appliances).

Exit Survey

- Add option for PG& E.
- There is a double % sign in the knowledge question.
- Regarding the question "Think about the past four weeks and your participation in the Dial Down Challenge…" if the "Other" option is not selected, it still forces the response.